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# Physical Therapy in Women After Mastectomy

## Fizykoterapia u kobiet po mastektomii

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**Włodzisław Kuliński<sup>1</sup>, Karolina Towarek<sup>2</sup>**<sup>1</sup>Department of Rehabilitation, Military Institute of Medicine, Warsaw, Poland<sup>2</sup>Collegium Medicum, Jan Kochanowski University, Kielce, Poland

### SUMMARY

**Aim:** Cancer is the second leading cause of death worldwide, with breast cancer being the most commonly occurring cancer in women. In Poland and in most of the other European countries, breast cancer constitutes 21% of all cancer cases. The aetiology of breast cancer has not yet been fully determined. Early detection offers a better chance of cure.

**Materials and Methods:** The study group consisted of 23 female patients from the breast cancer support group at the Specialist Hospital in Radom. The patients underwent rehabilitation. The study used a research tool in the form of a survey developed by the authors, which helped collect sociodemographic and health data. The data were statistically analysed and the presence of statistically significant differences was checked with a chi-squared test. The results were presented as a proportion (%) of the study group.

**Results:** The results of the study show that rehabilitation had a significant impact on the quality of life. Study patients described the physical therapy they received during and after hospitalisation as excellent.

**Conclusions:** Breast cancer patients should undergo physical therapy and rehabilitation both before and after surgery.

**Key words:** breast cancer, mastectomy, treatment, rehabilitation

**Słowa kluczowe:** rak piersi, mastektomia leczenie, rehabilitacja

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### INTRODUCTION

Breast cancer is one of the most difficult social and medical problems in women in Poland and worldwide. According to the statistics, the number of breast cancer patients has increased three-fold in the past thirty years. In Poland and in most of the other European countries, breast cancer constitutes 21% of all cancer cases in women. There are approximately 16,500 new breast cancer cases and more than 5,000 deaths due to breast cancer in Poland every year. The causes include lifestyle-related risk factors such as lack of exercise, poor diet, low parity, hormone therapy, addictions and a longer lifespan of women [1-10].

Early breast cancer is asymptomatic. It is usually detected on palpation as a painless lump or hard mass in or around the breast.

Every woman should learn to examine her own breasts. Breast cancer is treated with combination therapy, including local (surgery and radiotherapy), systemic (hormone therapy, chemotherapy) and biological treatment.

Surgical breast cancer treatment can be divided into breast-conserving surgery and amputation (mastectomy), which consists in the removal of the breast together with the axillary lymph nodes. After surgery, patients may wear an external breast

prosthesis or undergo reconstructive breast surgery. Following surgical treatment, patients may receive chemotherapy and/or radiotherapy as well as hormone therapy. The treatment has various negative effects, such as limited mobility of the operated upper limb, decreased muscle strength and a reduced range of motion in the joints. Lymphedema is very common. Hearing the news of breast cancer has a very negative influence on the patient's mental and physical status and contributes to considerable stress, leading to anxiety, depression, irritability and a reduced quality of life. Consequently, breast cancer patients need to see a psychologist, who can help them accept the new situation and support them throughout their fight with cancer [8-11]. Physical therapy and rehabilitation are the basis of treatment after breast cancer surgery [12-25].

### REHABILITATION ON THE FIRST DAY AFTER SURGERY

Rehabilitation should be initiated as early as possible to avoid unwanted effects. Patients start early rehabilitation on the first day after surgery to prevent lymphedema. Other methods of lymphedema prevention include limb elevation and muscle pump activation. It is important to facilitate surgical wound healing and help restore full limb function on the operated side.

**REHABILITATION IN THE EARLY POST-HOSPITALISATION PERIOD**

Rehabilitation performed during this period prevents cardiovascular and respiratory problems as well as lymphedema and vein thrombosis. Its main goals are to improve the overall fitness and mental status of the patient and to facilitate lymph drainage.

In order to prevent lymphedema, patients should learn self-massage. Vibration massage is performed using the Aquavibron massaging device.

A unilateral mastectomy results in various body posture changes, mainly shoulder girdle elevation or lowering on the operated side and an increased thoracic kyphosis.

In order to relearn how to maintain a normal body posture, patients may use an external breast prosthesis before their reconstructive surgery.

**AIM**

The aim of the study was to assess the impact of comprehensive rehabilitation on the life of women after mastectomy.

Research questions:

1. What is the sociodemographic situation of study patients?
2. What is the health status of study patients after mastectomy?
3. What rehabilitation intensity is used in the patients and what is the efficacy of rehabilitation according to the patients' occupational activity?
4. Does type of treatment influence rehabilitation intensity?
5. What is the relationship between rehabilitation intensity and rehabilitation efficacy according to the declared level of fitness?
6. Does rehabilitation influence the likelihood of returning to the preoperative level of physical activity?
7. What is the relationship between the intensity and efficacy of rehabilitation and the patients' mental status and self-assessment results?

**MATERIALS AND METHODS**

The research was conducted using a survey developed by the authors.

The study was performed in the breast cancer support group at the Dr Tytus Chałubiński Specialist Hospital in Radom and enrolled 23 women after mastectomy.

The data were statistically analysed using Statistica 13 and Excel 365.

Qualitative data included age, place of residence, type of work, marital status, self-assessed physical health and mental status, acceptance of one's appearance and of the amputated breast, and type of treatment used. Clinical assessment data were presented in the form of pie charts showing percentage distributions. Quantitative data included rehabilitation intensity assessment and a final assessment of rehabilitation effects and were presented using descriptive statistics as arithmetic mean (x), standard deviation (SD) and scatter and distribution measures (minimum [min] and maximum [max] values and quartiles: Q1, median and Q3). All quantitative data were

assessed in terms of the type of scale and the agreement of the scale with a normal distribution using the Shapiro-Wilk test. Independent variables were compared using the Mann Whitney U test.

**RESULTS**

**STUDY GROUP CHARACTERISTICS**

The study enrolled 23 women. The largest age group included patients aged 56-66 years, who constituted 43.48% of the study group. Women aged over 66 years made up 34.78% of the study group, those aged 46-55 years made up 13.04% of the group, and those aged 35-45 years constituted 8.7%.

Study patients lived mostly in cities of over 150,000 residents (43.48%). Women living in towns of 50,000-150,000 thousand residents made up 26.09% of the study group, those living in towns of up to 50,000 residents constituted 13.04% of the group, and the other 17.39% lived in rural areas.

Most study patients (52.17%) did not work (they were retired or were drawing a disability pension). Intellectual workers constituted 30.43% of the study group and manual workers constituted 8.7%. The other study patients were unemployed.

With respect to marital status, 56.52% of the women were married, 21.74% were widowed, 17.39% were divorced and 4.35% had never been married.

The majority of study patients (47.83%) detected their cancer themselves as a worrying change in their breast during a breast self-examination. A mammogram or breast ultrasound detected the cancer in 34.78% of the women and the other 17.39% explained that their cancer had been found by a physician during a routine examination (Figure 1).

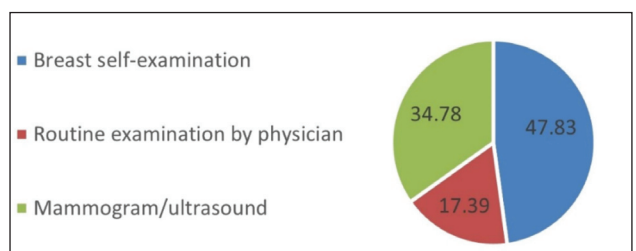
The majority of study patients (69.57%) underwent modified radical mastectomy. Radical mastectomy was performed in 17.39% of study patients and simple mastectomy was performed in 13.04%.

The period of time between surgery and study participation was one year in 43.48% of the women, 1 to 3 years in 21.74%, 3 to 5 years in 13.04% and at least 5 years in 21.74%.

The left breast was operated on in 60.87% of study patients and the right breast in 39.13%. Study patients underwent the following treatment: chemotherapy (69.57%), radiotherapy (21.74%) and hormone therapy (8.7%).

Study patients rated their health after surgery as excellent (52.17%), good (34.78%) or average (13.04%).

The majority of study patients (60.87%) fully accepted their own appearance. The other patients mostly accepted



**Figure 1.** How did the patient find out about her cancer?

their appearance (29.09%) or showed a moderate level of acceptance (13.04%).

When asked to self-assess their current mental status, 52.17% of study patients described it as excellent, 39.13% as good and 8.7% as average.

### REHABILITATION INTENSITY AND REHABILITATION EFFICACY ASSESSMENT

Each area was scored on a scale from 0 to 3 points; the lower the score, the shorter the duration of rehabilitation.

Before their hospitalisation, 47.83% of study patients did not receive any rehabilitation, 26.09% underwent rehabilitation that started a week before the procedure, 17.39% underwent rehabilitation 1 to 3 weeks before surgery and 8.7% underwent rehabilitation for more than 3 weeks. The mean rehabilitation intensity score before the procedure was 1.22. All study patients participated in rehabilitation after surgery. The duration of postoperative rehabilitation was up to one week (17.39%), up to 2 weeks (52.17%) or more than 2 weeks (30.43%) after the procedure. The mean rehabilitation intensity score after the procedure was 1.87.

The Figure 2 shows a histogram of the distribution of rehabilitation intensity assessment results. The mean value for the entire study population was  $3.913 \pm 1.578$  and the median value was 3.333. The values ranged from 1.667 to 7.5. The distribution was analysed with the Shapiro-Wilk test, which showed that it was significantly different from a normal distribution. The p value is equal to 0.0399.

Study patients either described their preoperative rehabilitation as excellent (43.48%) or good (4.35%) or responded that they had not undergone preoperative rehabilitation (52.17%). The mean score was 1.87.

In-hospital rehabilitation was described as excellent by 73.91% of the patients, good by 21.74% of the patients and average by 4.35%. The mean score was 3.7.

Post-hospitalisation rehabilitation was described by the patients as either excellent (78.26%) or good (21.74%). The mean score was 3.78.

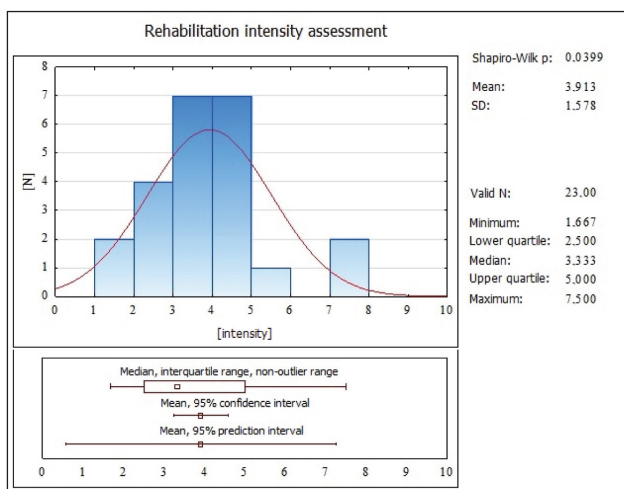


Figure 2. Final distribution of rehabilitation intensity assessment results

Study patients were also asked to rate the effects of comprehensive rehabilitation. Most study patients described them as excellent (73.91%), 21.74% described them as good and 4.35% described them as average. The mean score was 3.7.

The Figure 3 shows a histogram of the final distribution of rehabilitation efficacy assessment results. The mean value for the entire study population was  $8.152 \pm 1.478$  and the median value was 7.5. The values ranged from 4.375 to 10. The distribution was analysed with the Shapiro-Wilk test, which showed that it was significantly different from a normal distribution. The p value is equal to 0.0242.

The pie chart (Figure 4) presents the distribution of answers concerning time to complete physical recovery in the study group.

Study patients who recovered after 4–8 weeks made up 21.74% of the study population. The largest group of patients included women who needed 8–16 weeks to fully recover (47.83%). The recovery lasted more than 16 weeks in 13.04% of study patients.

When asked about their physical fitness after rehabilitation, study patients described it as excellent (52.17%), good (39.13%) or average (8.7%). Most study patients returned to their previous level of fitness (65.22%) and some patients did not (34.78%).

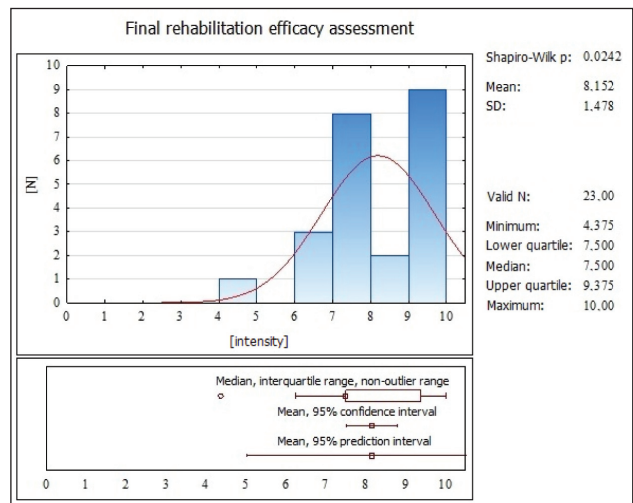


Figure 3. Final distribution of rehabilitation efficacy assessment results

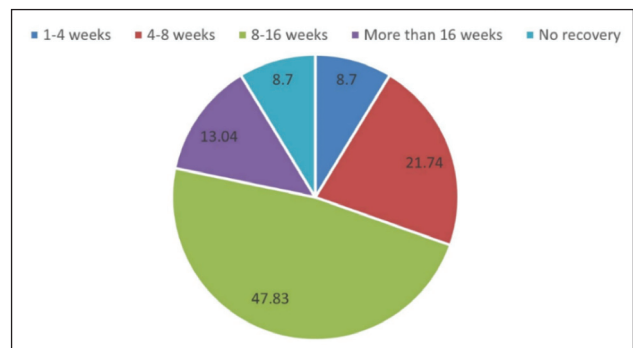


Figure 4. Complete physical recovery

**ASSESSMENT OF RESULTS ACCORDING TO OCCUPATIONAL ACTIVITY**

Table 1 shows data from a descriptive and statistical analysis of the comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to occupational activity.

There were no significant differences in rehabilitation intensity between patients who worked and those who had retired or were drawing a disability pension. The mean intensity in patients who worked was  $4.55 \pm 1.8$ , with a median of 4.2. The mean intensity according to patients who had retired or were drawing a disability pension was  $3.33 \pm 1.12$ , with a median of 3.3. The p value was equal to 0.124.

There were no significant differences in the final assessment of rehabilitation efficacy between patients who worked and those who had retired or were drawing a disability pension. The mean efficacy in patients who worked was  $8.47 \pm 1.26$ , with a median of 8.8. The mean efficacy according to patients who had retired or were drawing a disability pension was  $7.86 \pm 1.65$ , with a median of 7.5. The p value was equal to 0.447.

The analysis used the Mann Whitney U test.

**ASSESSMENT OF RESULTS ACCORDING TO TYPE OF TREATMENT**

Table 2 shows data from a descriptive and statistical analysis of the comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to the type of treatment used in study patients.

There were no significant differences in rehabilitation intensity between patients treated with chemotherapy and those treated with other methods. The mean intensity in patients treated with chemotherapy was  $3.75 \pm 1.52$ , with a median of 3.3. The mean intensity according to patients

treated with other methods was  $4.29 \pm 1.76$ , with a median of 4.2. The p value was equal to 0.539.

There were no significant differences in the final assessment of rehabilitation efficacy between patients treated with chemotherapy and those treated with other methods. The mean efficacy in patients treated with chemotherapy was  $8.28 \pm 1.24$ , with a median of 7.5. The mean efficacy score in patients treated with other methods was  $7.86 \pm 2.00$ , with a median of 8.1. The p value was equal to 0.836.

The analysis used the Mann Whitney U test.

**ASSESSMENT OF RESULTS ACCORDING TO DECLARED LEVEL OF FITNESS**

Table 3 shows data from a descriptive and statistical analysis of the comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to the declared level of fitness.

There were significant differences in rehabilitation intensity between patients with a level of fitness self-assessed as excellent and those with a level of fitness self-assessed as good or average. The mean intensity in patients with an excellent level of fitness was  $4.72 \pm 1.60$ , with a median of 4.6. The mean intensity according to patients with a good or average level of fitness was  $3.03 \pm 1.01$ , with a median of 3.3. The p value was equal to 0.009.

There were significant differences in the final assessment of rehabilitation efficacy between patients with a level of fitness self-assessed as excellent and those with a level of fitness self-assessed as good or average. The mean efficacy in patients with an excellent level of fitness was  $8.80 \pm 1.14$ , with a median of 9.4. The mean efficacy score in patients

**Table 1.** Range of rehabilitation intensity and rehabilitation efficacy assessment results according to occupational activity

Occupational activity	N	SD	Min	Q <sub>1</sub>	Me	Q <sub>3</sub>	Max	Test result	p value
Rehabilitation intensity assessment									
Working	11	4.55	1.80	2.5	3.3	4.2	5.8	1.539	0.124
Retired/disability pension	12	3.33	1.12	1.7	2.5	3.3	4.2		
Final rehabilitation efficacy assessment									
Working	11	8.47	1.26	6.3	7.5	8.8	9.4	0.760	0.447
Retired/disability pension	12	7.86	1.65	4.4	7.2	7.5	9.4		

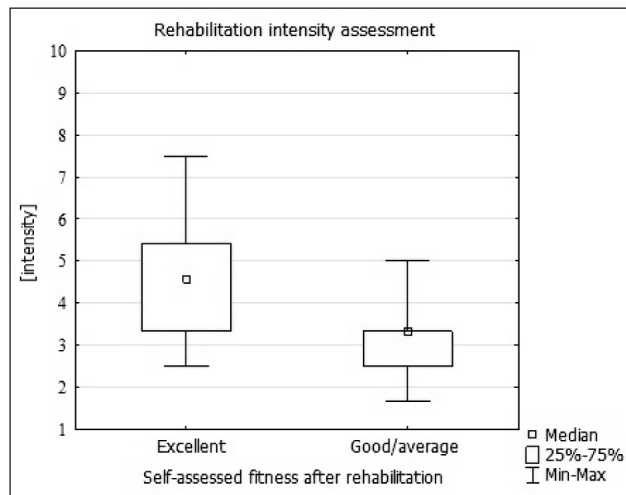
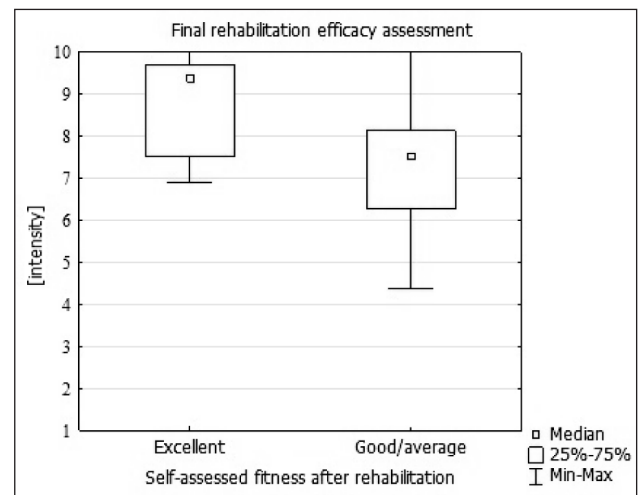
**Table 2.** Comparison of range of rehabilitation intensity and rehabilitation efficacy assessment results according to type of treatment

Type of treatment	N	SD	Min	Q <sub>1</sub>	Me	Q <sub>3</sub>	Max	Test result	p value
Rehabilitation intensity assessment									
Chemotherapy	16	3.75	1.52	1.7	2.9	3.3	4.6	-0.614	0.539
Other	7	4.29	1.76	2.5	2.5	4.2	5.0		
Final rehabilitation efficacy assessment									
Chemotherapy	16	8.28	1.24	6.3	7.5	7.5	9.4	0.206	0.836
Other	7	7.86	2.00	4.4	6.3	8.1	9.4		



**Table 3.** Comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to declared level of fitness

Self-assessed fitness after rehabilitation	N	SD	Min	Q <sub>1</sub>	Me	Q <sub>3</sub>	Max	Test result	p value
Rehabilitation intensity assessment									
Excellent	12	4.72	1.60	2.5	3.3	4.6	5.4	2.608	0.009
Good/average	11	3.03	1.01	1.7	2.5	3.3	3.3		
Final rehabilitation efficacy assessment									
Excellent	12	8.80	1.14	6.9	7.5	9.4	9.7	1.996	0.046
Good/average	11	7.44	1.52	4.4	6.3	7.5	8.1		

**Figure 5.** Distribution of rehabilitation intensity results according to declared fitness**Figure 6.** Distribution of rehabilitation efficacy results according to declared fitness

with a good or average level of fitness was  $7.44 \pm 1.52$ , with a median of 7.5. The p value was equal to 0.046.

The analysis used the Mann Whitney U test.

Figures 5 and 6 show data with respect to rehabilitation intensity and rehabilitation efficacy assessment results according to the declared level of fitness.

#### ASSESSMENT OF RESULTS ACCORDING TO RETURN TO PREOPERATIVE PHYSICAL ACTIVITY AFTER REHABILITATION

Table 4 shows a comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to return to the preoperative physical activity level after rehabilitation.

There were no significant differences in rehabilitation intensity between patients with a complete functional recovery

after rehabilitation and those who did not manage to achieve a complete functional recovery. The mean intensity in patients with a complete functional recovery after rehabilitation was  $4.22 \pm 1.77$ , with a median of 4.2. The mean intensity according to patients who did not manage to achieve a complete functional recovery after rehabilitation was  $3.33 \pm 1.00$ , with a median of 3.3. The p value was equal to 0.292.

There were no significant differences in the final assessment of rehabilitation efficacy between patients with a complete functional recovery after rehabilitation and those who did not manage to achieve a complete functional recovery. The mean efficacy in patients with a complete functional recovery after rehabilitation was  $8.54 \pm 1.15$ , with a median of 8.8. The mean efficacy score in patients who did not manage to achieve a

**Table 4.** Rehabilitation intensity and rehabilitation efficacy assessment results according to return to preoperative physical activity after rehabilitation

Return to the same physical activity	N	SD	Min	Q <sub>1</sub>	Me	Q <sub>3</sub>	Max	Test result	p value
Rehabilitation intensity assessment									
Yes	15	4.22	1.77	1.7	2.5	4.2	5.0	1.054	0.292
No	8	3.33	1.00	1.7	2.9	3.3	3.8		
Final rehabilitation efficacy assessment									
Yes	15	8.54	1.15	6.9	7.5	8.8	9.4	1.396	0.163
No	8	7.42	1.81	4.4	6.3	7.5	8.8		

complete functional recovery after rehabilitation was  $7.42 \pm 1.81$ , with a median of 7.5. The p value was equal to 0.163.

The analysis used the Mann Whitney U test.

**ASSESSMENT OF RESULTS ACCORDING TO SELF-ASSESSED HEALTH STATUS AS COMPARED TO PREOPERATIVE HEALTH STATUS**

Table 5 shows a comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to self-assessed health status.

There were no significant differences in rehabilitation intensity between patients who assessed their health status as good/average and those who assessed their health status as excellent. The mean intensity in patients who assessed their health status as good/average was  $4.32 \pm 1.93$ , with a median of 4.2. The mean intensity according to patients who assessed their health status as excellent was  $3.54 \pm 1.13$ , with a median of 3.3. The p value was equal to 0.396.

There were no significant differences in the final assessment of rehabilitation efficacy between patients who assessed their health status as good/average and those who assessed their health status as excellent. The mean efficacy in patients who assessed their health status as good/average was  $8.18 \pm 1.82$ , with a median of 9.4. The mean efficacy score in patients who assessed their health status as excellent was  $8.13 \pm 1.16$ , with a median of 7.5. The p value was equal to 0.849.

The analysis used the Mann Whitney U test.

**ASSESSMENT OF RESULTS ACCORDING TO ACCEPTANCE OF CURRENT PHYSICAL APPEARANCE**

Table 6 shows a comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to acceptance of one's current appearance.

There were no significant differences in rehabilitation intensity between patients who moderately or mostly accepted their appearance after surgery and those who fully accepted it. The mean intensity in patients who moderately or mostly accepted their appearance after surgery was  $4.07 \pm 1.97$ , with a median of 5.0. The mean intensity according to patients who fully accepted their appearance was  $3.81 \pm 1.34$ , with a median of 3.3. The p value was equal to 0.772.

There were no significant differences in the final assessment of rehabilitation efficacy between patients who moderately or mostly accepted their appearance after surgery and those who fully accepted it. The mean efficacy in patients who moderately or mostly accepted their appearance was  $8.06 \pm 2.04$ , with a median of 9.4. The mean efficacy score in patients who fully accepted their appearance was  $8.21 \pm 1.06$ , with a median of 7.5. The p value was equal to 1.000.

The analysis used the Mann Whitney U test.

**ASSESSMENT OF RESULTS ACCORDING TO CURRENT SELF-ASSESSED MENTAL STATUS**

Table 7 shows a comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to current self-assessed mental status.

There were no significant differences in rehabilitation intensity between patients who differed in terms of self-assessed mental status. The mean intensity in patients who assessed their mental status as good or average was  $3.94 \pm 1.83$ , with a median of 4.2. The mean intensity according to patients who assessed their mental status as excellent was  $3.89 \pm 1.39$ , with a median of 3.3. The p value was equal to 1.000.

There were no significant differences in the final assessment of rehabilitation efficacy between patients who differed in terms of self-assessed mental status. The mean efficacy in patients who

**Table 5.** Rehabilitation intensity and rehabilitation efficacy assessment results according to health status as compared to preoperative health status.

Self-assessed health status	N	SD	Min	Q <sub>1</sub>	Me	Q <sub>3</sub>	Max	Test result	p value	
Rehabilitation intensity assessment										
Good/average	11	4.32	1.93	1.7	2.5	4.2	5.0	7.5	-0.848	0.396
Excellent	12	3.54	1.13	1.7	2.9	3.3	4.2	5.8		
Final rehabilitation efficacy assessment										
Good/average	11	8.18	1.82	4.4	6.9	9.4	9.4	10.0	-0.190	0.849
Excellent	12	8.13	1.16	6.3	7.5	7.5	9.1	10.0		

**Table 6.** Rehabilitation intensity and rehabilitation efficacy assessment results according to acceptance of current appearance.

Acceptance of current physical appearance	N	SD	Min	Q <sub>1</sub>	Me	Q <sub>3</sub>	Max	Test result	p value	
Rehabilitation intensity assessment										
Moderately or mostly accepted	9	4.07	1.97	1.7	2.5	4.2	5.0	7.5	-0.289	0.772
Fully accepted	14	3.81	1.34	2.5	3.3	3.3	4.2	7.5		
Final rehabilitation efficacy assessment										
Moderately or mostly accepted	9	8.06	2.04	4.4	6.3	9.4	9.4	10.0	0.000	1.000
Fully accepted	14	8.21	1.06	6.9	7.5	7.5	9.4	10.0		

**Table 7.** Rehabilitation intensity and rehabilitation efficacy assessment results according to current self-assessed mental status

Self-assessed mental status	N	SD	Min	Q <sub>1</sub>	Me	Q <sub>3</sub>	Max	Test result	p value
Rehabilitation intensity assessment									
Good/average	11	3.94	1.83	1.7	2.5	4.2	5.0	0.000	1.000
Excellent	12	3.89	1.39	2.5	3.3	3.3	4.6		
Final rehabilitation efficacy assessment									
Good/average	11	8.07	1.88	4.4	6.3	8.1	10.0	-0.127	0.899
Excellent	12	8.23	1.06	6.9	7.5	7.5	9.4		

assessed their mental status as good or average was  $8.07 \pm 1.88$ , with a median of 8.1. The mean efficacy score in patients who assessed their mental status as excellent was  $8.23 \pm 1.06$ , with a median of 7.5. The p value was equal to 0.899.

The analysis used the Mann Whitney U test.

## DISCUSSION

Breast cancer is the second leading cause of death worldwide. According to the statistics, the number of breast cancer patients has increased three-fold in the past thirty years and continues to grow. The incidence of breast cancer has been increasing worldwide since the 1970s. The increase in the number of breast cancer cases is related to lifestyle factors and to an improved detectability [1-6].

Once a patient has been diagnosed with breast cancer, a mastectomy is performed. Modified radical mastectomy has the lowest number of side effects and is currently the most commonly used method of early-stage breast cancer removal. After the procedure, the patient may receive chemotherapy, radiotherapy, hormone therapy and pharmacotherapy as well as physical therapy and rehabilitation, which eliminate the negative consequences of surgical treatment. They also prevent such postoperative complications as lymphedema, poor wound healing, capsular contracture or problems with the scar.

The main aim of the study was to assess the effects of comprehensive rehabilitation on the life of women after mastectomy. The study group consisted of 23 female patients from the breast cancer support group at the Specialist Hospital in Radom. Study patients completed an anonymous survey.

The majority (43.48%) of study patients were aged 56 to 66 years. Women over the age of 66 years constituted 34.78% of the study group, women aged 46 to 55 years made up 13.04% of the study group and those aged 35 to 45 years made up 8.7% of the study group.

Most study patients (47.83%) detected their cancer themselves during a breast self-examination. A mammogram or breast ultrasound detected the cancer in 34.78% of the women while the other 17.39% reported that their cancer had been found by a physician during a routine examination.

The majority of study patients (69.57%) underwent modified radical mastectomy. Radical mastectomy was performed in 17.39% of study patients and simple mastectomy was performed in 13.04% of the patients.

Study patients described their own health status as excellent (52.17%), good (34.78%) or average (13.04%). In a study conducted by Milena Lachowicz, over a half (51.1%) of the patients were very happy with their health and only 2.1% described it as poor [6].

When asked if they accepted their current physical appearance, 60.87% of study patients declared that they fully accepted it and 13.04% described their level of acceptance as moderate.

In a self-assessment of their mental status, 52.17% of the patients described it as excellent, 39.13% as good and 8.7% as average.

The present study also evaluated the way study patients rated their preoperative, in-patient and postoperative rehabilitation. As many as 52.17% of study patients did not undergo any type of preoperative rehabilitation as part of preparation for breast cancer surgery. Study patients described their in-patient hospitalisation as excellent (73.91%), good (21.74%) or average (4.35%). When asked about the postoperative rehabilitation, 78.26% of the women answered that it was excellent and 21.74% said it was good. Study patients were also asked to rate the effects of their comprehensive rehabilitation; 73.91% described it as excellent, 21.74% as good and 4.35% as average. The efficacy of the entire rehabilitation cycle according to occupational activity was excellent; there were no significant differences between patients who worked and those who had retired or were drawing a disability pension.

An analysis of rehabilitation intensity and rehabilitation efficacy assessment results according to type of treatment did not reveal any significant differences between patients who received chemotherapy and those who were managed with other treatments.

There were significant differences in rehabilitation intensity between patients with a level of fitness self-assessed as excellent and those with a level of fitness self-assessed as good or average. The mean intensity in patients with an excellent level of fitness was 4.72 and the mean intensity according to patients with a good or average level of fitness was 3.03.

A comparison of rehabilitation intensity and rehabilitation efficacy assessment results according to return to the preoperative level of physical activity after rehabilitation, acceptance of current appearance and mental status did not show any significant differences.

## CONCLUSIONS

1. Breast cancer is a difficult clinical and social problem.
2. Modified radical mastectomy is the most commonly used method of breast cancer treatment.
3. Rehabilitation speeds up the recovery process and improves the physical and mental status of breast cancer patients.
4. Physical therapy is the basis of treatment both before and after surgery and should be adjusted to the individual needs of every patient.

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### ADDRESS FOR CORRESPONDENCE:

**Włodzisław Kuliński**

K Miarki 11 B St.

01-496 Warsaw, Poland

e-mail: wkulinski52@hotmail.com

### ORCID ID and AUTHORS CONTRIBUTION

0000-0002-6419-4030 – Włodzisław Kuliński (A, C, D, E, F)

Karolina Towarek – (B, C, D)

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article

# Assessment of the Quality of Life of Patients with Diabetic Polyneuropathy Using Hydrogen Sulphide Baths

## Ocena jakości życia pacjentów z polineuropatią cukrzycową korzystających z kąpieli siarkowodorowych

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**Tetiana G. Bakaliuk, Nadiya R. Makarchuk, Halina O. Stelmakh**

I.Horbachevsky Ternopil National Medical University, Ternopil, Ukraine

### SUMMARY

**Aim:** Evaluation of the effect of hydrogen sulfide baths on the quality of life of patients with diabetic polyneuropathy.**Materials and Methods:** 125 patients with type 2 diabetes mellitus complicated by diabetic polyneuropathy were examined. The patients were divided into 2 groups: the 1<sup>st</sup> group included 61 patients who received standard treatment in outpatient settings, whereas 64 patients of the 2<sup>nd</sup> group, in addition to standard treatment, received hydrogen sulfide baths in sanatorium conditions. Quality of life was assessed using the EQ-5D-3L questionnaire before treatment, followed by subsequent assessments made 14 days, 3 and 6 months after the treatment, to assess the durability of the effect.**Results:** Positive changes in physical, psychological and social condition were noted in all studied patients, and the patients who took hydrogen sulfide baths managed to achieve statistically significant positive changes and maintain positive dynamics for 3 months. However, after 6 months, quality of life indicators began to decrease, which shows the need for a repeated course of balneotherapy to be taken no later than 6 months.**Conclusions:** The use of hydrogen sulfide baths in the complex treatment of diabetic polyneuropathy improves the quality of life of patients for up to 6 months.**Key words:** quality of life, diabetic polyneuropathy, hydrogen sulfide**Słowa kluczowe:** jakość życia, polineuropatia cukrzycowa, siarkowodór

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### INTRODUCTION

The most frequent complication of diabetes mellitus (DM) is diabetic polyneuropathy (DPN) [1-3]. DPN significantly reduces the quality of life of patients [4]. Assessment of the quality of life allows to determine the patient's condition at the moment, makes it possible to study the effectiveness of rehabilitation measures and treatment, and also helps to predict the course of the disease [5, 6].

Among therapeutic, medical, health-promoting and preventive measures for diabetes, resort treatment is of significant importance. It aims at hindering the disease progression while stimulating compensatory capabilities and restoring lost functions [7].

Treatment medicine is a branch of medicine with long standing tradition in several European countries. A number of systematic reviews have shown the effectiveness of treatment resort for diseases of the musculoskeletal system and neuromuscular disorders. Hydrogen sulfide (H<sub>2</sub>S), the

active molecule of hydrogen sulfide mineral waters, is currently attracting the attention of scientists because of its potential therapeutic applications [8].

In addition to confirming the known properties of hydrogen sulfide mineral waters, data that discover new possibilities for the therapeutic use of these waters are constantly emerging [9].

As a gas, H<sub>2</sub>S can be absorbed in many ways. It is able to penetrate the skin and mucous membranes, so it can act at the cellular level both in the skin and in the internal organs. This means that the local application of hydrogen sulfide mineral waters has the potential to treat diseases of internal organs such as hypertension, ischemia, and conditions affecting the nervous system [10]. H<sub>2</sub>S is also effective in preventing neurodegeneration and neurovascular dysfunction [11].

However, despite the widespread use of hydrogen sulfide balneotherapy in clinical practice, it is promising to study the effect of hydrogen sulfide balneotherapy procedures on the quality of life in patients with diabetic polyneuropathy.

## AIM

The aim is to evaluate the effect of hydrogen sulfide baths on the quality of life in patients with diabetic polyneuropathy.

## MATERIALS AND METHODS

125 patients with type 2 diabetes mellitus and diabetic polyneuropathy were examined. The age of the examinees was from 47 to 61 years (average age  $53.95 \pm 4.84$  years). The duration of DM was from 5 to 21 years (average duration  $9.82 \pm 3.85$  years), and that of DPN ranged within 4-15 years (average duration  $7.43 \pm 3.85$  years). All the patients under examination were divided into 2 groups depending on the received treatment program: the control group (1<sup>st</sup> group) included 61 patients who received standard treatment in outpatient conditions according to the unified clinical protocol of primary and secondary (specialized) medical care (No. 1118 dated 21 Dec 2012) in outpatient settings [12]. 64 patients of the 2<sup>nd</sup> group were receiving sanatorium treatment and, in addition to standard medical treatment, received hydrogen sulfide baths No. 8 for 14 days.

For traditional hydrogen sulfide balneotherapy, mineral hydrogen sulfide sulfate-calcium low-mineralized neutral water was used, which was heated to 37-38°C and supplied from a well directly into the bath with a hydrogen sulfide concentration of 55-75 mg/l. The patient's time in the bath lasted from 10 to 15 minutes. During 14 days, patients took 8 hydrogen sulfide baths.

The groups were comparable in terms of age, duration of DM, and severity of clinical manifestations of DPN (Table 1).

The EQ-5D-3L questionnaire was used to assess the quality of life [13-15]. The patients assessed their condition according to the following points: mobility, independent self-care, daily activity, pain, discomfort, emotional instability (anxiety/depression). The results were evaluated according to the following criteria: no difficulties-1, minor difficulties-2, significant difficulties-3. After filling out the questionnaire, the researcher checked the questionnaire for absence of omissions. The survey was conducted four times: at admission, 14 days after the start of diabetic polyneuropathy therapy, and in the form of telephone survey 3 and 6 months after the treatment.

Analysis and processing of clinical examinations statistical data was carried out on a personal computer using the STATISTICA 10 and MS Excel XP software applications. Comparisons between groups were performed using mean rank comparisons and were considered veritable at  $p < 0.05$ .

The reliability of differences between groups was calculated on the basis of ANOVA-statistics functions. Absolute values were compared using the Pearson  $\chi^2$  (xi-square) test. The difference in indicators was considered veritable at  $p < 0.05$ .

The research methods used in the test groups of patients with DPN-complicated type 2 diabetes mellitus comply with the requirements of the World Health Association Helsinki Declaration on Ethical Principles for Scientific Research with Human Participation (1964-2000), as was confirmed on the meeting of Bioethics Commission of I.Horbachevsky Ternopil National Medical University of the Ministry of Health of Ukraine of April 12, 2022.

## RESULTS

When analyzing quality of life indicators using the EQ-5D-3L questionnaire before treatment in both groups, it was found that 26 (20.8%) of the examined patients had no mobility restrictions, and 99 (79.2%) had minor mobility restrictions. Not a single patient had a pronounced limitation of mobility. Self-care was not limited in 101 (80.8%) patients and was moderately limited in 24 (19.2%) respondents. Those who could not take care of themselves at all were not found among the examined. 48 (38.4%) patients were able to perform normal daily activities, while 50 (40%) had difficulties with performing daily activities. 8 (6.4%) respondents did not feel pain/discomfort, 99 (79.2%) patients had minor discomfort, and 18 (14.4%) patients were bothered by severe pain. Anxiety/depression did not bother 77 (61.6%) patients with diabetes, while in 43 (34.4%) such manifestations were moderate, and in 5 (4.2%) they were significantly pronounced. The generalized results in the groups according to the EQ-5D-3L questionnaire before treatment are shown in Figure 1.

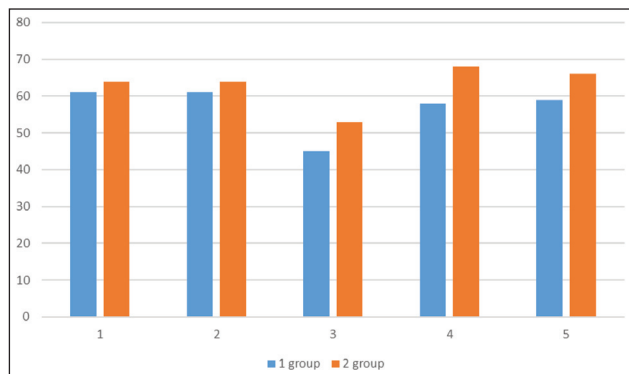
The analysis of the patients' answers to the items of the questionnaire showed that there were no significant differences in the answers between the studied groups before the treatment.

In 14 days both standard and modified treatment contributed to positive dynamics of the quality of life indicators of patients, however, the patients of the 2<sup>nd</sup> group, who, in addition to standard treatment, received hydrogen sulfide baths, showed significantly less discomfort in mobility and usual daily activities, as well as less pain sensations (Figure 2).

The results of individual questionnaire items obtained 3 months after treatment were as follows: subjective indicators of mobility 24(39.3%) in the 1<sup>st</sup> group of patients and 13(20.3%) in the 2<sup>nd</sup> group of patients, self-care 41( 67.2%) and 25(39.1%) patients, usual daily activities 32(52.5%) and 19(29.7%) patients, pain/discomfort 32(52.5%) and 13(20, 3%),

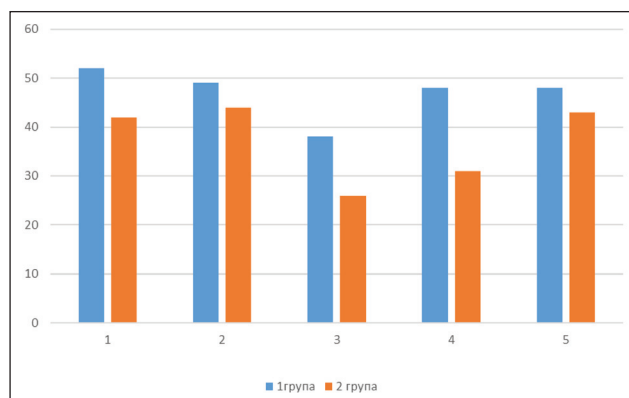
**Table 1.** General characteristics of patients with type 2 diabetes ( $M \pm \sigma$ )

Characteristic	1 <sup>st</sup> group n=61	2 <sup>nd</sup> group n=64	F	P
Age, years	$54.66 \pm 5.20$	$55.53 \pm 6.5$	2.15	$p > 0.05$
Duration of DM, years	$8.56 \pm 3.25$	$7.98 \pm 3.4$	1.72	$p > 0.05$
Duration of DPN, years	$6.91 \pm 2.82$	$7.19 \pm 2.91$	1.27	$p > 0.05$



**Figure 1.** The results of the survey of patients of the test groups (EQ-5D-3L questionnaire) before treatment

Note: 1 – mobility; 2 – self-care; 3 – normal daily activities; 4 – pain/discomfort; 5 – anxiety/depression



**Figure 2.** The results of questionnaires of patients in the test groups (EQ-5D-3L questionnaire) 14 days after the start of treatment

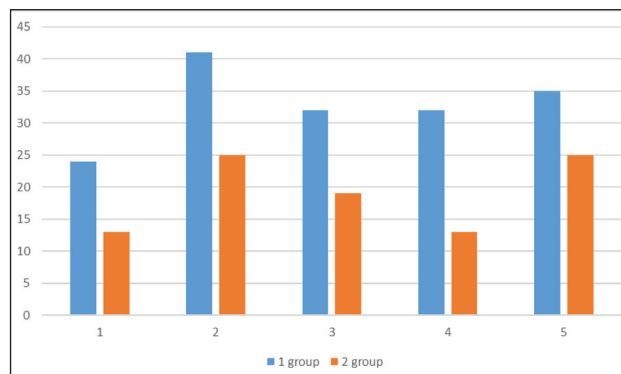
Note: 1 – mobility; 2 – self-care; 3 – normal daily activities; 4 – pain/discomfort; 5 – anxiety/depression

anxiety/depression 35(57.4%) and 25(39.1%) of the examined (Figure 3). Significant preservation of the treatment effect on quality of life indicators ( $p < 0.05$ ) was observed in the patients of the 2<sup>nd</sup> group, in comparison with the indicators of the quality of life of those in the 1<sup>st</sup> group.

Therefore, the additional inclusion of hydrogen sulfide baths in the treatment program contributed to the preservation of quality of life indicators after 3 months, since all indicators of the questionnaire reliably differed positively from the initial level, in contrast to the indicators in the 1<sup>st</sup> group.

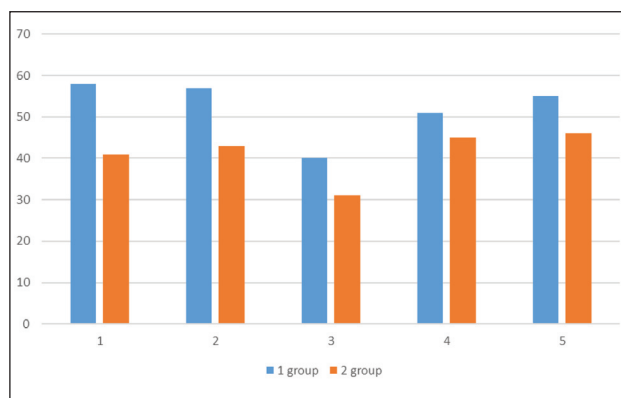
Comparison of the results of individual tests of the questionnaire between the groups showed that 6 months after treatment in the 1<sup>st</sup> and 2<sup>nd</sup> groups, pain returned to the initial level in 51 (83.6%) and 45 (70.3%), anxiety and depression in 55 (90.1%) and 46 (71.9%) respectively, whereas subjective indicators of mobility 41 (64.1%), self-care 43 (67.2%), and usual daily activities 31 (48.4%) veritably less bothered the patients of the 2<sup>nd</sup> group (Figure 4).

That is, the survey of patients 6 months after the treatment showed a partial return of patients' quality of life indicators to the level at the beginning of the study in the 2<sup>nd</sup> group and a complete return of these indicators in the 1<sup>st</sup> group.



**Figure 3.** The results of questionnaires of patients in the test groups (EQ-5D-3L questionnaire) 3 month after the start of treatment

Note: 1 – mobility; 2 – self-care; 3 – normal daily activities; 4 – pain/ discomfort; 5 – anxiety/depression



**Figure 4.** The results of questionnaires of patients in the test groups (EQ-5D-3L questionnaire) 6 month after the start of treatment

Note: 1 – mobility; 2 – self-care; 3 – normal daily activities; 4 – pain/ discomfort; 5 – anxiety/depression

The results of our work show that the retention of indicators of improved quality of life in patients with type 2 diabetes mellitus and DPN who take hydrogen sulfide baths is 6 months on average, thus in order to maintain the treatment efficacy and improve the quality of life, a course of balneotherapy should be retaken within this period.

## DISCUSSION

Diabetic neuropathy develops in patients with diabetes, and the occurrence of this complication cannot be associated with other causes of peripheral neuropathy.

The prevalence of DPN is on average 60-70%, and non-traumatic amputations of the lower limbs associated with diabetic foot syndrome occur in 40-70% of cases [16, 17].

In many patients with type 2 diabetes, neuropathy continues to progress, despite proper glycemic control and exclusion of risk factors, which significantly worsens the quality of life of such patients. Therefore, the search for ways of prevention and adequate pathogenetic treatment has not only medical, but also economic aspects.

In recent years, the assessment of the quality of life has gained more importance in global medical practice as an

indicator of the patient's general condition and is used to assess the effectiveness of treatment and rehabilitation measures in these patients. Quality of life is an integral characteristic of the patient's physical, psychological, emotional and social functioning, which is based on person's subjective perception. Each of the components, in turn, includes a number of constituents, for example, physical component includes symptoms of the disease, the ability to perform physical work, the ability to self-care; psychological one deals with anxiety, depression; social component refers to social support, work, etc. Their comprehensive study helps to find out the life quality level and determine which component increases or decreases it, as well as develop individualized programs to improve quality of life (adjust treatment, provide social support, etc.) [18-20].

According to literature data [21], hydrogen sulfide baths have a positive effect on the course of DPN: the skin is affected by the hydrostatic pressure of the water and its temperature regime, and the hydrogen sulfide contained in the water penetrates through the skin into the blood and irritates nerve endings. As a rule, the reaction of the skin to hydrogen sulfide waters is accompanied by redness, increased secretion of sebaceous glands, stimulation of metabolic processes, and improvement of skin nutrition.

Hydrogen sulfide baths are instrumental in cleaning the surface of the skin from acids, alkalis, salts, microorganisms and metabolic products, help accelerate the healing of muscle tissue, skin, and have an anti-inflammatory effect. In addition, hydrogen sulfide baths improve the condition of the central and peripheral nervous system, which is very important for diabetes.

In our study, we observed a better clinical effect in patients who took hydrogen sulfide baths, and their quality of life indicators had significant changes ( $p < 0.05$ ) after 14 days and 3 months. However, after 6 months, the patients' quality of life indicators began to partially return to their initial values.

Therefore, the use of hydrogen sulfide baths in addition to protocol treatment schemes contributes to the positive dynamics of patients' life quality indicators and the retention of the clinical effect, which is confirmed after 3 months by the reliably positive dynamics of subjective indicators of mobility and self-care (2.9 times  $p < 0.05$ ), usual daily activities (3.3 times,  $p < 0.05$ ), reduction in the frequency of discomfort and pain (3.8 times,  $p < 0.05$ ) and anxiety-depressive conditions (4.3 times,  $p < 0.05$ ) in the corresponding sections of the EQ-5D-3L questionnaire.

## CONCLUSIONS

The use of hydrogen sulfide baths at the sanatorium-resort stage of rehabilitation in patients with diabetic polyneuropathy contributes to the positive dynamics of indicators of the quality of life of patients 14 days and 3 months after treatment, and also affects the duration of the clinical effect, which extends up to 6 months, which is reflected in a reliably positive dynamics of such blocks of the EQ-5D-3L questionnaire as subjective indicators of mobility, self-care and daily living activities.

Monitoring the quality of life allows not only to control the functional state of the body in patients with DPN at various stages of treatment, but also correctly assess the effectiveness of treatment and, if necessary, adjust and correct treatment and rehabilitation measures.

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The Authors declare no conflict of interest

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#### ADDRESS FOR CORRESPONDENCE:

**Tetiana G. Bakaliuk**

I. Horbachevsky Ternopil National  
Medical University  
1 Maidan Voli Sq, 46001 Ternopil, Ukraine  
phone: +380988364164  
e-mail: tanita5d@ukr.net

#### ORCID ID and AUTHORS CONTRIBUTION

0000-0002-7619-0264 – Tetiana G. Bakaliuk (A, F)  
0000-0001-5196-1619 – Nadiya R. Makarchuk (B, C)  
0000-0003-2992-3274 – Halina O. Stelmakh (D, E)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



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Info

## POLISH ASSOCIATION OF HEALTH RESORT PATIENTS

On the initiative of Professor Irena Ponikowska, the Polish Association of Health Resort Patients was established in 2019. The Association aims to integrate patients using health resort treatment, increase the availability of health resort treatment for subjects in need, improve the quality of services provided in the health resort treatment sector, cooperate with doctors and health resort treatment facilities, and involve in patient education.

Each member of the Association will be able to benefit from discounts in fees for stay and treatment, during commercial stays in selected health resort treatment facilities, and take part in conferences, workshops, and consultations organized by the Association.

Natural and legal persons may be members of the Association. Membership in the Association for natural persons is free, whereas legal persons may become supporting members.

We invite both patients and companies operating in the field of health resort medicine to work together.

Please visit the website of the Association [udrowiskowi.eu](http://udrowiskowi.eu) where you will find more information as well as a declaration of joining the Association.

*The Board of the Polish Association of Health Resort Patients*

# The Effectiveness of High-intensity Pulsed Magnetic Therapy in Rehabilitation of Servicemen with Post-traumatic Osteoarthritis of Knee Joints

## Skuteczność magnetoterapii pulsacyjnej o wysokiej intensywności w rehabilitacji żołnierzy z pourazową chorobą zwyrodnieniową stawów kolanowych

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Iryna Babova<sup>1</sup>, Iryna Balashova<sup>2</sup>, Iryna Zabolotna<sup>2</sup><sup>1</sup>State Institution "South Ukrainian National Pedagogical University Named after K.D. Ushynsky", Odesa, Ukraine<sup>2</sup>State Institution "Ukrainian Research Institute of Medical Rehabilitation and Resort Therapy of the Ministry of Health of Ukraine", Odesa, Ukraine

### SUMMARY

**Aim:** To increase the effectiveness of complex rehabilitation of servicemen with PTO by using high-intensity pulse magnetic therapy (HIP MT).**Materials and Methods:** The study design included 62 patients with PTO of stage I-III who were divided into: – control group (32 patients) received rehabilitation complex (RC) №1, which included: climatotherapy, kinesiotherapy, massage and balneotherapy; – main group (30 patients) received RC №2 with adding of HIP MT on the affected joints. The analysis of the effectiveness was performed using an algometric clinical examination, Lequesne's algo-functional index (AFI), WOMAC, visual analog pain scale (VAS), HAQ questionnaire.**Results:** It was shown reliable benefits of RC № 2: the intensity of pain by VAS decreased by 3,1 times, according to the AFI gonarthrosis was assessed as mild, the value of the total WOMAC index was 20.2% better than in control group ( $p < 0.05$ ). The HAQ index showed a significant improvement in 41.3% (1.5 times better than in patients of control group). During long-term observation (3 months) after rehabilitation improvement was observed in 96.6% of patients of main group.**Conclusions:** The use of HIP MT in the complex rehabilitation of patients with PTO has significantly reduced the manifestations of pain, increase functioning of joints and restore combat readiness.**Key words:** post-traumatic osteoarthritis, servicemen, knee joints, high-intensity pulse magnetic therapy, rehabilitation**Słowa kluczowe:** pourazowa choroba zwyrodnieniowa stawów, żołnierze, stawy kolanowe, magnetoterapia pulsacyjna o wysokiej intensywności, rehabilitacja

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### INTRODUCTION

One of the features of the defeat of servicemen with modern weapons is severe injuries as a result of mine injuries [1, 2]. That is why the share in the structure of sanitary costs during hostilities is occupied by injuries of the musculoskeletal system [2, 3], most often – various injuries of the lower extremities (58.8%), including intra-articular fractures of large joints of the lower extremities, accompanied by trauma of musculoskeletal system, cartilage, and subsequently leads to the development of post-traumatic osteoarthritis (PTO) with a violation of the recovery and destruction of all joint tissues.

The severity of the medical and social consequences of PTO is due to the chronic progressive course and limitation

of joint function, which is accompanied by a high risk of loss of combat capability of the serviceman and disability [2].

The leading complaint and the earliest symptom in patients with PTO is pain, which is characterized by heterogeneity and multimodality, and is an important multidisciplinary problem in the treatment of this group of patients [4-6]. Trauma-induced damage to the structures of the joint leads to a prolonged inflammatory process, which is characterized, inter alia, by pain of varying intensity [7-9], which leads to a lack of function.

The main goal of treatment of patients with PTO is to reduce the manifestations of pain, improve the functional activity of the joints, improve the quality of life of patients, prevent disability [5,10-12].

Usually, analgesic drugs are used to control the pain syndrome in patients with PTO, which have long-term side effects and are limited to certain comorbid diseases [13-15].

Therefore, the concept of pain control in PTO should be comprehensive and aimed at prescribing effective analgesic factors that have the greatest analgesic and anti-inflammatory potential. An important role is played by modern physical modalities methods, in particular, high-intensity pulsed magnetic therapy (HIP MT).

High-intensity pulsed magnetic therapy (HIP MT) uses a unique high-intensity electromagnetic field with a magnetic induction of 1.5-3 T. The analgesic effect of HIP MT is due to a decrease in the excitability of afferent fibers with a decrease in the level of histamine in the nervous system and anti-edema effect with a decrease in histamine in tissues (antihistamine effect) [16]. Induced eddy currents of very low frequency generated by HIP MT, due to the activation of weakly myelinated A $\sigma$  and C-fibers are able to block the afferent impulse from the pain cell [16,17]. According to the degree of analgesic, anti-inflammatory, muscle-stimulating effect, HIP MT exceeds the known types of low-frequency magnetic therapy [16,18]. In addition, HIP MT helps to reduce the muscular-tonic syndrome, improve regenerative-reparative processes [16].

### AIM

To increase the effectiveness of rehabilitation of servicemen with PTO by using HIP MT to reduce pain syndrome, restore the functional activity of knee joints, increase quality of life and prevent disability, restore combat readiness.

### MATERIALS AND METHODS

The study design included 62 servicemen with PTO, all men, the average age was (34  $\pm$  5.8) years. The diagnosis of osteoarthritis of knee joints was established according to the classification of I. Kellgren, I. Lawrence. Confirmation of the traumatic origin of osteoarthritis was mandatory, with a period of three to six months after injury. The majority of patients had PTO of stage II – 36 (58.1%), the rest had stage I – 21 (33.9%) and stage III – 5 (8.1%), patients with stage IV were not included in the study. 46 (74.2%) patients had monoosteoarthritis of knee joint, bilateral lesions were observed in 16 (25.8%) cases. Patients were under observation in the Odesa military rehabilitation center of Ministry of Defence of Ukraine. Depending on the type of treatment all patients were divided into two groups: control (32 patients (51.6%)) and main (30 patients (48.4 %)) groups.

Patients of the control group received rehabilitation complex №1 (RC №1), which included: climatotherapy, kinesiotherapy, massage and balneotherapy.

Kinesiotherapy consists of physical exercises with a choice of starting position without axial load on the knee joints (in a sitting or lying position): passive, active exercises for the affected limb; three times a week, lasting 30-40 minutes. Balneotherapy was used in the form of sodium chloride general baths of medium concentration (20-40 g/l), every other day, with a course of 10 procedures. Massage (therapeutic classical and segmental-reflex) was applied to the affected limb

and the corresponding segmental area, course consisted of 10 procedures, daily or every other day. The massage procedure was aimed at normalizing the tone, increasing the contractility of weakened muscles, improving blood and lymph circulation, trophic and regenerative processes, correction of concomitant neurological manifestations, normalization of the patient's emotional state.

Patients of the main group received rehabilitation complex №2, in which to rehabilitation complex №1 were added HIP MT procedures on the affected joints. HIP MT procedures were performed on a HIP MT Zimmer emField Pro, program 3 (anesthesia for chronic pain), the duration of the procedure was 10-15 minutes. During the procedure patient was in a supine position, the intensity of exposure was adjusted during therapy individually. Patient was warned about the possibility of feeling moderate discomfort in the affected area, in this regard the first procedures were performed with an intensity of 5-10%. With a comfortable perception of the effect of the procedure, the intensity was increased to 40-50%. The course consisted of 8-10 procedures every other day.

Analysis of the effectiveness of treatment was performed using algometric clinical examination (severity of pain on palpation, active and passive movements, signs of inflammation, defiguration and deformation of joints), assessment of quality of life by Lequesne's algo-functional index (AFI) for knee joints, visual-analog scale of pain (VAS), Stanford Health Assessment Questionnaire (HAQ), Western Ontario and McMaster Universities osteoarthritis Index (WOMAC), coefficient of saturation of symptoms (CS).

In order to determine the severity of osteoarthritis of the knee joint, the Lequesne's algo-functional index (AFI) was used, which was a questionnaire for self-completion of patients and has three sections: characteristics of pain, maximum distance when walking without pain and functional activity. The assessment was performed on a scale, where 1-4 points – mild gonarthrosis, 5-7 points – gonarthrosis of moderate severity, 8-10 – severe gonarthrosis, 11-13 – more severe gonarthrosis, 14 points or more – very severe gonarthrosis [5].

The Stanford Health Assessment Questionnaire (HAQ) was used to assess quality of life. The questionnaire consists of 20 questions divided into 8 categories (dressing, getting up, eating, walking, hygiene, achievable range, hand function, mobility), which assess the ability to perform certain actions on a 4-point scale. The HAQ index was calculated as the average of the highest scores for each category [10,12].

The effectiveness of the treatment was assessed using Western Ontario and McMaster Universities osteoarthritis Index (WOMAC). The self-administered WOMAC questionnaire has questions regarding pain severity, stiffness, and functional capacity. The total WOMAC index [10, 12] was calculated.

The analysis of the study results was also performed by calculating the coefficient of saturation of symptoms (CS) – the ratio of the actual number of patients with characteristic symptoms (joint pain: at rest, when moving, at night, on palpation, restricted movement, fatigue in the lower extremities, reduced walking distance) to the number of examined patients in each clinical observation group.

In the long-term period (after 3 months) the effectiveness of rehabilitation was performed using the test “Evaluation of the effectiveness of treatment by the patient” on a scale of “significant improvement”, “improvement”, “good”, “satisfactory” and “unsatisfactory” results.

## RESULTS AND DISCUSSION

The analysis of the results of the study showed the reliable advantages of the rehabilitation complex № 2, in which physical modality HIP MT was additionally used.

According to the algometric clinical examination, patients of both groups showed a reliable improvement in the clinical condition. The majority of patients in the main group showed a marked reduction in pain when performing active and passive movements, at rest, at night, as well as a significant improvement in functional activity in the joints. In main group of patients with the use of rehabilitation complex №2 CS decreased almost 4.6 times ( $p < 0.05$ ), while in the control group – only 1.6 times. Evaluation of the severity of pain by VAS in patients of control group showed an improvement of 1.6 times, whereas in main group the intensity of pain decreased by 3.1 times (Table 1).

Evaluation of the Lequesne’s algo-functional index (AFI) at the beginning of treatment revealed significant pathological changes in patients of both observation groups. However, after the use of rehabilitation complex №2, which included HIP MT procedures, gonarthrosis was assessed as mild ( $3.7 \pm 1.2$ ) points, whereas in the control group – as moderate ( $7.4 \pm 1.2$ ) points. In patients of main group a significant reduction

of pain at night, after prolonged standing, increasing the maximum distance when walking without pain and improving functional activity were determined (Table 2).

According to WOMAC index in patients of both groups decrease in the intensity of pain and manifestations of stiffness, improved functional activity were also observed. However, in patients of the main group the value of the total WOMAC index was 20.20% better than in patients of the control group ( $p < 0.05$ ). Reliable changes related to pain during prolonged standing, at night, when moving and walking upstairs, stiffness during the day, functional limitations during squats (Figure 1).

Assessment of the quality of life of patients was performed on the HAQ scale. Patients in both groups noted the presence of moderately severe physical dysfunction in all categories of the questionnaire before rehabilitation. Thus, in the control group, the HAQ index was ( $1.41 \pm 0.36$ ), in main group – ( $1.38 \pm 0.31$ ) points. After rehabilitation patients in main group improved HAQ index by 41.3% to ( $0.81 \pm 0.32$ ) points, which is 1.5 times better than in patients of control group, where HAQ index remained at the level of ( $1.24 \pm 0.25$ ) points and the improvement was only 12.1% ( $p > 0.05$ ). The most significant improvements were observed in the categories of getting up, walking and mobility (other actions).

Evaluation of the long-term effectiveness of rehabilitation was performed 3 months after rehabilitation. Improvement and stabilization of the physical conditions were noted by almost all patients of the main group (96.6%). Of these, the assessment of “significant improvement” and “improvement” had more than half of patients, unsatisfactory results were not observed. In the

**Table 1.** Dynamics of algometric clinical examination of patients with post-traumatic osteoarthritis of knee joints,  $n=62$ , (%)

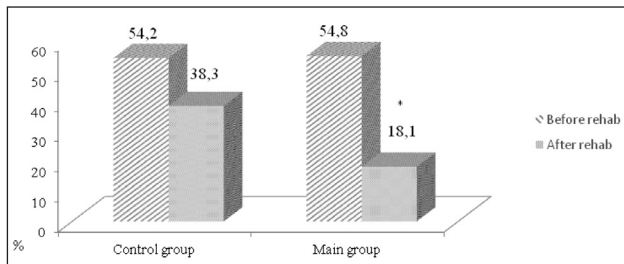
Clinical symptom	Control group, $n=32$		Main group, $n=30$	
	Before rehabilitation	After rehabilitation	Before rehabilitation	After rehabilitation
Pain at rest, n (%)	26 (81,3)	18 (56,3)	24 (80,0)	4 (13,3)
Pain during passive movements, n (%)	30 (93,8)	14 (43,8)	27 (90,0)	3 (10,0)
Pain during active movements, n (%)	32 (100)	24 (75,0)	29 (96,7)	6 (20,0)
Pain on palpation, n (%)	32 (100)	24 (75,0)	30 (100,0)	8 (26,7)
Pain at night time, n (%)	22 (68,8)	11 (34,4)	20 (66,7)	4 (13,3)
Restriction of movements, n (%)	24 (75,0)	10 (31,3)	21 (70,0)	7 (23,3)
Feeling tired while walking, n (%)	26 (81,3)	18 (56,3)	25 (83,3)	6 (20,0)
Reducing walking distance, n (%)	18 (56,3)	12 (37,5)	19 (63,3)	4 (13,3)
VAS, points ( $M \pm \sigma$ )	$6,7 \pm 0,2$	$4,3 \pm 0,2$	$6,9 \pm 0,2$	$2,2 \pm 0,2^*$
CS, ( $M \pm \sigma$ )	$6,6 \pm 0,2$	$4,1 \pm 0,1$	$6,5 \pm 0,1$	$1,4 \pm 0,1^*$

Note: \* data reliability ( $p \leq 0,05$ ) in comparison between groups after rehabilitation

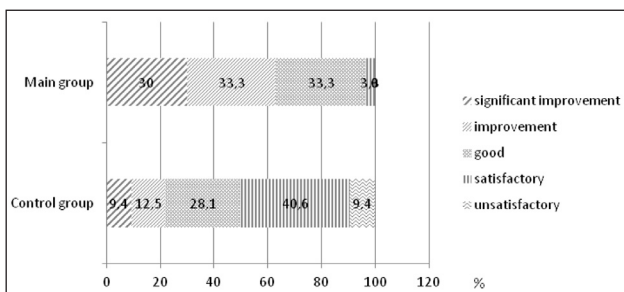
**Table 2.** Dynamics of Lequesne’s algo-functional index in patients with post-traumatic osteoarthritis of knee joints,  $n=62$ , ( $M \pm \sigma$ )

Data groups	Control group ( $n=32$ )		Main group ( $n=36$ )	
	Before rehabilitation	After rehabilitation	Before rehabilitation	After rehabilitation
Characteristics of pain or discomfort, ( $M \pm \sigma$ )	$5,7 \pm 1,2$	$2,9 \pm 1,2$	$5,6 \pm 1,2$	$1,2 \pm 1,2$
The maximum distance when walking without pain, ( $M \pm \sigma$ )	$1,9 \pm 1,1$	$1,7 \pm 1,1$	$1,9 \pm 1,02$	$0,8 \pm 1,1$
Functional activity, ( $M \pm \sigma$ )	$5,1 \pm 1,2$	$2,8 \pm 1,01$	$5,2 \pm 1,2$	$1,7 \pm 1,01$
Total points, ( $M \pm \sigma$ )	$12,7 \pm 1,2$	$7,4 \pm 1,2$	$12,7 \pm 1,2$	$3,7 \pm 1,2^*$

Note: \* data reliability ( $p \leq 0,05$ ) in comparison between groups after rehabilitation



**Figure 1.** Dynamics of the effectiveness of treatment of patients with post-traumatic osteoarthritis of knee joints according to the questionnaire WOMAC (\*data reliability  $p \leq 0,05$ )



**Figure 2.** Evaluation of the effectiveness of rehabilitation of patients with post-traumatic osteoarthritis of knee joints after 3 months

control group the assessment of “significant improvement” and “improvement” was noted by 21.9% of patients, most patients rated their condition as satisfactory (40.6%), 9.4% of patients remained unsatisfactory (Figure 2).

Thus, the use of high-intensity pulsed magnetic therapy in the complex rehabilitation of patients with post-traumatic osteoarthritis of the knee joints makes it possible to effectively control the manifestations of pain due to the impact on all pathogenetic links of its formation. It leads to increase of functional ability and quality of life, restore of combat readiness of servicemen. This effect remains in long observation period (3 months after rehabilitation).

## CONCLUSIONS

1. The use of High-intensity pulsed magnetic therapy (HIP MT) in servicemen with post-traumatic osteoarthritis of the knee joints reliably reduces the manifestations of pain according to VAS by 68.1%, decreasing of pain and increasing of functional ability according to Lequesne's algo-functional index and WOMAC index by 70.9 % and 20.2% respectively. This improves the effectiveness of rehabilitation of patients, elimination of deficit of functions, restore of combat readiness.
2. Patients who received High-intensity pulsed magnetic therapy (HIP MT) in the complex rehabilitation determined a significant improvement in quality of life according to the HAQ questionnaire.
3. Evaluation of the long-term effectiveness of rehabilitation (3 months after rehabilitation) showed improvement and stabilization of the physical conditions in almost all patients of the main group (96.6%).

4. Usage of high-intensity pulsed magnetic therapy in the complex rehabilitation of servicemen with post-traumatic osteoarthritis of the knee joints makes manage the manifestations of pain syndrome, increase of functional ability and quality of life, restore of combat readiness.

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**ADDRESS FOR CORRESPONDENCE:**

**Iryna Babova**

South Ukrainian National Pedagogical  
University named after K.D. Ushynsky  
6 Lermontovsky st., 65014 Odesa, Ukraine  
e-mail: babovairina@gmail.com

**ORCID ID and AUTHORS CONTRIBUTION**

0000-0003-1018-8302 – Iryna Babova (A, D, E, F)  
0000-0002-7529-4045 – Iryna Balashova (A, B, C, D)  
0000-0002-0159-2058 – Iryna Zabolotna (A, E)

A – Research concept and design, B – Collection and/or assembly of data,  
C – Data analysis and interpretation, D – Writing the article, E – Critical review of  
the article, F – Final approval of article



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Info

## IV EDYCJA OGÓLNOPOLSKIEJ KONFERENCJI NAUKOWO-EDUKACYJNEJ SENIOR CARE 2022 8 PAŹDZIERNIKA 2022 R., WROCŁAW

Konferencja jest dedykowana kadrze zarządzającej oraz pracownikom placówek świadczących całodobową opiekę długoterminową/domom seniora. Ta kolejna już edycja, cieszącego się bardzo dużą frekwencją wydarzenia, odbędzie się w tym roku 8 października 2022 roku we Wrocławiu (Congress Center Haston City Hotel\*\*\*\*) i zgromadzi przedstawicieli prawie 200 placówek senioralnych z całej Polski, reprezentowanych przez ponad 450-osobową kadrę zarządzającą i opiekuńczą. Do udziału w konferencji zaproszeni zostali przedstawiciele instytucji oraz firm których działalność, usługi oraz produkty dedykowane są szeroko rozumianej branży opieki senioralnej.

Wydarzenie to będzie miało szczególny wymiar, bowiem poprzedzone zostanie w dniu 7 października 2022 r. spotkaniem organizacyjnym Krajowej Izby Domów Opieki KIDO, zrzeszającej wiodące placówki opiekuńcze z obszaru całego kraju. Izba pełni rolę rzecznika oraz reprezentanta placówek opieki długoterminowej wobec urzędów i organów administracji państwowej a także opiniuje i przeprowadza audyty produktów oraz usług kierowanych do tej grupy odbiorców. Idea utworzenia Izby spotkała się z bardzo pozytywnymi reakcjami środowiska holistycznie pojętej opieki senioralnej a jej dotychczasowe dokonania potwierdzają słuszność podjęcia tej inicjatywy.

Współorganizująca konferencję Fundacja Senior-Care jest organizacją non-profit wspierającą swoją działalnością osoby starsze i z niepełnosprawnościami, w tym w szczególności Podopiecznych placówek opiekuńczych, wymagających szczególnej pomocy i troski. Poprzednio zorganizowane przez fundację oraz Krajową Izbę Domów Opieki KIDO konferencje potwierdziły potrzebę regularnej organizacji spotkań przedstawicieli i reprezentantów środowiska świadczącego usługi opieki długoterminowej w Polsce. W Komitecie Naukowym konferencji zasiądą reprezentanci środowisk naukowych ściśle związanych z medycyną, rehabilitacją oraz szeroko pojmowaną gerontologią i geriatrią. Szczegóły dotyczące poprzednich i obecnego wydarzenia oraz pakiety sponsorskie dostępne są w poniższym linku:

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# Application of “Polyana Kvasova” Mineral Water in the Complex Therapy of Patients with Gastro-esophageal Reflux Disease and Osteochondrosis of the Spine

## Zastosowanie wody mineralnej „Polyana Kvasova” w kompleksowej terapii pacjentów z chorobą refluksową przełyku i osteochondrozą kręgosłupa

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Yelyzaveta S. Sirchak, Yaroslav F. Filak, Vasiliy Ye. Barani, Oleksandr I. Hetsko, Yaroslav O. Mykhalko, Nelli V. Bedey, Inna S. Borisova, Andriy V. Ilko

Uzhhorod National University, Uzhhorod, Ukraine

### SUMMARY

**Aim:** To investigate the effectiveness of complex therapy using “Polyana Kvasova” mineral water in patients with GERD and osteochondrosis (OH) of the cervical and thoracic spine.

**Materials and Methods:** The examined patients included 56 *Helicobacter pylori* (HP)-positive patients with GERD and OH of the cervical and thoracic spine. The examined patients were divided into 2 groups depending on the scheme of complex treatment. All HP-positive patients with GERD and OH underwent standard triple anti-helicobacter therapy and itopride hydrochloride. Group I patients (n=26) received only the above-mentioned regimen. Patients of the II group (n=30) were additionally prescribed 100-150 ml of “Polyana Kvasova” carbonated bicarbonate-sodium mineral water (MW) as a natural antacid, warm, still 4 times a day (1.5 hours before meals and after 45 minutes after – both in the morning and evening) within 1 month.

**Results:** The complex therapy carried out had a positive effect on the endoscopic picture of GERD in patients with cervical and thoracic OH. The decrease in the severity of RE was accompanied by an increase in the number of GERD patients in whom the erosive form of reflux esophagitis was not detected during repeated fibroesophagogastroduodenoscopy (FEGDS) (mainly in the II group of examined patients – 10.0% of patients,  $p < 0.05$ ). The additional prescription of “Polyana Kvasova” MW to the complex treatment increased the frequency of eradication of HP infection by 9.2% –  $p < 0.05$  at the background of more pronounced normalization of clinical and endoscopic signs of GERD.

**Conclusions:** 1. GERD is often manifested by atypical extraesophageal symptoms (up to 25.0-27.3% of cases) in patients with OH of the cervical and thoracic spine. 2. The use of standard triple AHT in combination with itopride hydrochloride is an effective method of correcting esophageal and extraesophageal clinical manifestations of GERD in patients with cervical and thoracic spine OH. 3. The additional prescription of “Polyana Kvasova” MW as part of the complex therapy of patients with GERD and OH of the cervical and thoracic regions is a safe, effective method for reducing clinical symptoms, the severity of esophageal lesions with repeated FEGD, and also contributes to increasing the frequency of HP infection eradication in the data patients.

**Key words:** gastroesophageal reflux disease, osteochondrosis, treatment, mineral water

**Słowa kluczowe:** choroba refluksowa przełyku, osteochondroza, leczenie, woda mineralna

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### INTRODUCTION

Osteochondrosis (OH) of spine is also one of the most common diseases among the adult population, which affects from 40 to 80% of the world's inhabitants. Manifestations of OH are back pain, headaches, which are seen in 25-30% of patients after 30 years old [1, 2]. According to modern recommendations,

patients are prescribed non-steroidal anti-inflammatory drugs (NSAIDs) to reduce pain and improve the quality of life in case of the musculoskeletal system damage. Side effects of NSAIDs are very often observed during treatment with this group of drugs. The main negative property of all NSAIDs is a high risk of digestive tract disorders. Thus, dyspepsia is observed in 30-40%

of patients receiving NSAIDs, in 10-20% – erosions and ulcers of the stomach and duodenum, in 2-5% – bleeding and perforation. Dyspepsia is the main reason for discontinuation of NSAIDs in more than 50% of cases. Most often, this symptom is noted in patients with a history of digestive tract pathology [3].

Gastroesophageal reflux disease (GERD) is a polyetiological disease, the basis of which is the predominance of aggression factors over mucous membrane protection factors of the esophagus [4, 5]. Among the main factors in the development of GERD, obesity, pregnancy, stress, smoking, and diaphragmatic hernia are most often distinguished [6]. The nature of food (fatty, fried food, chocolate, coffee, alcohol, spices), medications (antibiotics, ascorbic acid, calcium channel blockers, antidepressants, and NSAIDs) also contribute to the development of GERD [7].

Nowadays proton pump inhibitors (PPIs) occupy a leading place in the treatment of acid-dependent diseases. At the same time, certain difficulties arise in the GERD patient's treatment [8]. The esophageal erosions healing time in many patients can reach 8-12 weeks, and some patients are refractory to taking antisecretory drugs [9]. Choosing treatment tactics for patients with combined pathology, when the appointment of drugs from the group of NSAIDs is inevitable, special attention should be paid to *Helicobacter* infection, the persistence of which can aggravate the clinical signs of GERD. Therefore, the search for alternative treatment schemes for patients with comorbid pathology is a particularly urgent issue for the modern medical community.

### AIM

The aim of the study is to investigate the effectiveness of complex therapy using "Polyana Kvasova" mineral water in patients with GERD and OH of the cervical and thoracic spine.

### MATERIALS AND METHODS

At the clinical base of the Department of Internal Diseases Propaedeutics of the Medical Faculty of the SHEI "UzhNU" (gastroenterological, endocrinological, neurological department of the KNP "ZOKL named after A. Novak" TRC and patients who were under outpatient observation by a family doctor at their residence place) during 2019-2022 years, 56 *Helicobacter pylori* (HP)-positive patients with GERD and OH of the cervical and thoracic spine were examined. Among the examined patients, there were 32 (57.1%) men, 24 (42.9%) women. The average age was 43.6±4.2 years. The control group included 20 practically healthy people (12 men (60.0%), 8 women (40.0%)). The average age was 44.1±5.2 years.

All studies were performed with the consent of the subjects, and the methodology of their conduct was in accordance with the Helsinki Declaration of Human Rights of 1975 and its revision of 1983, the Convention of the Council of Europe on Human Rights and Biomedicine, and the legislation of Ukraine.

All examined patients were subjected to anthropometric, general clinical, laboratory and instrumental methods of examination. OH of the cervical and thoracic spine was diagnosed based on physical, general clinical examination methods, as well as the results of computed tomography of the spine.

The diagnosis of GERD was established according to the criteria of the unified clinical protocol (order of the Ministry of Health of

Ukraine dated 31.10.2013 № 943) taking into account complaints, endoscopic examination data, etc. To confirm the diagnosis, the examined patients underwent fibroesophagogastroduodenoscopy (FEGDS) using endoscopy equipment Pentax ERM-3300 video processor and flexible fiber endoscopes Pentax E-2430, GIF-K20. Also, 24-hour pH monitoring according to Prof. V.N. Chernobrov's method was performed.

The Los Angeles (LA) classification (1998) was used for endoscopic assessment of the degree of damage to the esophagus:

Grade A – single erosion ≤5 mm;

Grade B – ≥1 erosion > 5 mm long that does not occupy the entire space between 2 adjacent folds of the esophagus;

Grade C – ≥1 erosion that occupies the entire space between ≥2 folds of the esophagus and ≤75% of the perimeter of the esophagus;

Grade D – erosions or ulcers occupying ≥75% of the esophageal perimeter [10].

In the examined patients, HP-infection was diagnosed using a rapid urease test (CLO-test) before the comprehensive treatment. The effectiveness of eradication therapy was assessed 4 weeks after treatment using the <sup>13</sup>C-urea breath test (<sup>13</sup>C-UBT) (IZINTA, Hungary).

The examined patients with GERD and OH of the cervical and thoracic spine were divided into 2 groups depending on the scheme of complex treatment. All HP-positive patients with GERD and OH of the cervical and thoracic spine underwent standard triple anti-helicobacter therapy (AHT) for 14 days (Pantoprazole ("Ulsepan" by World Medicine) 40 mg twice a day + Amoxicillin 1000 mg twice a day + Clarithromycin 500 mg twice a day 30-40 minutes before meals) in combination with *Saccharomyces boulardii* ("Lotardi" by Ananta Medicare, India) 1 capsule (500 mg) twice a day. Treatment with pantoprazole was continued for up to 1 month at 40 mg once a day in the morning 40 minutes before meals. To normalize the work of the upper parts of the gastrointestinal tract, itopride hydrochloride ("Motoprid" of the firm "Kyivskyi Vitaminnyi Zavod", Ukraine) was prescribed 50 mg 3 times a day before meals for 1 month. Group I patients (n=26) received only the above-mentioned regimen. Patients of the II group (n=30) were additionally prescribed 100-150 ml of "Polyana Kvasova" carbonated bicarbonate-sodium mineral water (MW) as a natural antacid, warm, still 4 times a day (1.5 hours before meals and after 45 minutes after – both in the morning and evening) within 1 month.

Changes in clinical symptoms were assessed in the dynamics, as well as at the end of the comprehensive treatment (after 4 weeks). The effectiveness of the performed AHT was determined 1 month after the complex treatment.

The analysis and processing of the results of the examination of patients was carried out using the Statistics for Windows v.10.0 computer program (StatSoft Inc, USA) using parametric and non-parametric methods of evaluating the obtained results.

### RESULTS

The leading clinical manifestation of digestive system upper parts damage in examined patients with GERD and OH of



the cervical and thoracic spine before treatment was acid belching, heartburn and dysphagia, which are considered typical manifestations of reflux disease. After a detailed analysis, it was established that some of the examined patients with GERD and OH of the cervical and thoracic spine often complain of a sore throat, hoarseness, a lump in the throat, as well as a dry cough, the presence of chest pain along the esophagus, disturbances of the heart work, which occurs more often after the consumption of fatty, fried food, carbonated drinks and coffee, which we considered as extraesophageal manifestations of GERD. These complaints before treatment in the examined patients indicated a typical extraesophageal GERD manifestation in Table 1.

The prescription of AHT in combination with itopride hydrochloride in patients with cervical and thoracic spine OH had a positive effect on the GERD clinical picture. It should be noted a significant reduction in the manifestations of dysphagia, heartburn, as well as extraesophageal manifestations of reflux disease, such as a hoarseness, dry cough, interruptions in the work of the heart already at the end of the 2nd week of complex treatment in both groups of examined patients. At the same time, the more pronounced therapeutic effect of the performed complex treatment was in patients of the II group, who additionally received MW "Polyana Kvasova".

The diagnosis of GERD was confirmed in all patients with the help of FEGDS before the comprehensive treatment initiation.

During endoscopic examination, gastroesophageal reflux and reflux esophagitis (RE) of various degrees of severity were observed in all patients with cervical and thoracic OH (Table 2).

During endoscopic examination of patients with cervical and thoracic spine OH combined with GERD, the degree of RE severity before treatment often corresponded to LA-B and LA-C degrees. The endoscopic picture of the examined patients with combined pathology was characterized by generalized, persistent edema, hyperemia of the mucous membrane along with multiple hemorrhagic elements. It has also been established that duodenogastric reflux (DGR) and esophageal candidiasis are often found in patients with GERD in combination with OH.

The complex therapy carried out had a positive effect on the endoscopic picture of GERD in patients with cervical and thoracic OH. The decrease in the severity of RE was accompanied by an increase in the number of GERD patients in whom the erosive form of reflux esophagitis was not detected during repeated FEGDS (mainly in the II group of examined patients - 10.0% of patients,  $p < 0.05$ ). Complex therapy using MW "Polyana Kvasova" also led to a significant decrease in the number of patients with DGR (by 26.6%, respectively -  $p < 0.01$ ).

The most objective method of evaluating the performed AHT is the frequency of HP infection eradication after a course of treatment in Figure 1.

**Table 1.** Dynamics of GERD clinical signs in examined patients with OH of the cervical and thoracic spine under the influence of complex therapy

	Examined patients with GERD and OH			
	I group (n=26)		II group (n=30)	
	before treatment	after treatment	before treatment	after treatment
Typical manifestation of GERD	57,70%		60,0 %	
- heartburn	86,7 %	26,7 %**	88,9 %	16,7 %**,+
- belching sour	66,7 %	20,0 %**	72,2 %	16,7 %**
- dysphagia	50,0 %	13,3 %**	55,6 %	5,6 %**,+
Atypical manifestation of GERD	42,3 %		40,0 %	
Dental	27,3 %		25,0 %	
- dental caries	66,7 %	33,3 %**	66,7 %	33,3 %**
- periodontal disease	66,7 %	-	66,7 %	-
- stomatitis	100,0 %	33,3 %**	100,0 %	-
Otolaryngological	36,3 %		33,3 %	
- tickling in the throat	75,0 %	-	100,0 %	25,0 %**
- hoarseness	75,0 %	25,0 %**	75,0 %	-
- a lump in the throat	100,0 %	50,0 %**	75,0 %	-
- chronic cough	50,0 %	25,0 %*	50,0 %	25,0 %*
Cardiac	18,2 %		16,7 %	
- retrosternal pain along the esophagus	100,0 %	50,0 %**	100,0 %	-
- interruptions in the work of the heart	100,0 %	-	100,0 %	-
Bronchopulmonary	18,2 %		25,0 %	
- dry cough	100,0 %	-	100,0 %	-
- night apnea attacks	50,0 %	50,0 %	66,7 %	33,3 %**,+

Note: the difference between indicators in patients before and after treatment is significant: \* -  $p < 0.05$ ; \*\* -  $p < 0.01$ ; the difference between indicators in patients of the I and II groups after treatment is significant: + -  $p < 0.05$

**Table 2.** Dynamics of endoscopic changes in examined patients with GERD and OH of the cervical and lumbar spine under the influence of complex therapy

Endoscopic signs	Examined patients with GERD and OH			
	I group (n=26)		II group (n=30)	
	before treatment	after treatment (after 4 weeks)	before treatment	after treatment (after 4 weeks)
Reflux esophagitis (degree of severity according to the LA classification):				
Absence of the esophagus damage	–	–	–	10,0 %
LA–A	19,2 %	50,0 %**	16,7 %	56,7 %**
LA–B	50,0 %	34,6 %*	50,0 %	23,3 %**,+
LA–C	30,8 %	15,4 %*	30,0 %	10,0 %**
LA–D	–	–	3,3 %	–
Candidal esophagitis	26,1 %	7,7 %**	23,3 %	6,7 %**
DGR	42,3 %	34,6 %*	43,3 %	16,7 %**,++

Note: the difference between indicators in patients before and after treatment is significant: \* –  $p < 0.05$ ; \*\* –  $p < 0.01$ ; the difference between indicators in patients of the I and II groups after treatment is significant: + –  $p < 0.05$ ; ++ –  $p < 0.01$



**Figure 1.** Frequency of HP infection eradication after comprehensive treatment

Note: the difference between indicators in patients of the I and II groups after treatment is significant: \* –  $p < 0.05$

A high frequency of eradication of HP infection in patients with GERD and OH of the cervical and thoracic spine on the background of standard triple AHT in combination with *Saccharomyces boulardii* was established. However, the additional prescription of “Polyana Kvasova” MW to the complex treatment increased the frequency of eradication of HP infection by 9.2% –  $p < 0.05$  at the background of more pronounced normalization of clinical and endoscopic signs of GERD.

## DISCUSSION

Patients who require long-term use of NSAIDs to reduce the severity of pain syndrome, including those with OH, represent a special contingent of patients with high comorbidity, including damage to the digestive organs, which requires a complex approach in terms of diagnosis and treatment. The prescription of AHT in combination with itopride hydrochloride to patients with GERD and OH of the cervical and thoracic spine is an effective method for rapid clinical symptoms severity reducing. At the same time, the inclusion of natural remedies that affects several pathogenetic links of comorbid pathology in the complex treatment, is an important element of the therapy of these patients, and is safe for long-term use.

“Polyana Kvasova” is carbonated (1681 mg/l), medium mineralization (10.6 g/l), sodium bicarbonate mineral water, with an increased content of boron (in the form of metaboric acid) (0.195 g/l) and biologically active doses of fluoride (0.002 g/l) [11-14]. It has a slightly alkaline pH of 6.8, a high buffering and neutralizing capacity (81 mmol/l and 105 mmol/l, respectively), the  $\text{HCO}_3$  content – is 7076 mg/l. The buffer capacity of MW is several times higher than antacids of cavity action, which are widely used in clinical practice (Almagel, Gastrofarm, Vicalin) [14].

It is known that carbonated sodium bicarbonate MWs are natural antacids, which reduce the acidity of gastric juice. The expression of antacid properties of MW depends not so much on water mineralization as on the level of hydrocarbons. “Polyana Kvasova” neutralizes the increased stomach acidity, which is equivalent to the effect of a 1% baking soda solution in terms of the alkalization depth, but the neutral environment in the stomach is maintained much longer than after taking a solution of baking soda. When neutralizing hydrochloric acid in the stomach cavity under the influence of MW, the direct irritating effect of the acid on mucous membrane of the stomach and duodenum is weakened and the pH rises to 3.5-5.0. Such shallow alkalization of gastric contents is more physiological and has less effect on the functional connections of the stomach with other digestive organs. When acidity decreases, proteolysis caused by the action of pepsin is inhibited, the peptic effect of gastric juice on mucous membrane of the esophagus, stomach, pancreas, biliary system, and proximal duodenum is weakened or lost [11, 14].

The anti-helicobacter effect of “Polyana Kvasova” water has been proven due to the bactericidal effect of metaboric acid [13]. Due to its remarkable antacid and buffering properties, “Polyana Kvasova” MW is the most effective for diseases of the stomach with increased acidity, reflux esophagitis, accompanying changes in the form of cholestasis and pancreatic stasis, as well as for chronic pancreatitis, hepatitis, hepatitis, and diabetes.

The results of our research also indicate the high effectiveness of the additional prescription of “Polyana Kvasova” MW as part of the

complex therapy of patients with GERD and OH of the cervical and thoracic spine. The obtained data indicate a more pronounced positive dynamics of both esophageal and extraesophageal manifestations of GERD in OH, which, accordingly, is accompanied by a more pronounced positive changes of the esophagus mucous membrane in case of repeated FEGDS. Attention is also drawn to the significant reduction in the DGR manifestations on the background of taking "Polyana Kvasova" MW, and it should also be noted the increase in the frequency of HP infection eradication by 9.2% in patients with combined pathology. Therefore, the complex therapy of patients with GERD and OH of the cervical and thoracic spine using MW "Polyana Kvasova" is both effective and safe method of treatment for patients with combined pathology.

## CONCLUSIONS

1. GERD is often manifested by atypical extraesophageal symptoms (up to 25.0-27.3% of cases) in patients with OH of the cervical and thoracic spine.
2. The use of standard triple AHT in combination with itopride hydrochloride is an effective method of correcting esophageal and extraesophageal clinical manifestations of GERD in patients with cervical and thoracic spine OH.
3. The additional prescription of "Polyana Kvasova" MW as part of the complex therapy of patients with GERD and OH of the cervical and thoracic regions is a safe, effective method for reducing clinical symptoms, the severity of esophageal lesions with repeated FEGDS, and also contributes to increasing the frequency of HP infection eradication in the data patients.

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## ADDRESS FOR CORRESPONDENCE:

**Yelyzaveta S. Sirchak**

Uzhhorod National University

1 Narodna sq., 88000 Uzhhorod, Ukraine

phone: +380509761794

e-mail: sirchakliza777@gmail.com

## ORCID ID and AUTHORS CONTRIBUTION

0000-0001-6738-0843 – Yelyzaveta S. Sirchak (A, F)

0000-0002-7510-263X – Yaroslav F. Filak (B, D, E)

0000-0002-2616-2230 – Vasilij Ye. Barani (B)

0000-0003-1607-2714 – Oleksandr I. Hetsko (C)

0000-0002-9890-6665 – Yaroslav O. Mykhalko (E)

0000-0002-8885-025 8 – Nelli V. Bedey (C)

0000-0003-4254-6004 – Inna S. Borisova (E)

0000-0003-0897-593X – Andriy V. Ilko (B)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article

# Clinical Course of Liver Cirrhosis in Torch-infected Patients and the Possibility of Correction Using “Polyana Kvasova” Mineral Water

## Przebieg kliniczny marskości wątroby u pacjentów z wywiadem infekcji z grupy TORCH i możliwość zastosowania wody mineralnej “Polyana Kvasova”

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Yelyzaveta S. Sirchak, Mariana M. Lukach, Stepan S. Kydybyts, Mykhailo Yu. Kochar, Maria M. Nastich, Yevheniia E. Dankanych

State University “Uzhhorod National University”, Uzhhorod, Ukraine

### SUMMARY

**Aim:** To investigate the peculiarities of clinical and laboratory changes in liver cirrhosis in TORCH-infected patients and their dynamics against the background of complex therapy with the use of Polyana Kvasova mineral water (MW).

**Materials and Methods:** 64 patients with alcohol-related LC were examined. The study was carried out in two stages. At the 1st stage, the examined patients with LC were divided into two groups depending on the presence or absence of TORCH infections to determine the characteristics of the clinical course of LC in these patients. Group I included patients with LC (n=30), who were not diagnosed with TORCH infection, and group II included patients with LC who tested positive for antibodies to infections of the TORCH group (n=34). The data of patients of group II were divided into two subgroups, depending on the treatment performed. Patients of subgroup IIA (n=16) received only basic therapy (BT), and patients of subgroup IIB (n=18) were additionally prescribed 100 ml of warm, still carbonated bicarbonate-sodium Polyana Kvasova mineral water (MW), 15-20 minutes before meals 6 times a day. The duration of the treatment and observation of patients at the second stage of the study was 1 month.

**Results:** In patients with LC of group II, signs of jaundice, pain and dyspeptic syndromes were statistically significantly more often detected -  $p < 0.05$ . In group II of patients with LC, a more pronounced, statistically significant increase in the indicators of cholestatic syndrome. A more significant reduction in the manifestations of dyspeptic and pain syndrome, as well as the severity of jaundice, was observed in LC patients of the IIB subgroup who, in addition to BT, were prescribed Polyana Kvasova MW. A significant decrease in laboratory markers of cholestatic syndrome was established (TBIL level by  $20.0 \pm 0.6$  mmol/L; ALP by  $84.0 \pm 1.8$  IU/L, GGT by  $48.7 \pm 1.5$  U/L) in the subgroup of patients, who in addition to BT were prescribed MW.

**Conclusions:** 1. In TORCH-infected patients, alcohol-related liver cirrhosis is more often detected at the stage of subcompensation (class C according to Child-Pugh) and is clinically detected by signs of dyspeptic and pain syndromes, as well as laboratory manifestations of cholestatic syndrome and jaundice syndrome. 2. The use of Polyana Kvasova MW as part of the complex therapy of patients with alcohol-related liver cirrhosis in combination with TORCH infection is a pathogenetically based and safe method for reducing the severity of dyspeptic and pain syndromes, as well as clinical and laboratory signs of jaundice in these patients.

**Key words:** liver cirrhosis, TORCH-infections, treatment, mineral water

**Słowa kluczowe:** marskość wątroby, infekcje TORCH, leczenie, woda mineralna

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### INTRODUCTION

The term TORCH-infections was first proposed by Andres Nahmias in 1971, to include infections, both bacterial and viral, capable of causing damage to the fetus and the newborn. This group of pathogens includes: T – *Toxoplasmosis*; O – Other (*syphilis, tuberculosis, chlamydia, listeriosis, urea* and

*mycoplasmosis, viral hepatitis A, B, papillomavirus infection, HIV infection, HP – Helicobacter pylori* and many others); R – *Rubella*; C – *Cytomegalovirus (CMV)*; H – *Herpes simplex virus (HSV)*. The list of Other diseases, as a component of the TORCH complex, is increasingly expanding. TORCH infections have the ability to replicate in all cells of the body (in endothelium,

epithelial and nerve cells, leukocytes, monocytes, fibroblasts and macrophages). It should be noted that these “delicate” infections can persist in the human body for years, and sometimes even decades, without showing any specific symptoms, provoking damage to organs and systems of the body, which can be diagnosed only when the patient seeks medical care for another disease or accidentally [1].

Acute liver decompensation is the main cause of hospitalization in patients with liver cirrhosis (LC), and it has been defined as the rapid development of at least one clinical complication between ascites, hepatic encephalopathy, gastrointestinal haemorrhage and bacterial infection. One of the keys to adequate management of hepatic decompensation is the prompt identification of its precipitating event, if any. This can be a direct liver injury (ie, a binge causing alcoholic hepatitis, drug-induced liver toxicity, superimposed viral hepatitis, portal vein thrombosis, ischaemia) or the consequence of systemic insults such as surgery, variceal bleeding or infection. In a significant proportion of patients (up to 43% of more severe cases), the precipitant factor remains undetected [2].

TORCH infections most often affect the central nervous system, organs of the visual system, reticuloendothelial system, very often the liver, especially in patients with weakened immunity. Toxoplasma infection can primarily be accompanied by liver damage. Among the manifestations of toxoplasmosis, persistent hepatomegaly is most often detected; IgM antibodies are detected in the blood, the content of total bilirubin and the activity of transaminases increase. At the same time, there is often lymphadenopathy, fever, and leukocytosis [1]. In young children, TORCH-induced lesions prevail in the structure of viral hepatitis, with cytomegalovirus (cytomegalovirus, CMV) hepatitis having the largest share. There is an opinion that CMV hepatitis plays a leading role in the genesis of biliary atresia [3].

Therefore, the persistence of TORCH infection in patients with liver damage can aggravate the clinical course of the disease, as well as provoke the formation/progression of complications, especially in liver cirrhosis. The search for alternative treatment regimens to reduce the severity of clinical signs of the combined course of TORCH infection and LC is a relevant and highly demanded method of treating these patients.

## AIM

The aim is to investigate the peculiarities of clinical and laboratory changes in liver cirrhosis in TORCH-infected patients and their dynamics against the background of complex therapy with the use of Polyana Kvasova mineral water (MW).

## MATERIALS AND METHODS

64 patients with alcohol-related cirrhosis were examined at the clinical base of the Department of Propedeutics of Internal Diseases of the Medical Faculty of Uzhhorod University (Gastroenterology and Surgery department of the Municipal Non-Profit Enterprise “Transcarpathian Regional Clinical Hospital named after Andrii Novak” of Transcarpathian Regional Council, patients who underwent a routine examination at the Municipal Non-Profit Enterprise “Uzhhorod City Maternity Hospital” of Uzhhorod

City Council, and were also under outpatient observation at a family doctor at their place of residence) in 2019-2022. All the examined patients were female, the average age was  $46.5 \pm 8.3$  years. The control group included 20 practically healthy women whose average age was  $45.3 \pm 6.1$  years.

All studies were performed with the consent of the patients, and the methodology was in accordance with the Helsinki Declaration of Human Rights of 1975 and its revision of 1983, the Council of Europe Convention on Human Rights and Biomedicine, and the legislation of Ukraine.

All patients were examined using anthropometric, general clinical, laboratory and instrumental research methods. The severity of LC was assessed according to the Child-Turcotte classification in the modification of Pugh (1973), taking into account the level of bilirubin, albumin, prothrombin index and the presence or absence of ascites and hepatic encephalopathy. All patients underwent a 13C-methacetin breath test (13C-MBT) to determine the degree of liver damage. Breath samples were analyzed on an infrared spectroscope IRIS (IZINTA, Hungary). With the help of 13C-MBT, the functioning hepatocyte mass (FHM) was determined in each examined patient. FHM 100% indicates normal liver function; FHM 50-100% indicates a moderate decrease in liver function (Child A); FHM 20-50% indicates a pronounced decrease in liver function (Child B); FHM <20% indicates a severe decrease in liver function (Child C). The sensitivity and specificity of 13C-MBT is high and is more than 99%.

The levels of IgM and IgG antibodies to TORCH group infections (to rubella, to herpes type 1/2, to toxoplasma, to cytomegalovirus) were determined in the examined patients prior to the comprehensive treatment using an immunoenzymatic analysis. Screening for Hepatitis B virus and Hepatitis C virus were also conducted (Patients who tested positive were excluded from this study).

The study was carried out in two stages. At the 1st stage, the examined patients with LC were divided into two groups depending on the presence or absence of TORCH infections to determine the characteristics of the clinical course of LC in these patients. Group I included patients with LC (n=30), who were not diagnosed with TORCH infection, and group II included patients with LC who tested positive for antibodies to infections of the TORCH group (n=34).

In the second stage of the study, only patients with LC were selected, who had antibodies to TORCH infections (group II, n=34). The provision of medical care to patients with LC was carried out in accordance with the clinical treatment protocol of the Ministry of Health of Ukraine dated 13.06.2005 No. 271. The patients received basic therapy (BT) against the background of alcohol refusal, diet, basic LC treatment, which was selected individually, taking into account the degree of severity of the pathological process, as well as the presence or absence of relevant complications. Basic therapy included the prescription of hepatoprotectors (essential phospholipids, amino acid preparations), detoxification and vitamin therapy (group B vitamins), diuretics (spironolactone, furosemide), enterosorbents, lactulose,  $\beta$ -blocker (propranolol) in individual

dosage. The data of patients of group II were divided into two subgroups, depending on the treatment performed. Patients of subgroup IIA (n=16) received only BT, and patients of subgroup IIB (n=18) were additionally prescribed 100 ml of warm, still carbonated bicarbonate-sodium Polyana Kvasova mineral water (MW), 15-20 minutes before meals 6 times a day. The duration of the treatment and observation of patients at the second stage of the study was 1 month.

The analysis and processing of the results of the examination of patients was carried out by the computer program Statistics 10.0 (StatSoftInc, USA) for Windows, using parametric and non-parametric methods of evaluating the obtained results.

### RESULTS

During the examination of patients with LC of both groups, signs of asthenovegetative, pain, dyspeptic syndromes and jaundice syndrome were revealed, which manifested as complaints of general weakness, headache, sleep disturbances, rapid fatigue, memory decline, pain and discomfort in the upper abdomen (mainly on the right), swelling and increase in the size of the abdomen, nausea, vomiting, loss of appetite, weight loss, feeling of bitterness in the mouth, yellowness of the sclera and skin, itching of the skin in Figure 1.

In patients with LC of group II, signs of jaundice, pain and dyspeptic syndromes were statistically significantly more often detected –  $p < 0.05$ .

The analysis of the results of laboratory indicators of blood serum revealed an increase in the activity of transaminases (alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma-glutamyltransferase (GGT), as well as the level of total bilirubin (TBIL) and alkaline phosphatase (ALP) (Table 1).

In group II of patients with LC, a more pronounced, statistically significant increase in the indicators of cholestatic syndrome (TBIL, ALP, GGT) and transaminases in blood serum was established, compared to patients of group I (patients with LC who are not carriers of TORCH infection).

After analyzing the results of clinical and laboratory-instrumental examination methods, the patients were divided according to degrees of severity according to the Child-Pugh classes (Figure 2).

Among the patients of group I, there was a preponderance of patients with Child-Pugh class A of LC (compensation stage), namely – 56.7%, and among the II group examined

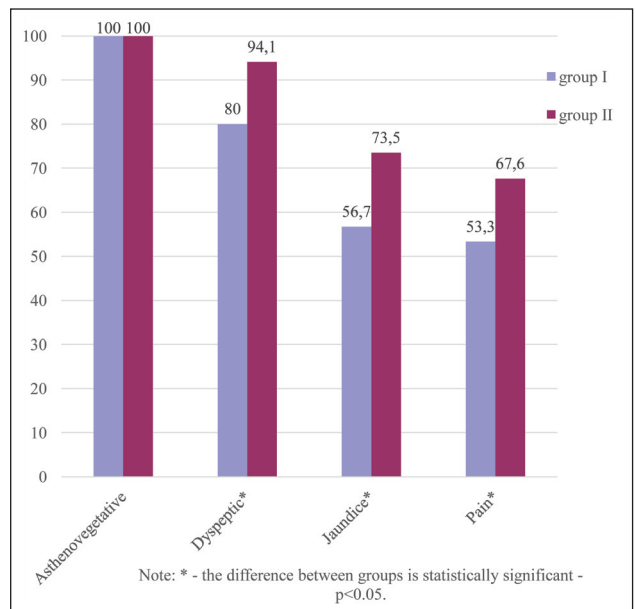


Figure 1. Frequency of detection of clinical syndromes in the examined patients (%)

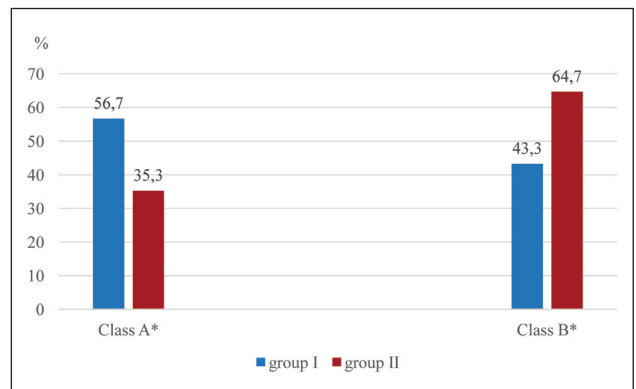


Figure 2. Distribution of the examined patients with liver cirrhosis according to Child-Pugh classes

Note: the difference between indicators in patients I and II is significant: \* –  $p < 0.01$ .

patients with Child-Pugh class B of LC (subcompensation stage) – 64, 7% ( $p < 0.01$ ).

Therefore, the persistence of TORCH infection in patients with alcohol-related LC contributes to a more severe course of liver damage according to the results of general clinical examinations.

Table 1. Changes in blood laboratory indicators in the examined patients with liver cirrhosis

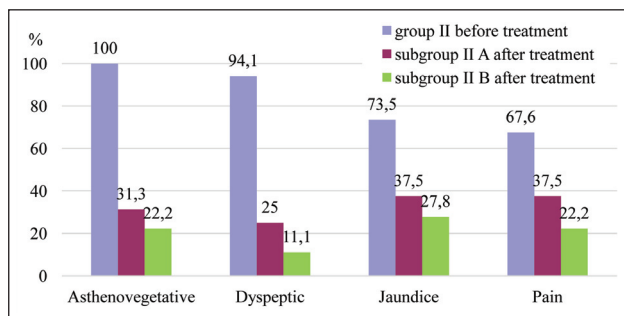
Indicator	The examined patients		
	Control group (n=20)	Patients with liver cirrhosis	
		group I (n=30)	group II (n=34)
ALT (U)	27.4±2.0	68.3±3.2**	74.8±1.3**
AST (U)	31.4±7.2	71.7±2.8**	91.2±7.7**,+
TBIL (mmol/L)	12.7±1.7	28.4±1.1*	39.7±0.6**,+
ALP (IU/L)	67.3±5.5	129.8±2.2**	168.1±0.9**,+
GGT (U/L)	32.8±1.1	72.7±1.6**	96.5±1.2**,+

Note: significant difference between indicators of the control group and patients with LC: \* –  $p < 0.05$ , \*\* –  $p < 0.01$ ; + – the differences between the specified parameter in patients of the I and II groups are significant ( $p < 0.05$ ).

**Table 2.** Dynamics of blood laboratory indicators in the examined LC patients of group II following treatment

Indicator	The examined patients		
	group II (n=34) before treatment	after treatment	
		subgroup IIA (n=16)	subgroup IIB (n=18)
ALT (U)	74.8±1.3	439±2.5*	44.9±1.8*
AST (U)	91.2±7.7	61.9±1.7*	58.2±3.1*
TBIL (mmol/L)	39.7±0.6	27.9±2.0*	19.7±1.2**,+
ALP (IU/L)	168.1±0.9	112.7±2.5*	82.1±2.7**,+
GGT (U/L)	96.5±1.2	63.6±2.0*	47.8±2.7*,+

Note: the significant difference between indicators in LC patients with after treatment is significant: \* –  $p < 0.05$ , \*\* –  $p < 0.01$ ; + – the differences between the specified parameter in patients with subgroups IIA and IIB after treatment are significant ( $p < 0.05$ ).

**Figure 3.** Dynamics of clinical syndromes in the examined patients of group II after treatment (%)

In the data of patients (group II), the decompensation of the cirrhotic process occurs more quickly, the signs of cytolytic and cholestatic syndromes are more pronounced, which indicates the progression of damage to the liver parenchyma, and an increase in the load on the biliary system.

The results of the treatment (according to the second stage of the scientific study) indicate a decrease in the severity of clinical symptoms on the background of a decrease in the activity of cytolytic, cholestatic syndromes and jaundice syndrome (Figure 3 and Table 2).

A more significant reduction in the manifestations of dyspeptic and pain syndrome, as well as the severity of jaundice, was observed in LC patients of the IIB subgroup who, in addition to BT, were prescribed Polyana Kvasova MW. They noted a decrease in the intensity of pain sensations, discomfort in the right hypochondrium already at the end of the 1st week of complex treatment, while in patients of the IIA subgroup, a decrease in clinical symptoms was noted only in the 2nd-3rd week of treatment.

A significant decrease in laboratory markers of cholestatic syndrome was established (TBIL level by  $20.0 \pm 0.6$  mmol/L; ALP by  $84.0 \pm 1.8$  IU/L, GGT by  $48.7 \pm 1.5$  U/L) in the subgroup of patients, who in addition to BT were prescribed Polyana Kvasova MW.

Therefore, the additional inclusion of Polyana Kvasova MW in the complex treatment in patients with alcohol-related LC in combination with TORCH infection is an effective method for reducing the severity of clinical symptoms, as well as laboratory findings indicating damage to the biliary system of these patients.

## DISCUSSION

The life cycles of TORCH agents are different from each other, and the TORCH infections are believed to have lifelong influences. For CMV infection, lifelong latency is established after acute infection in infected hosts. The natural cycle of initial infection is related to an increased IgG level and decreased IgM level, while women with IgG-seropositive CMV infection could not be absolutely protected against reactivation or reinfection of the same pathogen [4]. Most studies have focused only on the effects of TORCH infection during pregnancy, and many observations have shown that TORCH infection is responsible for several adverse prenatal and neonatal events, including miscarriage, malformations, and neurodevelopmental abnormalities. However, insufficient attention has been paid to the study of a special group of patients, specifically the study of the impact of TORCH infection on the mother's body before and after pregnancy. At the same time, the issue of the impact of TORCH infections on the host's body when the immune response is weakened, including liver cirrhosis, is particularly relevant.

Research shows that persistence of cytomegalovirus infection and toxoplasmosis is associated with damage to the liver and biliary tract, which is often clinically manifested by jaundice and hyperbilirubinemia [5]. The results of our observations indicate a higher frequency of signs of cholestatic syndrome (hyperbilirubinemia, increased levels of alkaline phosphatase, gamma-glutamyltransferase) in LC patients, with confirmed antibodies to TORCH infection. At the same time, in this category of patients, LC is more often detected at the stage of subcompensation (class B according to Child-Pugh). Also, this group of examined patients had more pronounced clinical signs of LC (dyspeptic manifestations, pain syndrome and jaundice).

The use of Polyana Kvasova MW as part of the complex treatment of patients with LC and TORCH infection is a pathogenetically based and effective method for this category of patients due to its therapeutic properties. It is believed that sodium bicarbonate waters have a universal effect on the body [6]. Sodium hydrogen carbonate MW is a natural buffer solution based on the bicarbonate buffer system ( $\text{HCO}_3^-/\text{CO}_2$  or  $\text{HCO}_3^-/\text{H}_2\text{CO}_3$ ). This system is one of the three main buffer systems of the body and accounts for about 53% of the buffer capacity of all buffer systems of human whole blood. Polyana Kvasova mineral water is carbonated (1681 mg/L), of medium

mineralization (10.6 g/L), sodium bicarbonate, with an increased content of boron (in the form of metaboric acid) (0.195 g/L) and biologically active doses of fluorine (0.002 g/L). It has a slightly alkaline pH of 6.8, a high buffering and neutralizing capacity (81 mmol/L and 105 mmol/L, respectively), and the HCO<sub>3</sub><sup>-</sup> content of 7076 mg/L [7- 9].

Due to its remarkable antacid and buffering properties, Polyana Kvasova MW is an efficient remedy for diseases of the stomach with increased acidity, reflux esophagitis, accompanying changes in the form of cholestasis and pancreatostasis, as well as for chronic pancreatitis, hepatosis, hepatitis, and diabetes. Internal intake of MW increases the adaptive and compensatory capabilities of the body [6, 8]. When choosing a drinking MW regimen, the level of free carbon dioxide, and water temperature should be taken into account, as well as the purpose for which MW is prescribed, and the functional state of the digestive organs. The higher the water temperature, the higher its pH – from 6.5 to 7.0 on average. In the same way, pH increases with removing carbon dioxide from MW by storing it in open containers.

The obtained results indicate the safety and efficiency of the course of Polyana Kvasova MW as part of complex therapy for patients with LC and TORCH infection, which contributes to a more pronounced reduction of clinical signs of the disease already in the early stages of the treatment, as well as to the improvement of laboratory blood parameters. It should be noted that no side effects from the complex treatment prescribed by us have been established in these patients, which is significant in the combination of liver damage and persistence of TORCH infection.

## CONCLUSIONS

In TORCH-infected patients, alcohol-related liver cirrhosis is more often detected at the stage of subcompensation (class C according to Child-Pugh) and is clinically detected by signs of dyspeptic and pain syndromes, as well as laboratory manifestations of cholestatic syndrome and jaundice syndrome.

The use of Polyana Kvasova MW as part of the complex therapy of patients with alcohol-related liver cirrhosis in combination with TORCH infection is a pathogenetically based and safe method for reducing the severity of dyspeptic and pain syndromes, as well as clinical and laboratory signs of jaundice in these patients.

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## ADDRESS FOR CORRESPONDENCE:

**Yelyzaveta S. Sirchak**

Uzhhorod National University

1 Narodna sgr., 88000 Uzhhorod, Ukraine

phone: +380509761794

e-mail: sirchakliza777@gmail.com

## ORCID ID and AUTHORS CONTRIBUTION

0000-0001-6738-0843 – Yelyzaveta S. Sirchak (A, F)

0000-0002-6608-0264 – Mariana M. Lukach (B, D)

0000-0002-6608-0264 – Stepan S. Kydybyts (B, C)

0000-0002-0219-0552 – Mykhailo Yu. Kochar (E)

0000-0001-8650-5306 – Maria M. Nastich (C)

0000-0001-7304-5945 – Yevheniia E. Dankanych (D)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



# Analysis of Decisions on Incapacity for Work Issued at the Polish Social Insurance Institution (ZUS) in Relation to Persons with Multiple Sclerosis Before and After the Introduction of Current Drug Treatment Programmes for Multiple Sclerosis in Poland

## Analiza orzeczeń o niezdolności do pracy wydawanych w Zakładzie Ubezpieczeń Społecznych w stosunku do osób ze stwardnieniem rozsianym przed i po wprowadzeniu aktualnie obowiązujących programów lekowych leczenia stwardnienia rozsianego w Polsce

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**Dariusz Lachman<sup>1</sup>, Piotr Winciuнас<sup>1,2</sup>, Jacek Lorkowski<sup>3</sup>, Piotr Kupidurski<sup>4</sup>, Zuzanna Komosińska<sup>1</sup>**<sup>1</sup>Medical Evaluation and Certification Department, ZUS Headquarters, Warsaw, Poland<sup>2</sup>Medical Centre for Postgraduate Education in Warsaw, School of Public Health, Department of Medical Law and Medical Certification, Warsaw, Poland<sup>3</sup>Department of Orthopaedics, Traumatology and Sports Medicine, Central Clinical Hospital of the Ministry of Internal Affairs and Administration, Warsaw, Poland<sup>4</sup>Statistics and Actuarial Forecasts Department, ZUS Headquarters, Warsaw, Poland

### SUMMARY

**Aim:** The aim of the study was to analyse the decisions on incapacity for work issued at the Polish Social Insurance Institution (ZUS) in the years 2009-2011 and 2016-2018 in relation to people with MS, before and after the introduction of MS drug treatment programmes in Poland, which in connection with the application for rehabilitation or disability pension were examined by a ZUS certifying doctor or ZUS medical board.

**Materials and Methods:** The analysis covered 100 cases, in which in the years 2009-2011 and 2016-2018, in connection with the application for a rehabilitation benefit or a disability pension, a ZUS certifying doctor or ZUS medical board issued a decision on incapacity for work in relation to the same person with the diagnosed SM. Statistical analysis was performed using IBM SPSS Statistics.

**Results:** There were 20% less medical decisions confirming deterioration of health condition related to persons covered by drug programmes compared to the group of persons not participating in these programmes. The asymptotic (two-sided) significance of the cross-tabulation association measure was  $p = 0.053$ . In the case of an increase in the number of no-change-in-disability decisions in the group of people covered by the drug programme, the asymptotic (two-sided) significance of the cross-tabulation association measure was  $p = 0.087$ .

**Conclusions:** 1. The introduction of immunological therapy that modifies the natural course of multiple sclerosis in patients under the MS drug treatment programmes has significantly reduced the development of their motor disability. 2. As a result, people who have become incapable of work due to this disease have maintained their job or have returned to work, which is particularly important for young patients who are likely to remain economically active for many years to come. 3. Such measures have a significant impact on reducing the number of benefits from the social insurance system.

**Key words:** multiple sclerosis, drug programme, medical certification, Social Insurance Institution

**Słowa kluczowe:** stwardnienie rozsiane, program lekowy, orzecznictwo lekarskie, Zakład Ubezpieczeń Społecznych

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## INTRODUCTION

Multiple sclerosis (MS) is a chronic, inflammatory, demyelinating disease of the central nervous system in which multifocal damage (demyelination and axonal disintegration) to the nervous tissue occurs. The disease usually has a multiphasic course, with periods of exacerbation and remission. Its incidence varies depending on latitude, country, population and ranges from 2 to 150 persons per 100 thousand population, affecting approximately 2.1 million people worldwide. The disease most often affects young people, with a peak incidence between 20 and 40 years of age, and with a slight predominance of women over men [1].

MS can cause many symptoms and syndromes. The most common of them are motor and sensory disturbances, cerebellar syndrome, visual disturbances, autonomic disorders, pain syndromes and psychiatric symptoms in the form of cognitive and mood disorders. Chronic fatigue is also a frequent symptom. MS is one of the most common causes of disability in young people, although many patients may experience a benign course of the disease [2, 3].

MS can progress in one of the following forms:

- relapsing-remitting [4];
- secondary progressive;
- primary progressive [5];
- progressive relapsing.

The most common clinical form of the disease, diagnosed in 85% of patients, is the relapsing-remitting multiple sclerosis (RRMS), characterised by periods of increased neurological symptoms (relapses) followed by phases of relative stability (remission). About 70% of patients with RRMS will experience future progression of neurological symptoms described as secondary progressive MS. Periodically occurring neurological symptoms in patients with RRMS after a relapse may resolve partially or completely [6, 7].

Currently, there is no known causal treatment for multiple sclerosis, but due to a large number of patients and the course of the disease which leads to disability, numerous scientific studies are being conducted with ever new molecules of potentially therapeutic substances [8, 9].

## AIM

The main aim of the study was to analyse the decisions on incapacity for work issued at the Social Insurance Institution (ZUS) in relation to people with MS before and after the introduction of MS drug treatment programmes in Poland.

Specific objectives have been defined as:

- assessment of the impact of introduction of immunological treatment modifying the natural course of MS within the framework of MS treatment drug programmes in Poland on the development of motor disability and incapacity for work due to MS;
- determination of the trend to maintain the job by people who have become incapacitated due to this disease or get them back to work;
- evaluation of actions having a significant impact on the number of benefits from the social insurance system.

The objectives have been achieved through the following research tasks:

- analysis of the population structure of persons who have received a certificate of incapacity for work due to MS before and after the introduction of drug programmes for MS treatment;
- assessment of the content, quantity and quality of decisions on incapacity for work in MS cases issued by ZUS doctors and medical boards before and after introduction of MS treatment drug programme in Poland;
- comparison of the number of certificates and certification qualifications issued before and after the introduction of drug programmes in relation to insured persons diagnosed with MS;
- recommendation of measures ensuring the correctness of decisions on incapacity for work in MS cases.

## MATERIALS AND METHODS

The analysis covered 100 cases, in which in the years 2009-2011 and 2016-2018, in connection with the application for a rehabilitation benefit or a disability pension, a ZUS certifying doctor or ZUS medical board issued a decision on incapacity for work in relation to the same person with the diagnosed MS. These decisions have been issued in ZUS branches in Wrocław, Warsaw, Lublin, Rzeszów, Gdańsk, Białystok, Bydgoszcz, Chorzów, Łódź, Kraków and Poznań. The survey covered cases of 72 (72%) women and 28 (28%) men, aged from 35 to 66 years.

The cases selected for analysis were covered by ZUS evaluation/certification procedure between 2009 and 2011, and then between 2016 and 2018.

To ensure the uniform assessment of cases, a *Case Report Card* has been developed, which included:

- data on the person covered by evaluation/certification procedure (gender, age, height, weight, BMI, place of residence, education, type of work performed, length of service);
- data on the course of the disease (duration, treatment, eligibility or not for treatment under a drug programme, neurological condition at the time of each medical assessment, results of additional tests, including MRI);
- data on the evaluation/certification procedure and the decision (benefit type and duration, pre-assessment documentation, main conditions);
- data on decision and judicial review proceedings (if any);
- data on the renewed disability pension claim and the evaluation/certification procedure;
- data on proceedings in the Medical Evaluation and Certification Department (during the analysis of cases, some of them, due to doubts as to their compliance with the medical evaluation/certification principles, have been referred for reconsideration to the medical board; a consultant's opinion or medical records of the course of treatment were requested in some cases).

Statistical analysis has been performed using IBM SPSS Statistics software (version 25). The equality in variables distribution has been estimated using the Chi-square test, with Yates continuity correction.

Due to the low number of people whose medical certificates indicated a decrease in the degree of incapacity for work, it was not possible to perform a valid Chi-square test (the asymptotic - two-sided - significance of the cross-tabulation association measure was  $p = 0.546$ ). Even after applying the Yates continuity correction (theoretically used for observed counts of no less than 10), the significance is at the 0.986 level, which completely excludes the hypothesis that there is an association in the counts of decisions about the decrease in the degree of incapacity for work in groups of people covered and not covered by the drug programme.

### RESULTS

The analysis of cases with decisions on incapacity for work showed that: the decisions concerned mainly women (72/100-72.00%), the mean age of the surveyed group was 49.75 years, the majority of persons covered by the survey performed manual work (51/100- 51.00%), the duration of MS in these persons was on average 14.28 years, half of the surveyed group, 50/100 persons (50.00%) have been covered by the MS treatment drug programmes. In the group of people covered by drug programmes, a reduction or no change in the degree of incapacity for work, as well as a significant reduction in the development of motor disability measured by the EDSS scale was observed in 34/50 cases (68.00%), while in the group of people not covered by the MS drug programmes the same result was observed only in 24/50 cases (48.00%) [Figure 1].

Between 2016 and 2018, in the group of people qualified for drug programmes for MS treatment, a decrease in the degree of incapacity for work was observed in 4% of cases, no change in 64%, while the deterioration of the general condition and thus an increase in the degree of incapacity for work was observed in 32% of cases. In the same period, in the group of insured persons not covered by the drug programmes, these values were as follows: none (0%) of cases with a decrease in the degree of incapacity for work, 48% of patients with no change in the degree of incapacity for work

and as many as half of the cases (52%) with the deterioration of the general condition resulting in an increased degree of incapacity for work.

There were 20% less medical decisions confirming deterioration of health condition in relation to persons covered by drug programmes compared to the group of persons not participating in these programmes. The relationship was statistically confirmed by the Chi-square test using IBM SPSS Statistics software (version 25). The asymptotic (two-sided) significance of the cross-tabulation association measure was  $p = 0.053$ . Thus, it can be considered a statistically significant relationship.

In the case of an increase in the number of no-change-in-disability decisions in the group of people covered by the drug programme, the asymptotic (two-sided) significance of the cross-tabulation association measure was  $p = 0.087$ . This is a significance result of less than 0.1, so it can be considered significant 'at the level of statistical trend'.

A slow decrease in the number of first-time disability decisions issued in ZUS in relation to people with MS has been observed for many years, while there is no similar relationship in the number of decisions issued for circumstances justifying entitlement to rehabilitation benefit, which is not associated with the concept of long-term incapacity for work [Figures 2-4].

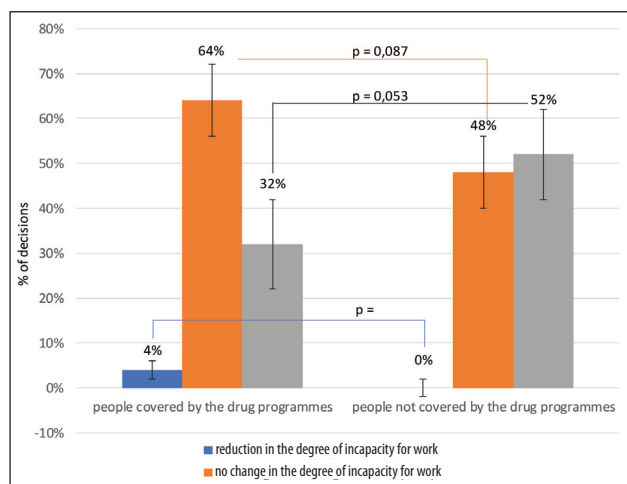


Figure 1. Results in the group of people covered by the MS drug programmes and in the group of people not covered by these programmes



Figure 2. First-time decisions issued by ZUS certifying doctors in 2009-2011 and 2016-2018 establishing the degree of incapacity for work in relation to people with MS

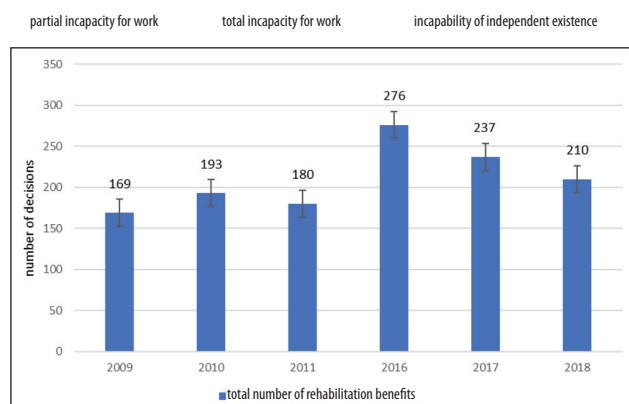
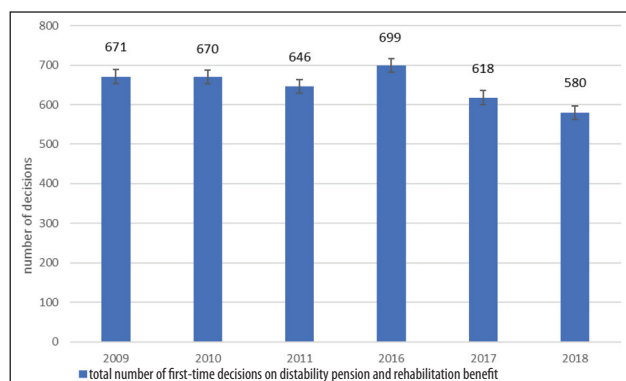


Figure 3. First-time decisions issued by ZUS certifying doctors in 2009-2011 and 2016-2018 establishing the entitlement to rehabilitation benefit in relation to people with MS



**Figure 4.** First-time decisions issued by ZUS certifying doctors in 2009-2011 and 2016-2018 establishing the entitlement to disability pension and to rehabilitation benefit in relation to people with MS

## DISCUSSION

It is not possible to compare many aspects of this work with the assessment, research or conclusions of other authors, because so far no one has assessed the impact of any MS therapy on medical evaluation and certification of incapacity for work performed by ZUS doctors and medical boards.

Drug programmes are a guaranteed benefit, with treatment carried out using the innovative, expensive active substances that are not funded under other guaranteed benefits. Treatment under drug programmes is carried out for selected diseases and covers a strictly defined group of patients. The content of each drug programme is published as an appendix to the announcement of the Minister of Health on the list of reimbursed medicines, foodstuffs for special nutritional purposes and medical devices. The description of each programme includes: eligibility criteria, criteria for exclusion from the programme, drug dosing regimen, method of drugs administration and a list of diagnostic tests performed for eligibility and for monitoring treatment. From 1 July 2012, the existing therapeutic programmes have been replaced by drug programmes. This change introduced other, more transparent legal regulations. The definition, rules and conditions for drug programmes implementation are set out in legislation in force. Based on the definition contained therein, a drug programme is considered to be a health programme including a drug technology in which the active substance is not a cost component of other guaranteed benefits or a foodstuff for special nutritional uses which is not a cost component of other guaranteed benefits. The drug programme can be delivered on an outpatient, same-day or inpatient basis. The mode of delivery of the drug programme is decided by the doctor and depends on the route of drug administration, the time of administration and the potential need to monitor the patient after drug administration for possible sequelae or side effects [10-12].

Based on the current announcement of the Minister of Health on the list of reimbursed drugs, foodstuffs for special nutritional purposes and medical devices, the MS therapy within drug programmes in Poland includes:

- first-line drugs (Appendix B.29) – beta interferon and beta-1a peginterferon (e.g. Avonex, Rebif, Betaseron and

Extavia), glatiramer acetate (Copaxone) – jointly referred to as ABCRE, newer oral drugs – dimethyl fumarate, teriflunomide, and monoclonal antibody therapy – alemtuzumab;

- second-line drugs used after failure of first-line drug therapy or in rapidly developing severe form of MS (Appendix B.46) – fingolimod, natalizumab, okrelizumab, cladribine [13, 14]. Almost 10 years after the introduction of the above-mentioned MS drug programmes in Poland, there has arisen interest in their impact on the qualifications contained in the decisions of ZUS practitioners and medical boards.

There is a large group of sick and disabled people in Poland who are inactive due to MS. Introduction of drug programmes for treatment of this disease was first of all intended to improve the health situation of these people. From the point of view of the social insurance system, it may also contribute to the return to the labour market of people who have become incapable of work due to this disease. This is particularly significant for young patients who, after participating in such programmes, will remain economically active for many years. This becomes all the more important in connection with the worldwide trend towards extending the retirement age. Such activities are both of a psychological importance - participation in the general labour market allows one to feel like a “fully valuable citizen” and does not give the feeling of being eliminated from social life, and economic importance – by paying old-age pension contributions one can earn a higher pension. The period that has elapsed since the introduction of drug programmes in the health care system is long enough to try to assess their impact on the medical evaluation and certification in the social insurance system [15, 16]. The results of the study have shown that the introduction of the immunological treatment modifying the natural course of MS within the framework of MS drug treatment programmes in Poland, has reduced the development of motor disability and has contributed to maintaining the job or returning to work by people who have become incapacitated, and after treatment are likely to remain economically active for many years.

In ZUS, certificates of incapacity for work are issued by doctors and medical boards. The definition of incapacity for work is set out in the Act on pensions from the Social Insurance Fund of 17 December 1998. pursuant to this Act, a person incapable of work means a person who has lost, completely or partly, earning capacity due to disturbance of body fitness and retraining does not promise restoration of his or her earning capacity. Partly incapable of work is a person who has lost – to a considerable degree – capacity for work corresponding to his or her level of qualifications. Completely incapable of work is a person who has lost capability for any work. When assessing the degree and length of the period of incapacity for work and prospects for restoring earning capacity, the following factors are considered:

- the degree of the impairment of body functions and possibilities to restore necessary body fitness through medical treatment and rehabilitation,

- possibility to perform the previous work or to enter into another employment and advisability of changing vocational qualifications, given type and nature of work performed so far, the level of education, age and psychophysical predisposition [17].

In certifying the incapacity for work, the Kurtzke Expanded Disability Status Scale (EDSS) is used to assess the functional capacity of MS patients. It allows for quantifying performance in eight functional systems. They include: pyramidal, cerebellar, brainstem, sensory, bowel and bladder, visual, cerebra functions. The Guy's Neurological Disability Scale (GNDS) may also be helpful as an important tool for assessing symptoms in people with MS, as well as the Barthel scale for assessing performance in activities of daily living and mobility and the Lovett Muscle Strength Scale [18].

In grades 0-3 the insured person is usually able to work, exceptionally partial incapacity for work is found in the case of increased symptoms of emotional disturbances such as depression and anxiety and fatigue syndrome. A mobility impairment of degree 3-4,5 may justify certifying partial incapacity for work. Severe motor impairment in grades 5 and 6 gives grounds for establishing total incapacity for work. Motor impairment in grades 7-9 indicates the need for assistance and care of other persons and justifies the establishment of total incapacity for work and incapability of independent existence [17].

Observations on the natural course of MS have shown that many patients, even after many years of observation, develop only slight motor impairment. Nevertheless, in Poland as many as 70% of patients with disability corresponding to EDSS score 3 stop working, and early work interruption unnecessarily traumatises the patient [19, 20].

The prognosis is less favourable in patients with a progressive disease course, with a large number of MRI lesions, and especially in those who have reached EDSS score 3 in less than 5 years. All these patients are at risk of more rapid disease progression [21, 22].

When analysing ZUS medical certificates based on statistical data, a slow decrease in the number of first-time disability certificates in relation to people with MS has been observed since 2009. No such trend has been observed in the number of certificates issued for circumstances justifying entitlement to rehabilitation benefit, which is not a long-term incapacity for work [23].

There were 20% less medical decisions confirming deterioration of health condition in relation to persons qualified for MS treatment drug programmes in Poland, compared to the group of persons not participating in these programmes. This is undoubtedly related to the enormous progress in recent years not only in the diagnosis of MS, but above all in its treatment. Thanks to the availability of many medicines, primarily under drug programmes, therapy can be tailored to the needs of the person with MS and his or her professional activity. The activity of the disease and its symptoms are different for each patient. The therapeutic management takes into account the severity of the disease and its activity, and then the therapy is individually tailored

to the patient's needs. Treatment personalisation means that some therapies give hope for the long-term inhibition of the disease. With these possibilities, the natural course of the disease is being clearly altered and many patients are free of relapses for years. As a result, people with MS can maintain their current lifestyle, pursue their passions and work professionally. Thanks to properly managed, early and effective pharmacotherapy and rehabilitation, people with MS remain fully valuable and effective employees. Early and effective treatment also reduces the risk of permanent neurological deficits. The current goal of the therapeutic process is not only to eliminate relapses and disability progression, but also to inhibit the appearance of cognitive impairment or minimise it [24].

Occupational activity can be mentioned as one of the preventive measures in MS.

The necessity of daily appearance at work, contacts with colleagues, undertaking professional activity – all this allows to increase the cognitive reserve, i.e. the knowledge and skills acquired during life, whose building protects people with MS from cognitive disorders. As the surveys have shown, 80% of employers believe that a person with a chronic disease can be an effective employee, meeting their expectations. Almost one in two is willing to create adequate working conditions for such a person, tailored to his or her needs. For people with multiple sclerosis, work not only provides a sense of security, but also builds social relationships and has a positive impact on the course of treatment itself. Continuity of employment is associated with a better prognosis of treatment for people with MS, and this is mainly a disease of young people, diagnosed most often between 20 and 40 years of age, i.e. in the period of their highest professional activity. It affects more than 45 thousand people in Poland. Three times as many patients are women. MS is most often associated with motor disability or difficulties in everyday routines. The results of surveys conducted among employers show that stereotypes of people with MS as disabled or with severe limitations of physical fitness are still strong, but they do not eliminate them from the labour market, which provides opportunities for a better understanding of the needs of people with MS on the labour market in the future [25].

In order to fully analyse the issue in question, it would be best to carry out an exercise covering all patients with MS in Poland - recipients of disability benefits and people with this disease who have been denied the benefit. At present, it is very difficult to carry out such studies. They would be facilitated by the introduction of a newer generation of computers and more modern software. Such software would allow to use artificial intelligence techniques, in particular machine learning and neural networks. Artificial intelligence techniques would allow for possible theses that are currently unnoticeable for researchers [26, 27].

## CONCLUSIONS

1. The introduction of immunological therapy that modifies the natural course of MS in patients under the MS drug treatment programmes has significantly reduced the development of their motor disability.

2. As a result, people who have become incapable of work due to this disease have maintained their job or have returned to work, which is particularly important for young patients who are likely to remain economically active for many years to come.
3. Such measures have a significant impact on reducing the number of benefits from the social insurance system.

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The Authors declare no conflict of interest

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**ADDRESS FOR CORRESPONDENCE:****Dariusz Lachman**

Medical Evaluation and Certification Department  
ZUS Headquarters  
Szamocka 3 St. , 01-748 Warsaw, Poland  
phone: +48 600 211 822  
e-mail: [dariusz.lachman@zus.pl](mailto:dariusz.lachman@zus.pl)

**ORCID ID and AUTHORS CONTRIBUTION**

0000-0001-8193-0397 – Dariusz Lachman (A, B, C, D, E, F)

0000-0002-5611-5646 – Piotr Winciunas (B, C)

0000-0001-5985-9790 – Jacek Lorkowski (C, D, E, F)

0000-0002-5473-8129 – Piotr Kupidurski (B, C)

0000-0002-3283-4523 – Zuzanna Komosińska (B, C)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of article



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# Evaluation of the Effectiveness of Methods of Rehabilitation Assistance to Children with Disabilities in the Case of Musculoskeletal Disorders According to the Data of Parents' Questionnaire

## Skuteczność metod pomocy rehabilitacyjnej u dzieci z niepełnosprawnościami związanymi ze schorzeniami układu mięśniowo-szkieletowego oceniana na podstawie danych z kwestionariuszy wypełnianych przez rodziców

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**Mykhaylo B. Shkolnyk<sup>1</sup>, Vasyl M. Mykhalchuk<sup>1</sup>, Yevgeniya B. Sharhorodska<sup>2</sup>, Lidia M. Melenchuk<sup>2</sup>**<sup>1</sup>PL Shupyk National University of Health of Ukraine, Kyiv, Ukraine<sup>2</sup>Institute of Hereditary Pathology of the National Academy of Medical Sciences of Ukraine, Lviv, Ukraine

### SUMMARY

**Aim:** An analysis of data from a questionnaire of parents whose children underwent rehabilitation for disability due to musculoskeletal disorders and an assessment of the effectiveness of the rehabilitation program for children's health.

**Materials and Methods:** A survey of 280 parents was conducted to assess the social-psychological, correctional-pedagogical and physical rehabilitation of children with disabilities, children with cerebral palsy and other lesions of the central nervous system with disorders of the musculoskeletal system with the involvement of a multidisciplinary team of rehabilitation specialists.

**Results:** 280 children in the age of 4 to 14 years with disabilities due to cerebral palsy and other lesions of the central nervous system were under observation. Each child received 10 comprehensive classes according to the standard of social services. The rehabilitation event included the following classes: physical rehabilitation, language and speech correction classes, correctional teacher classes, psychologist classes, and group classes: role-playing and didactic games. 280 persons were interviewed. The key audience consisted of mothers (or fathers) of children undergoing rehabilitation therapy.

**Conclusions:** Non-medicinal methods have substantial prospects for the effectiveness of the rehabilitation of sick children. An individual rehabilitation program for a child with disability can be fully and timely implemented with the participation of a multidisciplinary team of specialists, step-by-step control of the effectiveness of the program and its timely correction.

**Key words:** children with disabilities, rehabilitation assistance, disorders of the musculoskeletal system

**Słowa kluczowe:** dzieci niepełnosprawne, pomoc rehabilitacyjna, zaburzenia układu mięśniowo-szkieletowego

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### INTRODUCTION

Child disability is an important indicator of the development of society. Disability is a multifaceted problem, not just a biological or social phenomenon. According to the WHO, persons with disabilities make up 10% of the world's population, including 120 million children and adolescents [1]. Children's disabilities make up 5.1% of people, of which 0.7% have complex disabilities. According to UNICEF, in Central and Eastern Europe countries, the share of children with disabilities is 2.5%, of which 1% are children with severe disabilities [2, 3]. The percentage of children with disabilities from the total number of children in different countries is 2-3-4%

(USA – 4%, Great Britain – 2.5%, China – 4.9%, Ukraine – 2-3%) [1, 3-5].

During the years of Ukraine's independence, more and more attention is drawn to the problem of protecting children with limited functional capabilities. These provisions were also reflected in the National Program "Children of Ukraine", in which the early rehabilitation of disabled children is considered a problem of national importance that requires a priority solution [4].

The socio-economic situation that has developed at the current stage of Ukraine's development, crisis phenomena in the sphere of economy and finance make it necessary to strengthen the social protection of disabled children and define priority directions



in this work [6, 7]. Along with disorders of psychophysical development, children have social maladaptation, disruption of social contacts, and low sociometric status. Therefore, it is urgent to carry out rehabilitation of children from this category to restore their social and psychological functions.

Diseases of the nervous system are the leading causes of disability among children in Ukraine. They consistently occupy third place (with a specific weight of 11%) in the structure of primary disability and second place (with a specific weight of 15%) in the structure of general disability of children [6, 7]. According to the Center for Medical Statistics of the Ministry of Health of Ukraine for 2020, the total number of children with disabilities due to neurological diseases in Ukraine was 24,876.

In half of the cases (50.5% or 12,570 people), disability due to this class of diseases was caused by cerebral palsy (CP) [2, 6]. A significant proportion of children with disabilities due to diseases of the nervous system have movement disorders that significantly limit their life activities and require comprehensive rehabilitation assistance [8, 9].

The UN Convention on the Rights of the Child, ratified in Ukraine (Article 23), stipulates that every child, including those with functional limitations, „must live a full life in conditions that ensure dignity, promote self-confidence and facilitate adequate participation in society” [10]. Therefore, the relevance of the development of the rehabilitation system for children with disabilities is no less urgent than the implementation of measures to prevent the development of disability.

Ukraine has many achievements in this field. For example, modern medical and social rehabilitation technologies were introduced. However, each of the centers, performing very important work, has certain problems in providing assistance to families with children of the specified category [4, 8, 9].

At the same time, the existing system of rehabilitation of children with disabilities in Ukraine as a whole cannot be recognized as highly effective, and its legal support does not fully comply with the international obligations undertaken by Ukraine [11].

The main reasons that negatively affect the results of complex rehabilitation and social adaptation of children with disabilities are the lack of qualified personnel and the absence of generally accepted methods in complex rehabilitation. In addition, medical workers underestimate the psychological, pedagogical and social aspects of rehabilitation, and social workers underestimate the necessity and importance of the medical stage of rehabilitation. The problem is also the lack of a system of phasing and continuity of work with children's families [9].

The existing rehabilitation industry lacks a comprehensive system of needs assessment, interdisciplinary work in the provision of services and their direct focus on the client. At the state level, there is no medical and social monitoring of the effectiveness of the received rehabilitation services and the effectiveness of rehabilitation institutions [4, 8, 11].

A significant amount of scientific research is focused on the search for opportunities to improve the medical rehabilitation of children with movement disorders (the main causes of which are diseases of the nervous system, including cerebral palsy) [8, 12].

Significant prospects for achieving the medical and social effectiveness of the rehabilitation of sick children are non-pharmacological methods [8, 9, 13]. At the same time, the optimal selection of an individual rehabilitation program for a child with a disability cannot be fully and timely implemented without the functioning of an effective organizational model of rehabilitation with a step-by-step control of the effectiveness of the program and its timely correction. Analysis of the results of a number of researches provides the results of the effectiveness of the rehabilitation of sick children when receiving questionnaire data [14].

## AIM

The aim of the paper is an analysis of data from a questionnaire of parents whose children underwent rehabilitation for disability due to musculoskeletal disorders and an assessment of the effectiveness of the rehabilitation program for children's health.

## MATERIALS AND METHODS

A prospective study was conducted for four months (September 2021-January 2022) in the city of Kyiv using an anonymous questionnaire of parents whose children underwent rehabilitation at the Association “Medical and Social Center Alma”.

Questionnaires for assessing the effectiveness of rehabilitation measures were conducted after a 10-day rehabilitation course. The indicators of social-psychological, correctional-pedagogical, physical rehabilitation methods of children with disabilities, cerebral palsy patients and other CNS lesions with disorders of the musculoskeletal system were evaluated with the involvement of a complex team of rehabilitation specialists .

The questionnaire includes a number of questions related to the child's health, information about the parents, the social status of the family, the child's medical care, social and rehabilitation assistance, and the child's socialization.

280 children aged 4 to 14 with cerebral palsy and other CNS lesions were under observation. Each child received 10 comprehensive classes with a multidisciplinary team, according to the standard of social services.

Development, replication of the questionnaire, survey of parents, statistical processing of the results, and analysis of the received data were carried out.

280 respondents were interviewed . The key audience consisted of mothers (or fathers) of children undergoing rehabilitation therapy. The obtained data from the completed questionnaires were recorded and statistically processed using the “ Statistica 7.0” computer program package and the standard Excel 2013 statistical analysis package.

## RESULTS

The analysis of the data from the questionnaires of parents of children with disabilities showed that in the structure of the causes of the child's disability, the parents consider pathological childbirth as the first cause – 98 (35.0%), as the second cause – the mother's illness – 57 (20.3%), and the third cause – complications after the child's illness – 35 (12.5%). With almost the same frequency, parents name the environmental situation as the cause of the child's illness – 24 (8.6%) and an accident – 26 (9.3%) (Table 1).

**Table 1.** Characteristics of children by cause, course of the disease, and assessment of medical and physiotherapeutic care (n /%)

Indicators	The main one group (n=280)	
	n	%
<i>The cause of the child's illness</i>		
Pathological childbirth	98	35.0
Medical error	40	14.3
Ecological situation	24	8.6
Mother's illness during pregnancy	57	20.3
Unhappy case	26	9.3
Complication after diseases child	35	12.5
<i>The course of the child's illness</i>		
Light	26	9.3
Average	151	53.9
Severe	103	36.8
<i>Assessment of ambulatory medical care</i>		
Fine	34	12.1
Satisfactory	106	37.9
Unsatisfactory	140	50.0
<i>Evaluation of rehabilitation assistance</i>		
Fine	209	74.6
Satisfactory	71	25.4
Unsatisfactory	-	--
<i>What other types of help does your child need?</i>		
Hospital treatment	44	15.7
Treatment in a sanatorium	38	13.6
Treatment in specialized centers ( institutions rehabilitation )	198	70.7
Inclusive education _ class schools	216	77.1
Rehabilitation measures	280	100.0
<i>Does the child receive this help?</i>		
So	280	100.0
No	-	-

Respondents noted that 151 (53.9%) children had an average course of the disease, 103 (36.8%) – severe, and only 26 (9.3%) – mild.

When evaluating the child's outpatient medical care, half of the parents – 140 (50%) consider it unsatisfactory, 106 (37.9%) – satisfactory, and only 34 (12.1%) – good.

The majority of mothers consider the quality of rehabilitation care to be good – 209 (74.6%) and satisfactory – 71 (25.4%). All 280 (100%) parents of children with disabilities are satisfied with the quality of rehabilitation assistance.

The study of the socialization of children with disabilities based on the results of a parent questionnaire showed that 218 (77.9%) children from this group are not ready to study in a secondary school, and 62 (22.1%) are ready (according to their parents). Out of the entire group of 280 children, 216 (77.1%) are studying, and 64 (22.9%) are not.

Most children study in the inclusive group of the preschool education institution – 132 (47.2%), 102 (36.4%) children

attend the inclusive class of the general education school; 25 (8.9%) children study in a boarding school, and 21 (7.5%) study at home (Table 2).

When asked about the problems of joint education of children with disabilities together with healthy students, the majority of parents noted the relationship of healthy children to children with disabilities – 258 (92.1%) and psychological problems of a child with disabilities – 251 (89.6%), about half of parents 102 (47.2%) noted the physical limitations of children with disabilities, and 19 (5.8%) noted the attitude of teachers. Moreover, almost all parents indicated 2 or 3 problems of joint learning at the same time.

It was found that when evaluating the effectiveness of the rehabilitation program for children with disabilities, the majority of parents (178-89.0%) were satisfied with the results of the rehabilitation program, 18 (9.0%) were not completely satisfied and 4 (2.0%) respondents were not satisfied (Table 3).

**Table 2.** Assessment of socialization of children with disabilities (n /%)

Indicators	Number children ( n=280)	
	n	%
<i>Are you ready to study in general education school?</i>		
Yes	62	22.1
No	218	77.9
<i>Is the child studying?</i>		
Yes	216	77.1
No	64	22.9
<i>Where does the child study</i>		
Home	21	7.5
In the institution preschool education, inclusive group	132	47.2
In the middle school, inclusive class	102	36.4
In a boarding house	25	8,9
<i>What prevents the joint education of children with disabilities and healthy children?</i>		
Teachers' attitude	19	6.8
Attitude of healthy children to children with disabilities	258	92.1
Physical limitations of children with disabilities	102	47.2
Psychological problems of children with disabilities	251	89.6

**Table 3.** Evaluation of the effectiveness of the rehabilitation program for children with disabilities (n /%)

Indicators	Number children ( n=280)	
	n	%
<i>Satisfied with the effect of rehabilitation programs</i>		
Yes	178	89.0
No	4	2.0
Not quite	18	9.0
<i>Noted the improvement of the child's condition when using the costume Gravistat (n=200)</i>		
Yes	168	84.0
No	32	16.0
<i>What types of physical and medical rehabilitation do you think should be increased?</i>		
Physical rehabilitation with reflex loading a device of the type Gravistat	200	71.4
Correction classes: languages and speech	58	20.7
Occupation correctional teacher	51	18.2
Classes with a psychologist	28	10.0
Role-playing and didactic games	27	9.6
Do not change	12	4.3
<i>Do you (your family) need any kind of information?</i>		
No, I don't need it	10	3.6
Information about diseases child	28	10.0
Methodical materials video films, printed materials about rehabilitation	208	74.3
Information about specialists and institutions that provide help	34	12.1

Improvement of the child's condition after completing the course of the rehabilitation program with the device Gravistat was noted by 168 (84.0%) parents, 32 (16.0%) respondents did not note improvement. Under this program, 200 (71.4%) children underwent a rehabilitation course, and 80 (28.6%) had contraindications or no indications for using this device.

In order to improve the course of rehabilitation assistance for children with disabilities, parents were asked about the desired improvement of certain types of rehabilitation programs.

All 200 (71.4%) parents, whose children used Gravistat device, would like to increase physical rehabilitation classes with a reflex-loading device of the Gravistat type. 58 (29.7%) respondents would like to add language and speech correction classes, 51 (18.2%) would like to have trainings with a correctional teacher, 28 (10.0%) would like to have plot role-playing and didactic games, and only 12 (4.3%) believed that the program does not need changes.

In order to determine the information needs of parents of children with disabilities, part of the questions in the questionnaires were devoted to this aspect. The majority of parents (208 or 74.3%) needed methodological materials, video films, printed materials about rehabilitation methods, a smaller number – 34 or 12.1% needed information about specialists and institutions that provide assistance; and 28 or 10.0% – information about the child's illness, and 10 or (3.6% respondents did not need any information materials.

## DISCUSSION

The significance of the disability problem is confirmed by the fact that the prevention of disability is included in the 11 most priority medical measures defined by the WHO. Our study analyzed (according to the data of an anonymous questionnaire of parents) the effectiveness of social-psychological, correctional-pedagogical, physical rehabilitation of children with disabilities, cerebral palsy patients and other patients with CNS lesions and disorders of the musculoskeletal system with the involvement of a comprehensive team of rehabilitation specialists. The majority of parents (98-35.0%) consider the cause of the child's illness to be pathological childbirth, 151-39.5% believe that the course of the child's illness is of medium severity, and 140-50.0% are not satisfied with the child's outpatient treatment. All parents positively assessed the quality of rehabilitation assistance: 209 (74.6%) consider it good, 71 (25.4%) – satisfactory. Among the needs for medical care, all 280 (100.0%) parents named rehabilitation measures, in addition, almost the same number of respondents consider the need for treatment in a specialized rehabilitation center – 198 (70.7%) and the need to study in an inclusive class of a general education school – 216 (77.1%). The majority of parents believe that the child is not ready for education – 218 (77.9%), but a large part of children with disabilities study in inclusive institutions – 216 (77.1%).

The majority of parents are satisfied with the rehabilitation program – 178 (89.0%) and noted the improvement of the child's condition after completing the course when using a reflex loading device of the “ Gravistat “ type – 168 (84.0%).

The majority of respondents noted the need for awareness of rehabilitation methods – 208 (74.3%).

The analysis of the obtained data showed the presence of a reserve of factors contributing to the improvement of the provision of rehabilitation assistance to children with disabilities with cerebral palsy and CNS lesions. Significant prospects for the clinical effectiveness of the rehabilitation of sick children remain lie with non-pharmacological methods [4, 5, 14]. At the same time, the optimal selection of an individual rehabilitation program for a child with a disability cannot be fully and timely implemented without the functioning of an organizational model of rehabilitation with step-by-step control of the effectiveness of the program and its timely correction.

## CONCLUSIONS

In the Analysis of the cause of the child's illness, parents most often consider pathological births – 98 (35.0%) cases, 151 (39.5%) name the course of the child's illness is of medium severity - and 140 (50.0%) of them are not satisfied with the outpatient treatment of the child.

The analysis confirmed that all parents positively assessed the quality of rehabilitation assistance: 209 (74.6%) of them consider it good, 71 (25.4%) – satisfactory.

It was found that among the needs for providing medical care, all 280 (100.0%) parents named rehabilitation measures, almost the same number of respondents consider the need for treatment in a specialized rehabilitation center – 198 (70.7%) and study in an inclusive class of a general education school – 216 (77.1%). The majority of parents believe that the child is not ready for education – 218 (77.9%), but a large part of children with disabilities study in inclusive institutions – 216 (77.1%).

The obtained data will allow to evaluate the effectiveness of the comprehensive rehabilitation program of a multidisciplinary team of specialists for children with disabilities with musculoskeletal disorders, which will help to investigate the need for medical rehabilitation assistance and develop a strategy for improving the assistance to persons with disabilities.

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**ADDRESS FOR CORRESPONDENCE:**

**Mykhaylo B. Shkolnyk**

Shupyk National University

of Health of Ukraine

9 Dorogozhytska St., 04112 Kyiv, Ukraine

phone: +380930156475

e-mail: myhaylo24@gmail.com

**ORCID ID and AUTHORS CONTRIBUTION**

0000-0003-0305-4357 – Mykhaylo B. Shkolnyk (A, C, D)

0000-0002-5398-4758 – Vasyl M. Mykhalchuk (E, F)

0000-0003-0240-4765 – Yevgeniya B. Sharhorodska (C)

0000-0001-5318-9992 – Lidia M. Melenchuk (B, D)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



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*Info*

On behalf of the Editorial Board and the Publisher of *Acta Balneologica* – the official journal of the Polish Society of Balneology and Physical Medicine (published since 1905), we cordially invite you to the new website [www.actabalneologica.eu](http://www.actabalneologica.eu) where, among others, we publish open access articles. We would like to remind you that *Acta Balneologica* is indexed in the Web of Science (ESCI) as well as EBSCO databases, has 20 MEiNSzW points, and has the permanent patronage of the Rehabilitation Committee of the Polish Academy of Sciences.

At the same time, we encourage you to visit and like the *Acta Balneologica* profile on Facebook. [facebook.com/actabalneologica](https://facebook.com/actabalneologica). There, we place posts in the field of health resort medicine.

And we will share information about treatment methods available in health resort stations.

A natural consequence of our activities in the field of health resort medicine has been the establishment of the Polish Society of Health Resort Patients in 2019. You can find out more about the goals, tasks, and methods of operation of this Society on the website [www.uzdrowiskowi.pl](http://www.uzdrowiskowi.pl).

You can also download the membership declaration here.

# The Complex Rehabilitation Effectiveness of Patients with Chronic Pancreatitis and Chronic Viral Hepatitis C

## Skuteczność kompleksowej rehabilitacji u pacjentów z przewlekłym zapaleniem trzustki oraz przewlekłym wirusowym zapaleniem wątroby typu C

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**Liliya S. Babinets, Halyna O. Khomyn, Iryna M. Halabitska**

Horbachevsky Ternopil National Medical University, Ternopil, Ukraine

### SUMMARY

**Aim:** To investigate the parameters of the functional state of the pancreas in chronic pancreatitis in the background of chronic viral hepatitis C, as well as their dynamics under the influence of complex therapy with the inclusion of complex bioregulatory drugs.

**Materials and Methods:** 106 patients were examined: patients with CP in remission, patients with CP in remission in combination with HCV in remission, and after antiviral therapy. Patients with CP and concomitant HCV were divided into two groups according to correction programs. Group I (36 patients) received only conventional treatment: antispasmodics and/or prokinetics, enzyme preparations, proton pump inhibitors, hepatoprotectors in the mode "on-demand". Group II (36 patients), in addition to conventional treatment, received additional complex bioregulatory drugs.

**Results:** After treatment, there was an improvement in coprogram results and an increase in fecal elastase-1 levels. Positive dynamics was observed in both groups, but in patients of group I it was statistically insignificant ( $p > 0.05$ ), while in the group of patients who additionally received complex of bioregulatory drugs, the changes were more pronounced: in group II the level of fecal elastase-1 increased by 52.79% ( $p < 0.05$ ).

**Conclusions:** This indicates a statistically significant effect of treatment using a complex bioregulatory corrector of exocrine insufficiency (Momordica Compositum: 1 ampoule 2.2 ml intramuscularly 3 times a week №10) and a complex bioregulatory hepatotropic drug (Hepeel: 1 tab. sublingually 3 times a day 15-20 minutes before meals or 1 hour after meals for 1 month).

**Key words:** chronic pancreatitis, chronic viral hepatitis C

**Słowa kluczowe:** przewlekłe zapalenie trzustki, przewlekłe wirusowe zapalenie wątroby typu C

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### INTRODUCTION

Diseases of the pancreas and, in particular, chronic pancreatitis (CP) are common in the clinic of internal medicine, but their diagnosis and treatment still bring a lot of difficulties. In recent years, there has been an increase in this pathology, especially in people of working age, which is associated not only with increased alcohol abuse, eating disorders, chronic stress, and adverse environmental factors, but with an improved diagnosis of pancreatic disease [1-3].

Of particular importance is the development of pancreatitis in the background of viral infections B and C. The pathogenesis of pancreatic lesions, as well as the liver, consists of replication of viruses in these organs, heterogeneity of genotypes and mutations of viral genomes, direct cytopathic effect (for HCV), immunopathological changes in liver and pancreas, common immunological disorders. Thus, HBV antigens and HBV DNA in integrative and replication forms are found in

acinar, ductal, endocrine cells of the pancreas, and HBsAg - in pancreatic secretion [4, 5].

Insufficient development of primary and secondary prevention of CP, which takes place in the background of chronic viral hepatitis C (HCV), requires a deeper study of the mechanism of its development and the establishment of clinical and pathogenetic features, which should be taken into account when developing new approaches to prevention, treatment, and rehabilitation. One of such approaches to the complex treatment of CP on the background of HCV is the inclusion of drugs of complex bioregulatory therapy, which motivated this study.

### AIM

The aim is to investigate the parameters of the functional state of the pancreas in chronic pancreatitis in the background of chronic viral hepatitis C, as well as their dynamics under the influence of complex therapy with the inclusion of complex bioregulatory drugs.

## MATERIALS AND METHODS

106 patients were examined: patients with CP in remission, patients with CP in remission in combination with HCV in remission, and after antiviral therapy. The main group of the study included 72 patients with CP in the phase of unstable remission with concomitant HCV before and after antiviral therapy. The comparison group included 34 patients with CP in the phase of unstable remission without concomitant HCV (to assess the impact of HCV on the course of CP). The control group included 30 healthy individuals, comparable in age and sex with the study groups. Among the patients were 51 (48%) men and 55 (52%) women. The age of patients ranged from 28 to 84 ( $56 \pm 10.16$ ) years. Diagnosis and treatment of CP were performed according to a unified clinical protocol (order of the Ministry of Health of 10.09.2014 № 638). Confirmation of the diagnosis of chronic HCV was performed according to the unified clinical protocol (order of the Ministry of Health of 18.07.2016 № 729).

Criteria for inclusion in the group of CP with concomitant HCV: patients with CP in the phase of unstable remission in combination with HCV in the latent stage. Criteria for inclusion in the group of CP: patients with CP in the phase of unstable remission.

Exclusion criteria: other acute and chronic infectious diseases, exacerbation or decompensation of any chronic diseases, including the gastrointestinal tract, acute myocardial infarction during the last 3 months, surgery during the last 4 weeks, continuous systemic glucocorticosteroids, cancer, pregnancy, refusal to participate in the study.

The study did not identify patients who were registered at the drug dispensary, so the CAGE questionnaire was used to assess the impact of alcohol on the development of CP. Survey result: women - ( $1.81 \pm 0.04$ ) points show no craving for alcohol; men: ( $2.20 \pm 0.06$ ) points indicate the presence of a hidden craving for alcohol.

The exocrine function of the pancreas was determined by the level of fecal elastase-1 (by enzyme-linked immunosorbent assay) and the coprogram score (one pathological feature was evaluated at 1 point).

In the study, patients with CP and concomitant HCV were divided into two groups according to correction programs. Group I (36 patients) received only conventional treatment: antispasmodics and/or prokinetics, enzyme preparations, proton pump inhibitors, hepatoprotectors in the mode "on-demand". Group II (36 patients), in addition to conventional treatment, received additional *Momordica compositum* 1 amp. intramuscularly 3 times a week for 1 month and Hepeel 1 tab. sublingually 3 times a day for 15-20 minutes before meals or 1 hour after meals for 1 month. The effectiveness of treatment was assessed by the dynamics of laboratory and instrumental parameters before and after treatment. Statistical analysis was performed on a personal computer in Microsoft Excel 2016 (Microsoft Windows 10).

## RESULTS

In the Table 1 it shows the indicators of the excretory function of the pancreas in patients with isolated CP and CP on the background of HCV.

Exacerbation of excretory insufficiency was found in the group of patients with CP + HCV: the rate of fecal elastase-1 was statistically significantly lower compared to the group of patients with isolated CP, indicating enzymatic insufficiency of moderate severity ( $p < 0.05$ ). The group of patients with isolated CP found excretory insufficiency of the pancreas, mostly mild. There was also significant deterioration in the coprogram in the group of patients with CP + HCV compared with the group of patients with isolated CP ( $p < 0.05$ ) (Table 2).

The next stage of the study analyzed the dynamics of the parameters of the functional state of the pancreas under the influence of different treatment regimens.

After treatment, there was an improvement in coprogram results and an increase in fecal elastase-1 levels. Positive dynamics was observed in both groups, but in patients of group I it was statistically insignificant ( $p > 0.05$ ), while in the group of patients who additionally received complex of bioregulatory drugs, the changes were more pronounced: in group II the level of fecal elastase-1 increased by 52.79% ( $p < 0.05$ ). This indicates a statistically significant effect of treatment using a complex bioregulatory corrector of exocrine insufficiency

**Table 1.** Indicators of the excretory function of the pancreas of patients with CP and CP on the background of HCV

Indicator of excretory function of the pancreas	Control group (n=30)	CP (n=34)	CP + HCV (n=72)
Fecal elastase-1, $\mu\text{g/g}$	$283.34 \pm 20.62$	$186.14 \pm 4.12^*$	$110.88 \pm 5.72^{**}$
Coprogram, point	$0.03 \pm 0.03$	$3.1 \pm 0.04^*$	$5.2 \pm 0.06^{**}$

Note \* – a probable difference of indicators of the group of patients with CP relative to the control group ( $p < 0.05$ )

Note \*\* – a probable difference of indicators of the group of patients with CP compared to the group of patients with CP + HCV ( $p < 0.05$ )

**Table 2.** Indicators of excretory function of the pancreas in the comparison groups for the treatment of patients with CP + HCV

Indicator of excretory function of the pancreas	Comparison group		
	CP + HCV (n=72)	Group I (n=36)	Group II (n=36)
	Before treatment	After treatment	After treatment
Fecal elastase-1, $\mu\text{g/g}$	$110.88 \pm 5.72$	$137.33 \pm 3.58^*$	$169.42 \pm 3.18^{**}$
Coprogram, point	$5.2 \pm 0.06$	$2.8 \pm 0.04^*$	$1.5 \pm 0.05^{**}$

Note \* – a probable difference of indicators of group I in relation to treatment ( $p < 0.05$ )

Note \*\* – a probable difference of indicators of the II group ( $p < 0.05$ )

(Momordica Compositum: 1 ampoule 2.2 ml intramuscularly 3 times a week №10) and a complex bioregulatory hepatotropic drug (Hepeel: 1 tab. sublingually 3 times a day 15-20 minutes before meals or 1 hour after meals for 1 month).

## DISCUSSION

One of the most important discoveries of recent years is the establishment of the fact of replication of HBV and HCV in tissues of lymphatic and non-lymphatic origin. This contributed to the understanding of the pathogenesis of the multisystemic lesions observed in these infections, which allows to consider viral hepatitis not as liver disease, but as an infectious disease or systemic (generalized) infection [6-8].

Chronic HCV infection is a systemic disease that affects a number of other organs and systems in addition to the liver as the main target. To date, more than 30 different pathologies are associated with chronic HCV infection. In general, the occurrence of extrahepatic manifestations of HCV infection is unpredictable, ie does not depend on the stage of liver disease [9-11].

The fact that the severity of extrahepatic manifestations does not necessarily correlate with the severity of liver disease is of great clinical importance, because even in cases of inactive chronic hepatitis there may be a significant violation of general health and quality of life [12, 13].

Extrahepatic manifestations of any form can occur in approximately 74.0% of patients with chronic HCV infection and are long preceded by a variety of non-specific health disorders, including malaise, fatigue, nausea, weight loss, and musculoskeletal pain. [13, 14].

## CONCLUSIONS

1. Concomitant HCV worsens the course of CP, which indicates negative changes in the indicators of foreign secretory activities of the pancreas, which are statistically confirmed.
2. The use of complex treatment contributed to a statistically significant increase in the effectiveness of treatment of CP with concomitant HCV: the level of fecal elastase-1 increased in this group by 52.79% ( $p < 0.05$ ) from the level of exocrine insufficiency of moderate to mild, while, as in the group of conventional treatment, the level of pancreatic insufficiency also decreased significantly ( $p < 0.05$ ), but remained at the level of moderate severity ( $137.33 \pm 3.58$ )  $\mu\text{g/g}$ .

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### ADDRESS FOR CORRESPONDENCE:

Liliya S. Babinets

I. Horbachevsky Ternopil National Medical University  
1 Maidan Voli, 46001 Ternopil, Ukraine  
phone: +380673520743  
e-mail: lilyababinets@gmail.com

### ORCID ID and AUTHORS CONTRIBUTION

0000-0002-0560-1943 – Liliya S. Babinets (A, B, C, D, E, F)  
0000-0002-1058-7904 – Halyna O. Khomyn (A, B, C, D, E, F)  
0000-0002-9028-7230 – Iryna M. Halabitska (A, B, C, D, E, F)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



# Specific Features of Postoperative Rehabilitation of Patients with Secondary Hyperparathyroidism After Parathyroid Surgery Intervention

## Specyficzne cechy rehabilitacji u pacjentów poddawanych operacji przytarczyc z powodu ich wtórnej nadczynności

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**Anatolii I. Denysenko, Volodymyr I. Cherniy**

State Institution of Sciences «Research and Practical Centre of Preventive and Clinical Medicine» State Administrative Department, Kyiv, Ukraine

### SUMMARY

**Aim:** The objective of the research is to assess the effectiveness of postoperative rehabilitation of patients with secondary hyperparathyroidism (SHPT) after parathyroid surgery intervention (PTSI).

**Materials and Methods:** The research focused on 143 patients with SHPT after PTSI who experienced chronic renal failure and were on programmed hemodialysis, the ASA risk III-IV. PTSI was performed under general anesthesia. After surgery, group I patients (n=71) received a "potassium-free" diet, programmed hemodialysis, calcium preparations, prophylactic doses of heparins, and symptomatic treatment. In group II (n=72), rehabilitation measures were supplemented with the administration of glucocorticoids with the control of blood cortisol and metabolism.

**Results:** After PTSI, all patients felt general weakness, had a low level of ionized blood calcium, hemodynamic, oxygen and metabolism disorders, with more pronounced manifestations in group I. In group II, synchronously with the reduction of metabolic disorders, hemodynamics and oxygen level were restored to reference values, and hypocalcemia was quickly corrected with administering calcium ( $\geq 2g/day$ ).

**Conclusions:** The use of glucocorticoids accompanied with the control of blood cortisol levels and indirect calorimetry during the rehabilitation of patients with SHPT after PTSI accelerates the recovery of life support functions of patients and improves the results of their rehabilitation.

**Key words:** secondary hyperparathyroidism, parathyroid surgery, rehabilitation

**Słowa kluczowe:** wtórna nadczynność przytarczyc, operacja przytarczyc, rehabilitacja

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### INTRODUCTION

Secondary hyperparathyroidism (SHPT) affects more than half of patients with stages 3 and 4 and 90% of patients with the terminal stage of chronic kidney disease (CKD) accompanied with chronic renal failure (CRF) when they undergo program hemodialysis [1]. It is manifested in disorders of phosphate excretion and a decrease in the synthesis of active 1,25-dihydroxyvitamin D. This causes an increase of the level of phosphate, a decrease of calcium in the blood serum and directly stimulates the secretion of parathyroid hormone (PTH). A wide spectrum of clinical manifestations is observed, from asymptomatic ones to the appearance of pathological bone fractures as a result of a decrease in their density and the development of renal osteodystrophy which complicates the course of the disease [2-5]. Severe debilitating calcium-

uraemic arteriopathies (calciphylaxis), which often accompany SHPT, are manifested in inflammatory necrotic lesions of the skin and soft tissue, and the prognosis is very unfavorable, traditionally associated with long-term hyperphosphatemia and hyperparathyroidism [6-8]. The majority of those patients who undergo PTSI are on programmed hemodialysis (76% in the USA between 2002 and 2011) [9]. This probably reflects the increased severity of SHPT, especially in the later stages of CKD. In addition, there are works that indicate that patients with chronic renal failure who are on long-term treatment with programmed hemodialysis experience suppression of the function of the adrenal glands, metabolic disorders, the presence of metabolic acidosis, which requires appropriate correction and increased intensity of hemodialysis. [10, 11]. In order to stabilize PTH indicators and the composition of

calcium in the blood, SHPT patients receive calcium receptor antagonists (calcium mimetics) for a long time [12]. The possibility of surgical treatment of SHPT is considered if the use of these drugs did not give the proper effect, and the factors that are subject to correction (hypocalcemia, vitamin D deficiency, and hyperphosphatemia) have been eliminated as much as possible. The main direction of surgical treatment of hyperparathyroidism is the elimination of hyperparathyroidism by resection of such a volume of the parathyroid gland that will ensure the achievement of the target level of PTH (150-300 pg/ml). At the same time, it reduces the risk of recurrence of the disease, preventing the development of hypoparathyroidism [13-15]. Taking into account all the pathophysiological changes during SHPT, the high risks involved in the disruption of homeostasis due to CKD, the safety of PTSI and the importance of subsequent postoperative rehabilitation are of special importance. The terminal stage of CRF poses a serious professional challenge not only to the anesthesiologist during surgery, but also to the doctor of the hemodialysis department, who, dealing with further treatment and rehabilitation of the patient, is faced with the need to correct the whole complex of pathophysiological changes associated with the course of CRF and further growth of preoperative homeostasis disorders during the postoperative treatment. These are arterial hypertension, and persistent azotemia, and disorders of electrolyte metabolism with hypocalcemia, possible calciphylaxis with systemic damage to organs and systems (heart, pulmonary vessels, muscles, joints, spine), metabolic acidosis, hemocoagulation disorders, and systemic osteoporosis. General anesthesia, as well as the surgical intervention itself, increases the initial disturbances of homeostasis, and therefore increases the already high risk of perioperative and postoperative complications, especially in the terminal stage of chronic renal failure [16]. That is why it is very important to carry out postoperative rehabilitation correction of the above-mentioned disorders, taking into account their wave-like nature from one hemodialysis to the next, ensuring, at the same time, the maximum possible "safe corridor" of homeostasis and metabolism indicators [10-11]. Taking into account the possible suppression of the function of the adrenal glands, metabolic disorders, the presence of metabolic acidosis, which often require appropriate correction, it is very important to ensure a stable and safe postoperative metabolism, especially where there are manifestations of adrenal insufficiency.

### AIM

The objective of the study is to evaluate the effectiveness of the postoperative rehabilitation of patients with SHPT after PTSI.

### MATERIALS AND METHODS

The study was prospective, not randomized. The study group (n = 143) included patients with manifestations of SHPT in severe form, due to the terminal stage of CRF caused by CKD, who were treated with PTSI, (m-74, w-69). All of them had a preoperative risk of III-IV according to the ASA classification. The age of patients was 22-76 years. Before the operation, the patients were examined and treated at their place

of residence where they underwent programmed hemodialysis three times a week. Among the causes of the CKD, there were kidney defects – 13 patients (9,1%), polycystic kidneys – 16 (11,2%), glomerulonephritis – 67 (46,9%), pyelonephritis – 47 (32,8%). The level of parathyroid hormone in the patient's blood ranged from 800 to 6000 pg/ml, creatinine – from 770 to 1540  $\mu\text{mol/l}$ . The study group did not include patients with severe cerebrovascular pathology, who had organic neurological symptoms, dilated cardiomyopathy and coronary heart disease of functional class IV with a cardiac ejection fraction less than  $\leq 35\%$ . During the preoperative examination, preparation for surgical intervention, anesthesia provision, intensive therapy, post-operative rehabilitation, and all measures of the treatment protocol for patients with SHPT accepted in the medical institution were performed. Patients underwent PTSI (subtotal parathyroidectomies) under general anesthesia using the inhaled anesthetic sevoflurane and the narcotic analgesic fentanyl under conditions of low-flow artificial lung ventilation, according to the International Standards of Safe Anesthesiological Practice of WFSA (World Federation of Societies of Anaesthesiologists, 2010). An integral part of effective postoperative rehabilitation was an objective preoperative assessment of the severity of patients, their preparation for surgical intervention, taking into account concomitant pathology, involving the appropriate profile of doctors, and ensuring a "safe corridor" of homeostasis and metabolism indicators during and after PTSI. Postoperative rehabilitation measures included the following [16].

Daily control of the level of ionized calcium in the blood and timely correction of hypocalcemia with intravenous administration of a 10% calcium gluconate solution in the amount of 100 ml within 12 hours after the end of the operation and a long-term administration of tablet form calcium (calcium-D3 Nicomed)  $\geq 2000$  mg per day, accompanied with the control of ionized blood calcium, with the target value of which being considered to be 1.1-1.35 mmol/l in order to prevent severe hypocalcemia and the syndrome of "hungry bones" due to calcium metabolism disorders. Cholecalciferol (vitamin D3) was additionally prescribed internally in a total daily dose of up to 2000 IU.

Postoperative correction of secondary arterial hypertension, heart rhythm disorders, dynamic assessment of the severity of coronary heart disease taking into account all risks of myocardial infarction and cerebrovascular disorders; timely involvement of specialists of the appropriate profile.

Prevention of thromboembolic complications using prophylactic doses of low molecular weight heparins and unfractionated heparin during hemodialysis sessions and evaluation of hemocoagulation indicators.

Control and correction of "potassium-free" diet, water balance, azotemia, hyperkalemia, and metabolic acidosis, taking into account the choice, features and intensity of program hemodialysis.

Correction of anemia as necessary (iron preparations and erythropoietin).

Analysis of the dynamics of changes in blood parathyroid hormone to assess the effectiveness of the performed PTSI.

In the course of the study, the patients' central hemodynamic parameters (cardiac index, CI,  $l \times \min^{-1} \times m^{-2}$ ) were determined by the continuous calculation method esCCO biomonitor Life Scope PVM – 2701, NIHON KONDEN (Japan, Europe GmbH), gas composition and acid-alkaline state of blood were determined with an analyzer Cobas b 221 (Roche Diagnostics GmbH, Germany, Austria), oxygen mode indicators were calculated using a computer algorithm on a special device for Android 5: oxygen delivery index ( $DO_2$ ,  $ml \times \min^{-1} \times m^{-2}$ ), oxygen consumption index ( $VO_2$ ,  $ml \times \min^{-1} \times m^{-2}$ ), oxygen extraction coefficient (O<sub>2</sub>ER, %) and respiratory coefficient, (RQ, unit). In addition, all patients underwent energy monitoring using indirect calorimetry and determination of the current metabolic index (Metabolic Rate, MR,  $cal \times \min^{-1} \times m^{-2}$ ), and with the help of a hermetic face mask, a built-in monitor of the Dräger Fabius Tiro anesthetic breathing apparatus and a biomonitor Infinity Delta (Dräger, Germany), comparing it with postoperative (baseline) values and basal metabolic index (Basal Metabolic Rate, BMR,  $cal \times \min^{-1} \times m^{-2}$ ) [17]. The patients were divided into two groups. In group I (n=71), postoperative rehabilitation was carried out according to the stages of treatment described above [16]. Group II (n=72) consisted of patients whose blood cortisol was determined on the first day after surgery (using the electrochemiluminescence method on the device Cobas 6000 Roche Diagnostics (Switzerland), and rehabilitation measures were supplemented by personalized energy monitoring developed and implemented at our clinic, with additional determination of the target metabolism (Target Metabolic Rate, TMR,  $cal \times \min^{-1} \times m^{-2}$ ) and severity of metabolic disorder (Metabolic Disorders, MD, %) [11]. In cases of low blood cortisol level (<170 nmol/l) and metabolic disorders, intravenous prednisolone (30-60 mg) was administered. At values of the current metabolism close to the basal level and below, IV hydrocortisone (Solu-Cortef) 125-250 mg was additionally administered. The main direction of postoperative rehabilitation in group II was the correction of metabolism due to the optimization of hemodynamics, the acid-base status of blood and the use of glucocorticosteroids, taking into account the dynamics of metabolic changes and determining the severity of their violations. In cases of long-term low blood cortisol levels, methylprednisolone (midrol) 8 mg/day was prescribed in the middle, along with proton pump blockers (pantoprazole 40 mg/day) with a gradual dose reduction and its withdrawal within 14 days. The basis of postoperative rehabilitation in both groups was maintenance of normal oxygen status, normovolemia, normocardia, and optimal values of acid-base status against the background of programmed hemodialysis. The study was conducted daily in the morning, from the first to the seventh day after PTSL. The level of pain of the "hungry bones" syndrome, associated with a calcium metabolism disorder, was evaluated according to the Huskisson (1974) visual analog pain scale (VAS). Study stages: first day after surgery (initial data) – 1st stage, 2nd day – 2nd stage, 3rd day – 3rd stage, 4th day – 4th stage, 5th day – 5th stage, 6th day – 6th stage, 7 day - 7 stage.

Statistical processing of the results was carried out using the STATISTICA v.64 software package (license number 12334567). Using the specified software package, the obtained quantitative parameters were checked and confirmed their compliance with the Gaussian normal distribution law according to the Shapiro-Wilk test. Having a normal distribution of parameter values, the arithmetic mean value (M) and its standard error (m) were determined. The significance of the differences in indicators was assessed using the Student's test (t). For all types of analysis, the critical level of significance (p) was <0,05.

## RESULTS

The indicators of central hemodynamics, oxygen regime and metabolism of the patients, obtained during the study, are presented in Tables I and II. The initial indicators of metabolism in both groups were quite low and close to the basal level and were, respectively,  $620 \pm 12 cal \times \min^{-1} \times m^{-2}$  in group I and  $617 \pm 13 cal \times \min^{-1} \times m^{-2}$  in group II. The indicators of the respiratory coefficient in both groups practically did not differ and had values, respectively, of  $0,83 \pm 0,02$  and  $0,85 \pm 0,01$ , which indicated the same conditions for their energy production, which corresponds to the absence of differences in the level of oxygen consumption on the first day examination ( $126 \pm 6 ml \times \min^{-1} \times m^{-2}$  in group I and  $124 \pm 4 ml \times \min^{-1} \times m^{-2}$  in group II) ( $p < 0,05$ ). It is worth noting that on the first day of the examination, in both groups, there were increased indicators of oxygen extraction ( $33,8 \pm 0,4\%$  in group I and  $33,9 \pm 0,5\%$  in group II), which with such low metabolism, indicated intensive tension of the oxygen regime and the presence of energy-oxygen debt, probably associated with low indicators of central hemodynamics and oxygen delivery. So, in group I, CI was  $2,2 \pm 0,1 l \times \min^{-1} \times m^{-2}$ , and in group II –  $2,1 \pm 0,1 l \times \min^{-1} \times m^{-2}$ . At the same time,  $DO_2$  was, respectively,  $-372 \pm 12 ml \times \min^{-1} \times m^{-2}$  in group I, and  $366 \pm 11 ml \times \min^{-1} \times m^{-2}$  in group II. In group I (Table 1), low indicators of cardiac index, oxygen delivery and consumption, increased oxygen extraction were maintained throughout the study. All this, against the background of high values of the respiratory coefficient, may indicate the non-productive work of the "energy machine" of the patient's body and the preservation of energy-oxygen debt, which could lead to postoperative complications. Speaking about the current metabolism in group I, it was low and did not significantly differ from the basal level throughout the study ( $p < 0,05$ ). In group II (Table 2), a steady increase in hemodynamic indicators was observed. Thus, from the third day, CI daily exceeded the initial values by 19,1%, 28,6%, 38,1%, 47,6%, and 62% ( $p < 0,05$ ), respectively, and at the end of the examination, it reached a value of  $3,4 \pm 0,1 l \times \min^{-1} \times m^{-2}$ . A similar rate of growth was observed in oxygen delivery and consumption. Thus, on the seventh day of the survey,  $DO_2$  had a value of  $549 \pm 12 ml \times \min^{-1} \times m^{-2}$ , which was  $183 ml \times \min^{-1} \times m^{-2}$  (50%) higher than the initial value,  $110 ml \times \min^{-1} \times m^{-2}$  (25,1%) on the third day and  $56 ml \times \min^{-1} \times m^{-2}$  (11,4%) of the fifth day ( $p < 0,05$ ).  $VO_2$  exceeded initial values: on the fourth day by 11,3%, on the fifth – by 12,1%, on the sixth – by 16,9%, and

on the seventh – by 21,8% ( $p<0,05$ ). The oxygen extraction coefficient in group II was not as high as in group I, and on the sixth and seventh days it reached reference values, which indicated sufficient energy-oxygen supply and complete balance of the oxygen regime of the patients in this group. The current metabolism of group II patients, the first three days of the study, was close to the basal level and did not significantly differ from it. From the 4th to the 7th day, the current metabolism exceeded the basal values: respectively, by 11,2% (4th day), 19,7% (5th day), 25,6% (6th day) and 31,4% (7th day). This corresponded to a steady decrease in metabolic disorders from  $24,6\pm 2,4\%$  on the 4th day to  $7,8\pm 1,1\%$  on the 7th day ( $p<0,05$ ). During the study, patients of both groups experienced general weakness, which was more pronounced in group I, where hemodynamic parameters remained lower, and there were disturbances in the oxygen regime and metabolism. At the same time, the general weakness in group I persisted until the 5th day, and the patients of group II already felt much better from the third day, according to their estimates, at the level of the preoperative state. Pain associated with “hungry bones” syndrome due to calcium deficiency (in muscles, joints, spine, back, limbs) gradually decreased, with the advantage of changes in group II, where it was less intense and disappeared on the 7th day (Table 3). During the 7 days of the study, there were no significant dynamics of indicators of the acid-alkaline state of venous blood and their differences in the groups.

During the first day, in both groups, a decrease in ionized blood calcium was observed: in group I – from  $1,23\pm 0,02$  mmol/l to  $0,93\pm 0,03$  mmol/l and in group II from  $1,22\pm 0,01$  mmol/l to  $1,06\pm 0,02$  mmol/l ( $p<0,05$ ), which was below the lower reference value (1,12 mmol/l) and required additional IV administration of 10% calcium gluconate. Thus, in group I, 46 patients (64,8%) needed additional intravenous administration of 10% calcium gluconate solution in a daily dose of 100 ml for three days against the background of taking calcium preparations in the middle for the correction of hypocalcemia. In group II, it was sufficient to take tablet forms of calcium in

a dose of  $\geq 2000$  mg/day to maintain the reference values of ionized blood calcium. From the seventh day, after surgical interventions, the PTH, calcium, and blood phosphorus indicators of the patients in both groups quickly returned to normal, the signs of systemic osteoporosis disappeared or stopped, the patients stopped complaining about pain in the muscles and joints and felt much better. There were no perioperative and postoperative complications.

## DISCUSSION

As can be seen from the obtained results, after the end of PTSTI, patients of both groups had a low (close to the basal level) metabolism, due to hemodynamic and oxygen status disorders, which could lead to irreversible changes in any organ or life support system and increased the risks of severe postoperative complications for patients with the terminal stage of CKD, who are on programmed hemodialysis [10]. At the same time, in group I, low metabolism remained throughout the study, and in group II, from the fourth day, there was a steady increase in metabolism against the background of recovery of hemodynamic indicators and oxygen regime. Patients of group I, during the study, experienced stronger general weakness than in group II, due to hemodynamics of the oxygen regime and metabolism disorders [11]. The recovery of hemodynamics, oxygen status, and metabolism in group II was much faster than in group I. The pain associated with the disturbance of calcium metabolism gradually decreased, with the advantage of changes in group II, where it was less intense and disappeared in 7 days in contrast to group I, where the pain persisted even after 7 days. There were no significant deviations in the indicators of the acid-base status of venous blood and their differences in the groups. From the first day of the postoperative course, a decrease in ionized blood calcium was observed in all patients, with more pronounced manifestations in group I, where in 46 patients (64,8%) for the correction of hypocalcemia, for three days against the background of taking tablet forms of calcium preparations in the middle, in a dose of  $\geq 2000$  mg/day, an additional IV administration of 10% calcium

**Table 1.** Dynamics of indicators of central hemodynamics, oxygen regime and metabolism of patients of group I ( $n=71$ ,  $M\pm m$ )

Indicators/ research stages	1	2	3	4	5	6	7
CI ( $l\times min^{-1}\times m^{-2}$ )	$2,2\pm 0,1$	$2,0^{\#}\pm 0,1$	$2,0\pm 0,1$	$1,9^{\#}\pm 0,1$	$2,0^{\#}\pm 0,1$	$2,0^{\#}\pm 0,1$	$2,3^{\#*}\pm 0,1$
$DO_2$ ( $ml\times min^{-1}\times m^{-2}$ )	$372\pm 12$	$365\pm 13$	$360^{\#}\pm 11$	$363^{\#}\pm 12$	$449^{\#*}\pm 13$	$451^{\#}\pm 13$	$472^{\#}\pm 12$
$VO_2$ ( $ml\times min^{-1}\times m^{-2}$ )	$126\pm 6$	$124\pm 5$	$120\pm 7$	$128\pm 5$	$139\pm 6$	$134\pm 7$	$136^{\#}\pm 6$
$O_2ER$ (%)	$33,8\pm 0,4$	$33,9\pm 0,7$	$33,3\pm 0,5$	$30,4\pm 0,6$	$30,9\pm 0,5$	$29,7\pm 0,6$	$28,9\pm 0,5$
RQ (unit)	$0,83\pm 0,02$	$0,90\pm 0,03$	$1,27^{\#}\pm 0,03$	$1,20^{\#}\pm 0,02$	$1,18^{\#}\pm 0,03$	$1,28^{\#}\pm 0,02$	$1,18^{\#}\pm 0,02$
MR ( $cal\times min^{-1}\times m^{-2}$ )	$620\pm 12$	$616\pm 14$	$605\pm 13$	$589^{\#}\pm 11$	$594^{\#}\pm 11$	$596^{\#}\pm 12$	$634^{\#}\pm 11$
BMR ( $cal\times min^{-1}\times m^{-2}$ )	$583\pm 12$						

Note:

\* – the difference is significant in comparison with the original data ( $p<0,05$ ).

# – the difference is significant in comparison with the similar stage of group II ( $p<0,05$ ).

$\alpha$  – the difference is significant in comparison with the previous value ( $p<0,05$ ).

$\varphi$  – the difference is significant in comparison with the basal level of metabolism ( $p<0,05$ ).

**Table 2.** Dynamics of indicators of central hemodynamics, oxygen regime and metabolism of patients of group II (n=72, M±m)

Indicators/research stages	1	2	3	4	5	6	7
CI (l×min <sup>-1</sup> ×m <sup>-2</sup> )	2.1±0.1	2.3 <sup>#</sup> ±0.1	2.5 <sup>*#</sup> ±0.1	2.7 <sup>#</sup> ±0.1	2.9 <sup>*#</sup> ±0.1	3.1 <sup>*#</sup> ±0.1	3.4 <sup>*#x</sup> ±0.1
DO <sub>2</sub> (ml×min <sup>-1</sup> ×m <sup>-2</sup> )	366±11	398±13	439 <sup>*#x</sup> ±14	482 <sup>*#x</sup> ±12	493 <sup>*#</sup> ±11	515 <sup>*#</sup> ±11	549 <sup>*#x</sup> ±12
VO <sub>2</sub> (ml×min <sup>-1</sup> ×m <sup>-2</sup> )	124±4	125±4	129±5	138 <sup>#</sup> ±5	139 <sup>#</sup> ±6	145 <sup>#</sup> ±4	153 <sup>#</sup> ±4
O <sub>2</sub> ER (%)	33.9±0.5	31.4±0.5	29.4±0.7	28.6±0.6	28.2±0.5	27.9±0.6	27.5±0.5
RQ (CU)	0.85±0.01	0.84±0.02	0.86±0.03	0.84±0.03	0.84±0.02	0.83±0.01	0.83±0.01
MR (cal×min <sup>-1</sup> ×m <sup>-2</sup> )	617±12	625±13	636 <sup>φ</sup> ±11	644 <sup>#φ</sup> ±12	693 <sup>*#xφ</sup> ±11	727 <sup>*#xφ</sup> ±11	761 <sup>*#xφ</sup> ±12
TMR (cal×min <sup>-1</sup> ×m <sup>-2</sup> )	916±12	884±15	875±13	854±11	849±13	833±14	825±12
BMR (cal×min <sup>-1</sup> ×m <sup>-2</sup> )	579±13						
MD (%)	32.6±3.1	29.3±2.5	27.3±2.4	24.6 <sup>#</sup> ±2.4	18.4 <sup>#</sup> ±2.3	13.1 <sup>#</sup> ±2.1	7.8 <sup>#</sup> ±1.1

Note:

\* – the difference is significant in comparison with the original data ( $p < 0,05$ ).

# – the difference is significant in comparison with the similar stage of group II ( $p < 0,05$ ).

x – the difference is significant in comparison with the previous value ( $p < 0,05$ ).

φ – the difference is significant in comparison with the basal level of metabolism ( $p < 0,05$ ).

**Table 3.** Indicators of the visual-analog pain scale

Group	Visual-analog pain scale (cm)						
	Examination stages						
	1	2	3	4	5	6	7
I	4.8±0.3	4.5±0.3	4.2±0.3	4.0±0.3	3.7±0.3	3.4±0.3	2.7±0.2
II	3.9±0.3	3.7±0.2	3.1±0.3	2.8±0.2	2.3±0.2	2.2±0.3	1.6±0.2

gluconate solution in a daily dose of 100 ml was required. From the seventh day, after surgical interventions, the PTH, calcium, and blood phosphorus indicators of the patients in both groups quickly returned to normal, the manifestations of systemic osteoporosis disappeared or stopped, the patients stopped complaining about pain in the muscles and joints and felt much better [13-15]. There were no perioperative and postoperative complications.

## CONCLUSIONS

1. In almost half of patients with SHPT and end-stage CKD, glucocorticoid insufficiency and a low level of metabolism were diagnosed, which can lead to irreversible changes in organs or the life support system, increase the risks of both perioperative and postoperative complications in patients with PTSE.
2. Both preoperative and postoperative control of the blood cortisol level are mandatory for patients with SHPT against the background of the terminal stage of CKD, who are on programmed hemodialysis, with the aim of a differential approach to treatment in the postoperative period: determination of the dose of intravenous forms of glucocorticoids and, if necessary, long-term postoperative reception of them in the middle.
3. Control of the current metabolism and determination of the degree of its disorders, during postoperative energy monitoring, allows to timely increase the dose of corticosteroids to correct these disorders and to evaluate the effectiveness of postoperative therapy.

4. The main direction of postoperative rehabilitation of patients with SHPT after PTSE who are on programmed hemodialysis in connection with the terminal stage of CKD is the correction of calcium and vitamin D3 metabolism disorders, together with the correction of metabolic disorders due to the optimization of hemodynamic indicators, oxygen regime, acid-base blood conditions and the use of glucocorticoids, taking into account the dynamics of metabolic changes and determining the severity of their disorders.

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#### ADDRESS FOR CORRESPONDENCE:

##### Volodymyr I. Cherniy

Research and Practical Centre of Preventive and Clinical Medicine  
5 Verkhnya St., 01014 Kyiv, Ukraine  
phone: + 38-098-310-65-61  
e-mail: vladimircherniy3@gmail.com

#### ORCID ID and AUTHORS CONTRIBUTION

0000-0002-9057-0327 – Anatolii I. Denysenko (A, B, C, D)

0000-0002-9885-9248 – Volodymyr I. Cherniy (E, F)

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



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# The Effectiveness of the Gastro-esophageal Reflux Disease Treatment in Persons who have Completed Successful Chronic Hepatitis C Antiviral Therapy at the Rehabilitation Stage

## Skuteczność leczenia choroby refluksowej przełyku u pacjentów, którzy ukończyli z sukcesem leczenie antywirusowe przewlekłego zapalenia wątroby na etapie rehabilitacji

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Mariya A. Derbak<sup>1</sup>, Oksana T. Hanych<sup>1</sup>, Taras M. Ganich<sup>1</sup>, Volodymyr V. Timashev<sup>1</sup>, Vasilina V. Svistak<sup>1</sup>, Valentyna Yu. Koval<sup>1</sup>, Pavlo P. Ganynets<sup>2</sup>

<sup>1</sup>Uzhhorod National University, Uzhhorod, Ukraine

<sup>2</sup>Sanatorium «Kvitka Polonyny», Solochyn Village, Solochyn, Ukraine

### SUMMARY

**Aim:** To assess the effectiveness of the physiopharmacological treatment of GERD in persons who successfully completed a full course of CHC therapy with direct antiviral drugs no more than 6 months ago.

**Materials and Methods:** 67 people with GERD who completed a course of CHC therapy with direct antiviral drugs no more than 6 months ago were under observation. The patients were divided into: 1 group (n=20) – received rabeprazole 20 mg in the morning 40 minutes before meals, 2 group (n=23) – rabeprazole 20 mg in combination with taking mineral water “Polyana Kvasova” according to the proposed scheme, group 3 (n=24 patients) – took rabeprazole 20 mg in combination with MV«Polyana Kvasova» for 24 days, and with a course of magnetic therapy procedures.

**Results:** Under the influence of treatment, on the 24 th day of observation, all 100% of patients in the 3rd group had positive dynamics: the elimination of heartburn ( $p<0.001$ ), pain in the epigastrium ( $p<0.001$ ), and manifestations of dysphagia ( $p<0.001$ ), which were confirmed by fibrogastroscopy - disappearance of esophagitis ( $p<0.001$ ) and gastroesophageal reflux ( $p<0.001$ ). In 80% of the patients of the second group, positive dynamics of the clinical and endoscopic picture was also observed ( $p<0.005$ ), and in the rest of the patients, the improvement was unreliable ( $p>0.05$ ). After the treatment, a decrease in manifestations of asthenovegetative and dyspeptic syndromes, cholestatic syndrome was recorded in all groups of patients, with a predominance in group 3.

**Conclusions:** The use of complex physiopharmacological treatment has a reliable advantage over standard pharmacological treatment, as it has a positive effect not only on GERD manifestations, but also on clinical and laboratory manifestations of CHC and improves the quality of life.

**Key words:** GERD, CHC, mineral water, rabeprazole, magnetic therapy

**Słowa kluczowe:** GERD, przewlekłe zapalenie wątroby typu C, woda mineralna, rabeprazol, magnetoterapia

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### INTRODUCTION

Although great success has been achieved in the study of etiopathogenesis, methods of diagnosis and treatment of chronic liver diseases, chronic hepatitis C (HCV) remains an unsolved problem of modern healthcare [1, 2]. According to the statistical data of WHO experts, about 71 million people suffer from CHC, and 350-399 thousand die annually due to liver damage and complications caused by hepatitis C virus (HCV) [3, 4]. The significant prevalence of CHC often leads

to its combined course with other gastrointestinal tract (GI) diseases [5].

Of special interest is the pathology of the gastroduodenal zone, where acid-dependent diseases, in particular gastroesophageal reflux disease (GERD), are prevalent. The World Organization of Gastroenterologists called GERD a disease of the 21st century, which is found in 20% to 50% of the world's population and has a clear tendency to grow [6-8]. The continuous relapsing course of GERD with the progressive development of complications, which

is accompanied by a significant decrease in the quality of life of patients, puts this disease among the most important medical and social problems of practical health care [9,10]. Treatment of GERD involves long-term inhibition of acid production using proton pump inhibitors (PPIs), which can interact with the cytochrome P450 system, inhibiting it [11-13].

The adverse effect of long-term drug load during the treatment of patients with GERD on the body of a patient with liver pathology necessitates the development of new rehabilitation programs based on non-drug effects with the mechanism of action of simultaneous hepatoprotection and normalization of disorders in the digestive system. An alternative to such treatment can be the appointment as part of complex mineral water (MW) therapy and magnetic therapy procedures. Hydrocarbonate waters improve carbohydrate and protein metabolism, have an anti-inflammatory effect. Taking into account that hydrocarbonates reduce the level of acid formation in the stomach, they are indicated for combined liver and gastro-duodenal system pathology [14].

MV should be drunk warm at a temperature of 40-45 degrees C in the amount of 100 to 250 ml per reception, three times a day, before eating. With increased acid formation, MW is prescribed 90-60 minutes before eating food, sometimes 40 minutes after eating food at the height of digestion. With reduced acid-forming function of the stomach, MW is prescribed 30 minutes before eating [15].

### AIM

To assess the effectiveness of the physiopharmacological treatment of GERD in persons who successfully completed a full course of CHC therapy with direct antiviral drugs no more than 6 months ago, at the rehabilitation stage.

### MATERIALS AND METHODS

During 2020-2021, 67 people who were being treated at the "Kvitka Polonyny" sanatorium of "Suzirya" Ltd (General Director - Honored Doctor of Ukraine P.P. Ganynets) were under observation. Among the examined patients, 58.2% were men, 41.8% were women, the average age was  $47.5 \pm 5.4$  years. Before the start of the study, all patients were informed about the study and signed an informed consent in accordance with the methodological recommendations of the Helsinki Declaration (1975) as amended, the International Code of Medical Ethics (1983), the laws of Ukraine, the relevant provisions of the WHO and approved by the local ethics commission of the Medical Center "UzhNU" (protocol No. 7/2 dated September 30, 2020).

Before the start of sanatorium-resort treatment, all patients were diagnosed with a refractory form of GERD at their place of residence, and all patients completed a full course of CHC therapy with direct antiviral drugs (DAV) sofosbuvir 400 mg + daclatasvir 60 mg no more than 6 months ago, which served as a criterion for inclusion in the study.

Exclusion criteria were infection with hepatitis B and D viruses, alcoholic, autoimmune, toxic liver damage, liver cirrhosis, concomitant diseases of the respiratory system, diseases of the nervous system, psycho-emotional sphere, mental disorders that prevent the conduct of this study and the patient's decision to stop participating in the study.

General clinical, biochemical, serological tests were carried out in certified Uzhgorod and commercial laboratories ("Dila" and «Sinevo»). Indicators of biochemical blood analysis - total bilirubin and its fractions, total protein and protein fractions, activity of serum cytolytic enzymes alanine aminotransferase (ALT) and aspartate aminotransferase (AST), activity of cholestatic enzymes alkaline phosphatase (ALP) and  $\gamma$ -glutamyl transpeptidase (GGT) were determined using an automatic biochemical analyzer and original ChemWell reagents, Awareness Technology INC (USA). All patients underwent FEGDS using endoscopy equipment with a "Pentax" EPM-3300 video processor, during which any pathological changes in the esophagus and/or stomach and the degree of varicose veins of the esophagus were detected. Hp infection was diagnosed using a rapid urease test (CLO-test) or a stool test (CITO TEST, manufactured by Farmasco LLC, USA). The examined patients underwent an ultrasound examination of the abdominal organs (HDI-1500 device, USA).

Depending on the tasks and options of pharmacotherapy, all patients are divided into three groups. The groups were representative by age and sex. The first group (n=20) received only PPI rabeprazole 20 mg (PPI) in the morning 40 minutes before meals. The second group of patients (n=23) took rabeprazole 20 mg (PPI) in the morning 40 minutes before a meal in combination with a course of internal administration of "Polyana Kvasova" MW according to our proposed scheme. The third group (main, n=24 patients) patients took rabeprazole 20 mg (PPI) in the morning 40 minutes before meals in combination with internal reception of MW "Polyana Kvasova" according to the scheme: reception of warm MW at a temperature of 40-45 degrees C in quantities of 200 ml per reception, three times a day, 90-60 minutes before eating, for 24 days in combination with a simultaneous course of magnetotherapy procedures, which included a low-frequency pulse variable magnetic field on the area of the lower esophageal sphincter with a pulse frequency of 0.1-10.0 Hz, with induction of 128  $\mu$ T, procedure duration 40 minutes, treatment course 8-10 procedures, every other day. The dynamics of treatment were evaluated according to generally accepted standard research methods on the 24th day of stay in the sanatorium. The criteria for the effectiveness of therapy were the reduction or disappearance of patients' complaints, disappearance of esophagitis, gastroesophageal reflux, and improvement in quality of life. Quality of life (QoL) was assessed in patients according to the scale of the SF-36 questionnaire. The analysis and processing of the results of the examination of patients was carried out using the Statistics for Windows v.7.0 computer program (StatSoft Inc, USA) using parametric and non-parametric methods of evaluating the obtained results. The difference was considered to be significant at  $p < 0.05$ .

### RESULTS

Under the influence of treatment, on the 24th day of observation, all 100% of patients in the main group had positive dynamics: elimination of heartburn ( $p < 0.001$ ), pain in the epigastrium ( $p < 0.001$ ) and manifestations of dysphagia ( $p < 0.001$ ), which were confirmed by fibrogastroscopy - disappearance of esophagitis ( $p < 0.001$ ) and gastroesophageal reflux ( $p < 0.001$ ). In 80% of the patients of the second group, positive dynamics of the clinical and



endoscopic picture was also observed ( $p<0.005$ ), in the remaining patients the improvement was unreliable ( $p>0.05$ ). In patients of the third group, positive dynamics of GERD clinical symptoms were registered only in 67.5% of patients. After the treatment, a decrease in manifestations of asthenovegetative and dyspeptic syndromes, cholestatic syndrome was recorded in all groups of patients, with a predominance in group 3. Dyspeptic complaints decreased or disappeared in 91.7% (22 out of 24) of patients in group 3 versus 65.0% (13/20) and 73.9% (17/23) of patients in groups 1 and 2. Disappearance of heaviness in the right hypochondrium was also significantly more frequent in patients of group 3 than in patients of groups 1 and 2 (95.8% (23/24) versus 60.0% (12/20) and 69.6% (16/23), respectively;  $p<0.05$ ).

Under the influence of the physiopharmacological therapy proposed by us, positive changes were registered not only in the well-being of the patients, but also in the biochemical indicators of the blood, which characterized the cholestatic syndrome – alkaline phosphatase, gammalutamyltransferase (GGT) and total bilirubin (TB). After 24 days of treatment, group 3 patients showed a decrease in the levels of TB from normally high to normal, normalization of ALP and GGT, which were increased before treatment by 1.5 and 1.9 times, respectively. No significant changes in these indicators were registered in the patients of the other two groups.

The most objective assessment of the treatment effectiveness is the evaluation of the quality of life of patients with GERD. After the course of treatment of patients with GERD, a tendency to improve all quality of life indicators was found, but a statistically significant difference between the signs before and after treatment was established only in patients of the first group.

After treatment, scores on the entire scale of SF-36 increased the most in patients of group 1, namely quality of life improved most significantly in this group.

Analyzing the integrated indicators of the physical and mental components of health in GERD patients by group, the following dynamics were revealed: the average values of the integrated indicator of the physical component of health (PH)

in patients of groups 1 and 2 increased by  $5\pm 1.5$  and  $6\pm 0.2$  points, and in patients of 3 groups, the maximum improvement was observed – by  $8\pm 1.7$  points compared to the indicators before treatment. The same dynamics were observed in the characteristics of the integrated mental component of health (MH), namely: in patients of groups 1 and 2, the indicator increased by  $7\pm 1.8$  points and  $7\pm 4.1$  points, and in patients of group 3 – by  $11\pm 0.5$  points (Table 1).

## DISCUSSION

As the observations showed, in the majority of patients of all groups, after the treatment, the general well-being improved, the severity of subjective and objective symptoms of GERD significantly decreased, and the functional state of the liver normalized. The most expressive positive dynamics of complaints was in patients who received mineral water on the background of rabeprazole intake according to the proposed scheme and magnetic therapy procedures. Obviously, this is due to the mechanism of the therapeutic and preventive effect of MW, the hydrocarbons of which neutralize increased acid formation in the stomach [14]. The obtained data coincide with numerous experimental and clinical studies by scientists of the Ukrainian Research Institute of Medical Rehabilitation and Spa, which demonstrated the multifaceted therapeutic effect of MW [15, 16]. Mineral waters are able to influence the regulation of the work of the central brain structures, tissue respiration, stimulate the work of the enteroinsular axis and the release of gastrointestinal hormones, strengthen the function of the gastric glands, the processes of regeneration of the gastric mucosa, normalize its motor and evacuation functions. The ability to restore the metabolism of hepatocytes, exert an immunoregulatory effect, stimulate the processes of bile formation, bile secretion and pancreatic secretion, were confirmed by the normalization of cholestasis markers, namely ALP, GGP and total bilirubin. Similar data on the effect of MW on the indicators of pigment metabolism ( $p<0.001$ ) and cholestasis ( $p<0.05$ ) in patients with steatohepatitis were obtained by other scientists [15, 16]. The improvement in the quality of life, which we registered in people

**Table 1.** Quality of life indicators before and after treatment

Index	Control group (n=25)		Group 1		Group 2		Group 3	
			Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
PF	78±1.6	81±2.2	77±2.1	81±1.7	72±1.2	79±1.8	77±2.5	86±1.4
RP	56±3.3	59±1.6	51±3.3	58±1.2	41±3.6	49±2.5	39±2.2	45±1.5
BP	52±1.1	56±2.7	53±1.1	62±2.2	42±4.2	45±3.1	35±4.1	42±1.7*
GH	52±1.6	58±2.1	52±2.0	59±2.4	43±3.1	49±2.1	36±3.5	45±4.4*
VT	56±2.4	60±1.3	54±2.3	61±3.2	46±2.0	51±2.5	37±4.2	46±5.4*
SF	57±1.4	61±2.1	59±2.0	69±4.4	52±2.5	58±2.7	45±1.2	50±2.5
RE	38±4.2	42±3.1	41±2.1	45±2.6	33±2.5	39±2.1	27±1.7	33±2.1*
MH	51±1.9	55±3.1	51±1.9	60±1.7	44±3.3	48±2.0	41±3.5	48±1.1*
PH	54±1.2	58±1.4	55±2.2	60±1.7	50±1.2	56±1.4	44±1.8	52±3.5
MH1	50±2.4	53±2.7	48±3.3	55±1.5	44±1.1	51±5.2	40±1.7	51±1.2

Notes: \* – the difference is significant ( $p<0.05$ ); a – before treatment; b – after treatment

who received complex treatment, is probably due to an increase in the level of serotonin [17]. Our data coincide with experimental data obtained by other scientists, who showed that after a course of taking MW together with other hormones, the basal level of serotonin increases by almost 75%. At the same time, similar to insulin, there is stimulation of the early phase of serotonin secretion [17, 18]. Therefore, the use of complex physiopharmacological treatment has a reliable advantage over standard pharmacological treatment, as it has a positive effect not only on the manifestations of GERD, but also on the clinical and laboratory manifestations of CHC and improves the quality of life.

## CONCLUSIONS

The proposed complex therapy with the use of natural physical factors (magnetotherapy) and the internal intake of «Polyana Kvasova» bicarbonate-sodium mineral water against the background of rabeprazole administration contributes not only to the rapid normalization of the acid-forming function of the stomach, but also to the restoration of the functional state of the hepatobiliary system, and improves the quality of life of patients.

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### ADDRESS FOR CORRESPONDENCE:

**Mariya A. Derbak**

Uzhhorod National University

20 Hryboiedova St., 88000 Uzhhorod, Ukraine

phone: +380506275075

e-mail: morika1415@gmail.com

### ORCID ID and AUTHORS CONTRIBUTION

0000-0003-4791-4080 – Mariya A. Derbak (A, E, F)

0000-0001-8213-1829 – Oksana T. Hanych (B)

0000-0002-5278-7576 – Taras M. Ganich (E, F)

0000-0001-9432-3318 – Volodymyr V. Timashev (C)

0000-0002-9552-6456 – Vasilina V. Svistak (D)

0000-0001-8423-9534 – Valentyna Yu. Koval (E)

0000-0002-5017-1401 – Pavlo P. Ganynets (D)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article

# The Rehabilitation of the Nasopharyngeal Microbiome in Patients with Chronic Nasopharyngitis

## Rehabilitacja mikrobiomu nosogardzieli u pacjentów z przewlekłym zapaleniem nosogardzieli

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**Vasyl I. Popovych, Oleksii I. Leta, Ivanna V. Koshel**

Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine

**SUMMARY**

**Aim:** To evaluate the effect of immunorehabilitation therapy of CNP associated with Epstein-Barr virus on the nasopharyngeal microbiome changes and related to them indications for surgery.

**Materials and Methods:** 20 healthy individuals and 32 patients diagnosed with CNP associated with Epstein-Barr virus were included in the study. The qualitative composition of microbiome and its quantitative characteristics were studied during the course of immunorehabilitation therapy with the phytoextract BNO 1030. The findings were compared with the features of the course of disease and existence of indications for surgical treatment.

**Results:** In patients with indications for adenotomy, a nasopharyngeal dysbiosis was formed through elimination of commensal bacteria and contamination of nasopharynx with opportunistic and pathogenic bacteria, *Candida fungi*. The immunorehabilitation therapy helped 75% patients gain a pronounced clinical response and refuse operative treatment. The qualitative and quantitative composition of commensal flora, reduction in the rate of opportunistic flora and elimination of pathogenic and fungal flora were observed in such patients. In 25% patients with poor therapeutic efficacy and indications for adenotomy against the background of elimination of pathogenic and fungal flora, the level of commensal and opportunistic flora of nasopharynx remained unchanged.

**Conclusions:** The immunorehabilitation helps 75% patients normalize the microbiome of nasopharynx, improve the clinical symptomatology and cancel the indications for surgical treatment.

**Key words:** microbiome, rehabilitation, surgical treatment

**Słowa kluczowe:** mikrobiom, rehabilitacja, leczenie chirurgiczne

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### INTRODUCTION

“Chronic adenoiditis” is an extremely common disease in the pediatric population [1]. However, the term Chronic Nasopharyngitis (CNP), specified in the ICD 11 as “CA09.1”, is more correct [2]. The main reason for incorrect determination of the disease is anatomic-topographical features of nasopharynx, which is called a “blind” area of upper respiratory tracts [3]. The endoscopic examination of nasopharynx helped differentiate the hypertrophy of lymphoid tissue of nasopharynx (adenoids) “CA0F.1” and CNP “CA09.1” [4]. Children with chronic diseases of the pharyngeal tonsil (adenoids), who do not respond to the traditional treatment including antibiotic treatment, are usually the candidates for adenotomy. However, a surgery does not mainly resolve the problem as 19-26% patients still have the symptoms [5].

The CNP is etiopathogenetically based on chronic inflammation, connected mostly with nasopharyngeal microbiome dysfunction. There is a balance between the microflora of the nasopharynx and immune protection factors in healthy people whose failure can lead to the progress of inflammatory diseases. Dynamics of microbiome changes and particularly, colonization of the nasopharynx with *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, etc. is extremely important for the course of chronic diseases of URT [6-8]. Association of lymphoid tissue of pharyngeal tonsil with respiratory epithelium is morphological substrate of leisure with herpesvirus 4 – Epstein-Barr virus, (EBV). One of its characteristics is an ability to replicate and persist in B-lymphocytes. When this happens, the immune system does not respond to a small number of pathogens, enabling them

to persist in the tonsil tissue for a long time – a phenomenon of immune tolerance that causes a decrease in their functional activity. Then “a cycle” is developed, i.e. immunological tolerance can lead to conversion into a chronic disease, which, in its turn, while progressing, results in immunodepression, and immunodepression strengthens immunological tolerance that promotes the bacterial biofilm formation [9]. Inefficient conservative treatment in children with CNP is associated, namely, with bacterial biofilms of the nasopharynx [10-12]. The adenoids, removed in patients with chronic respiratory diseases, had mature biofilms [13,14]. The study with the use of innovative technologies of visualization informs about the biofilms in 70,8-85% patients with adenotonsillar pathology [15,16]. The bacterial biofilm formation is a form of “survival of the strongest ones” during adverse conditions, including chemical factors or antimicrobial treatment. Subsequently, the bacterial cells can separate (planktonic bacteria) and create new biofilms [17]. During the biofilm formation associated with adenotonsillar tissue, *Strept. pneumoniae*, *Haemoph. influenzae*, *Staph. aureus* and other microorganisms are very important [18-21]. However, the biofilm created of various microbial communities, is 500-1000 times more tolerable to antimicrobial medications [22]. In this regard, the effective eradication of pathogenic agents involves the modulation of the local immune system activity which is the factor that makes the condition of nasopharyngeal microbiome normal, prevents biofilm formation. Therefore, there is a strong need to choose a medication that has a combined effect on the biofilm formation. The combined phytonceering extract BNO 1030 (Imupret) has such properties. The medication can stimulate a non-specific reaction of the immune system through increasing the phagocytosis of macrophages and granulocytes, intracellular destruction of bacteria during the phagocytosis [23]. The results of randomized studies showed the efficacy and preventive action in patients with diseases of the pharyngeal lymphoid ring: acute, recurrent tonsillitis, nasopharyngitis that has justified the use of the said medication in our research [24-26].

### AIM

The aim was to determine the efficacy of immunorehabilitation therapy of CNP, associated with Epstein-Barr virus on the nasopharyngeal microbiome changes and related to them indications for surgery.

### MATERIALS AND METHODS

32 children were included in the study. The inclusion criteria:

- 2 and more complaints typical for CNP for more than 3 months: disorders of nasal breathing, tingling sensation, globus sensation, symptoms of postnasal drip, stuffy ear;
- objective signs of the inflammatory process in the nasopharynx (hyperemia, edema, plaques, hypertrophy of the pharyngeal tonsil, enlarged pharyngeal tonsil, swollen cervical lymph nodes);
- existence of indications for surgical treatment (adenotomia).

The control group included 20 healthy individuals of the same age.

The diagnosis of CNP associated with EBV in all patients was made on the basis of clinical endoscopic data and serologic validation of the ELISA profile: IgM-VCA/IgG-EA/IgG-EBNA. The patients with high antibody titers against EBNA with antibodies against VCA or EA or without them which attests to the chronic or reactivated EBV-infection were included into the research [27].

All the patients were prescribed endonasal irrigation therapy with isotonic seawater and the drops per os BNO 1030 (Imupret®) in the dosage based on the patient's age, 6 times a day. The medication was registered in Ukraine and the indications for it are tonsillitis, pharyngitis and prevention of complications and recurrence of respiratory viral infections. The assessment of therapeutic efficacy was based on the analysis of dynamics of symptoms of nasopharyngitis according to the following criteria: clinical recovery: regression of symptoms  $\geq 85\%$ . The indications for surgery were cancelled for those patients. The absence of clinical recovery: regression of symptoms  $\leq 85\%$ . Those patients underwent surgical treatment.

The research procedure provided the collection of specimens from the nasopharynx for bacteriologic test with an endoscopic control prior to and after the treatment. The microbiological study suggested the identification of microorganisms of all types that persisted on the nasopharyngeal mucosa. The population level of microorganisms was shown with the number of colony-forming units per 1 ml of swab (CFU/ml $\pi$ ). All microbiological studies were completed at the Department of Microbiology, Ivano-Frankivsk National Medical University in accordance with DSTU EN ISO 15189:2015 (Medical laboratories. Requirements for quality and competence).

All research activities were conducted in compliance with ethical principles (the Minutes of the meeting of Commission on Ethics, IFNMU No.111/19 of 19.11.2019).

The comparative assessment of microbiological study results was performed prior to and after the treatment and compared with the results that healthy individuals had. To evaluate the differences between the groups, the univariate dispersed analysis (a factor group: fixed) with the further use of the Tukey test at the confidence level of 0,05.

### RESULTS

After the treatment was completed and clinical efficacy was assessed, the patients were divided into two groups: group I – clinical recovery: 24 (75%) of 32 (100%) patients, group II– clinical response: 8 (25%) of 32 (100%) patients.

The microbiological testing in healthy individuals has shown that the basis of normal nasopharyngeal microbiome is formed with commensal anaerobia: *Lactobacillus spp.* which can be identified at the high population level –  $7,75 \pm 0,20$  CFU/ml, *Bifidobacterium spp.* –  $5,72 \pm 0,18$  CFU/ml and anaerobia: *S. Salivarius* –  $6,78 \pm 0,32$  CFU/ml and *S. Viridans* –  $2,58 \pm 0,06$  CFU/ml. These microorganisms occupy a leading place in the microbiota.

No yeast-like *Candida fungi*, opportunistic, pathogenic microflora were found.

Prior to the treatment, the patients with CNP had complaints about steady and continuous nasal breathing difficulties. The hypertrophy of lymphoid tissue of the nasopharynx and the symptoms of nasopharyngitis: hyperemia, edema of mucosa, sick rheuma and purulent discharges that covered the pharyngeal tonsil and flew down into the throat along with the signs of pharyngitis granulosa were detected by endoscopy. The enlarged lymph nodes of the neck were palpated.

The said patients had the changes in respect to normalization of nasopharyngeal microbiome due to the credible reduce in the level of commensal flora: *Lactobacillus spp.* up to 4,88±0,06 CFU/ml, *Bifidobacterium spp.* up to 4,11±0,13 CFU/ml, *S. salivarius* up to 4,54±0,2 CFU/ml (Table 1). There was a slight increase in the level of *S. Viridans* up to 3,47±0,06 CFU/ml. There was identified a colonization by opportunistic microflora: *Staph. aureus* up to 4,51±0,12 CFU/ml, *Staph. epidermidis* up to 5,27±0,16 CFU/ml., *E. Coli* up to 3,45±0,12 CFU/ml, *Strept. Pyogenes* 5,66±0,14 CFU/ml. As well, there was a colonization by pathogenic bacteria: *Pneumococcus pneumoniae* 3,86±0,07 CFU/ml, *Haemophilus influenzae* 3,99±0,01 CFU/ml, *Pseudomonas aeruginosa* 4,56±0,25 CFU/ml, *Klebsiella pneumoniae* 4,86±0,13 CFU/ml in association with *Candida fungi* 2,89±0,19 CFU/ml.

After the end of treatment, nasal breathing normalization in patients with high clinical efficacy – group I (24 of 32, or 75%) could be seen. The endoscopy found a pharyngeal tonsil of normal size that did not prevent normal nasal breathing. There was a regression of hyperemia, edema of nasopharyngeal mucosa. A surface of tonsil was clean, without discharges. The sizes of lymphoid granules on the back of throat and regional lymph nodes became smaller. Based on the dynamics of the clinical presentation, the indications for surgical treatment were cancelled in the said patients.

The microbiological study showed a reliable, close to normal indices, increased level of commensal flora: *Lactobacillus*

*spp.* up to 6,94±0,17 CFU/ml, *Bifidobacterium spp.* up to 5,24±0,17 CFU/ml, *S. salivarius* up to 6,87±0,19 CFU/ml, *S. Viridans* up to 2,47±0,07 CFU/ml. As well, there was registered a statistically significant reduction of *Strept. Pyogenes* from 5,66±0,14 to 3,01±0,06 CFU/ml. and other representatives of opportunistic microflora: *Staph. Aureus* from 4,51±0,12 to 2,76±0,10CFU/ml, *S. Epidermidis* from 5,27±0,16 to 2,70±0,08 CFU/ml. No colonization with *E. Coli*, pathogenic bacteria: *Pneumococcus pneumoniae*, *Haemophilus influenzae*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* or *Candida fungi* was seen.

There was a slight improvement of nasal breathing and reduction of nasal discharge after the therapy in the patients of group II (8 of 32, or 25%). An increased size of the pharyngeal tonsil was found by endoscopy that prevented a normal nasal breathing and its size corresponded to the condition prior to the treatment. The tonsil surface was partially covered with sick plague. The sizes of lymphoid granules on the back of throat and regional lymph nodes became slightly smaller. Based on the dynamics of the clinical presentation, the said patients were recommended a surgical treatment – adenotomy.

While analyzing a microbiome, there was a reliable, but still below normal, increase of commensal flora level: *Lactobacillus spp.* up to 3,68±0,09 CFU/ml, *Bifidobacterium spp.* up to 4,76±0,12 CFU/ml, *S. salivarius* up to 3,15±0,08 CFU/ml. No *S. Viridans* was found. An addition, there was registered a statistically significant reduction of *Strept. Pyogenes*, but considerably less than in group I – up to 4,38±0,17 comparatively 3,01±0,06 CFU/ml. Other representatives of opportunistic microflora remained almost at the same level as they were prior to the treatment: *Staph. Aureus* 5,55±0,11 CFU/ml, *S. Epidermidis* 5,04±0,25 CFU/ml. Like in group I, a colonization with *E. Coli*, pathogenic bacteria: *Pneumococcus pneumoniae*, *Haemophilus influenzae*, *Pseudomonas aeruginosa* and *Candida fungi* is absent after the treatment.

**Table 1.** Population level of nasopharyngeal microflora in healthy individuals and patients with CNP

Microorganisms	Population level of microorganisms (CFU/ml)			
	Control (n=20)	Prior to treatment (n=32)	Group I (n=24)	Group II (n=8)
<i>Staph. aureus</i>	–	4,51±0,12*	2,76±0,10*	5,55±0,11*
<i>Staph.epidermidis</i>	–	5,27±0,16*	2,70±0,08*	5,04±0,25*
<i>Strept. pyogenes</i>	–	5,66±0,14	3,01±0,06*	4,38±0,17*
<i>S. viridans</i>	2,58±0,06*	3,47±0,06*	2,47±0,07*	–
<i>S. salivarius</i>	6,78±0,32*	4,54±0,2*	6,87±0,19*	3,15±0,08*
<i>Pneum. pneumoniae</i>	–	3,86±0,07*	–	–
<i>Haem. influenzae</i>	–	3,99±0,01*	–	–
<i>Pseudom. aeruginosa</i>	–	4,56±0,25*	–	–
<i>Escherichia coli</i>	–	3,45±0,12*	–	–
<i>Klebs. pneumoniae</i>	–	4,86±0,13*	–	–
<i>Lactobacillus spp.</i>	7,75±0,20*	4,88±0,06*	6,94±0,17*	3,68±0,09*
<i>Bifidobacterium spp.</i>	5,72±0,18*	4,11±0,13*	5,24±0,17*	4,76±0,12*
<i>Candida fungi</i>	–	2,89±0,19*	–	–

\* Current statistically significant difference between the groups. The conclusion is made at a significance level of 0.05

## DISCUSSION

The findings of the survey have suggested that most of the healthy individuals have *Lactobacillus spp.* and *Bifidobacterium spp.* as the basis for nasopharyngeal anaerobic microflora, whereas, for aerobic one – *Streptococci salivarius* that are nasopharyngeal commensal microorganisms. This obligate part of the normal microflora forms a colonizing resistance of the nasopharynx [6]. In patients with EBV-associated CNP, the mucous coat loses its protective function, therefore, the conditions for its contamination with opportunistic and pathogenic microorganisms and biofilm formation are created [9-12]. During the course of immunorehabilitation therapy with phytonering extract BNO 1030, the patients of the group I had normalization of their clinical presentation and the major representatives of the normal microflora were practically restored and corresponded to the normal indices. The process of normalization of the nasopharyngeal microbiome is accompanied with the reduction of opportunistic flora and the elimination of pathogenic one. Based on the positive clinical and microbiological dynamics, the said patients have no indications to the surgical treatment that was planned in advance.

The patients of group II had little improvement in clinical symptomatology and no qualitative and quantitative changes in major representatives of the normal and opportunistic nasopharyngeal flora. The indices practically correspond to the indicators prior to the treatment. However, due to the therapy, the patients of that group have no pathogenic and fungal flora any more which causes insignificant clinical improvement. The said patients still had indications for the surgical treatment that was planned in advance.

Therefore, the findings have suggested that the pharyngeal dysbiosis and biofilms were formed in patients with EBV-associated CNP since the presence of such pathogens as *Streptococcus pneumoniae* and *Haemophilus influenzae* is their true sign. [19-22]. The immunorehabilitation therapy is recommended for such patients, and Imupret, that ensures a balanced pathogenetic directional response, is the medication to be administered. The findings have shown that the immunorehabilitation therapy has high clinical and microbiological efficacy and leads to cancellation of the elective surgery in two thirds (75%) of patients. The patients with low clinical and microbiological efficacy should have surgery and the complete conservative treatment shall be deemed as pre-surgery preparation.

## CONCLUSIONS

The qualitative and quantitative changes of nasopharyngeal microbiome were seen in the patients with CNP associated with EBV due to the reduction of commensal flora and the increased level of opportunistic, pathogenic microflora and *Candida fungi* which are associated with the indications for surgery;

During the immunorehabilitation treatment, a qualitative and quantitative composition of nasopharyngeal commensal flora restored to normal levels, the level of opportunistic flora reduced and pathogenic and fungi flora were absent in the patients with a high level of clinical response who refused from surgical treatment;

The correspondence of the main representatives of commensal and opportunistic flora of the nasopharynx to the indices that were prior to the treatment could be seen in the patients with poor clinical response to immunorehabilitation therapy against the absence of pathogenic and fungal flora which has shown the absence of dynamic changes and is an indication for the operative treatment.

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#### ADDRESS FOR CORRESPONDENCE:

**Vasyl I. Popovych**

Ivano-Frankivsk National Medical University  
149 H. Mazepy St., 76023 Ivano-Frankivsk, Ukraine  
phone: +38 (050) 373-4839  
e-mail: popovychvasyl@gmail.com

#### ORCID ID and AUTHORS CONTRIBUTION

0000-0002-2898-8474 – Vasyl I. Popovych (A, E, F)  
0000-0002-8761-7446 – Oleksii I. Leta (A, B, C)  
0000-0002-5466-4537 – Ivanna V. Koshel (A, C, D)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



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# Acupressure as a Method of Rehabilitation and Treatment of Patients with Gastroduodenal Pathology

## Akupresura jako metoda rehabilitacji i leczenia pacjentów ze schorzeniami żołądka i dwunastnicy

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Olga O. Hutsalenko, Ivan P. Katerenchuk, Ulia A. Kostrikova, Iryna V. Tsyganenko, Tetyana I. Yarmola, Lidiya A. Tkachenko, Lyudmila K. Ovcharenko

Poltava State Medical University, Poltava, Ukraine

### SUMMARY

**Aim:** To assess the effectiveness and safety of acupressure in the complex rehabilitation and treatment of patients with gastroduodenal pathology.

**Materials and Methods:** A retrospective analysis of the results of examination and treatment of 40 patients with gastroduodenal pathology was carried out. For treatment, the author's protocol of acupressure (AP) was used based on the recommendations of F.M. Houston. Statistical processing of the results was carried out according to the qualitative data analysis algorithm using the MedCalc 2022 software package. The frequency of occurrence of qualitative binary variables was analyzed with the calculation of 95% CI. To determine the effect of AP on the change in the frequency of clinical syndromes, the McNemar test for related groups was used. The assessment of the risk of side effects of AP was carried out on the basis of determining the significance level of 95% CI for the share, taking into account the binomial distribution of the characteristic. Formulated null and alternative statistical hypotheses.

**Results:** After two weeks of treatment with the using of AP against the background of the disappearance of endoscopic signs of gastroduodenal pathology, statistically significant changes in the frequency of manifestations of all clinical syndromes were detected. AP not only relieves pain, but also shortens the duration of the illness, eliminates functional disorders of the motility of the upper parts of the digestive tract, allows to achieve clinical and endoscopic recovery and provides stable and long-term remission. Tolerability of AP was good. No side effects were registered. It has been proven with a probability of 95% that the risk of a side effect does not exceed 9%.

**Conclusions:** Using of AP is effective, safe, which corresponds to the alternative statistical hypothesis.

**Key words:** acupressure, rehabilitation, gastroduodenal pathology

**Słowa kluczowe:** akupresura, rehabilitacja, schorzenia żołądka i dwunastnicy

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### INTRODUCTION

Digestive diseases are the sixth leading cause of death in the world and accounted for 2.56 million deaths in 2019. In Ukraine, these diseases are the third of the five main causes of death of Ukrainians according to the Conclusions of the Global Burden of Disease study for 2019 [1]. Gastritis and duodenitis (23.7%), chronic cholecystitis and cholangitis (21.1%), peptic ulcer disease (13.3%) and pancreatic diseases (14.4%) have the greatest influence on the prevalence of gastroenterological pathology among the adult population in Ukraine [2]. So, in total, the pathology of the gastroduodenal zone is 37% (more than a third of cases among all pathologies of the digestive organs).

The above data emphasize the medical and social relevance of diseases of the gastrointestinal tract in general and

gastroduodenal pathology in particular, which necessitates the development and implementation of new treatment methods in practical health care aimed at improving the quality of life of this group of patients [2] and preventing disability during their treatment.

One of the powerful systems for the rehabilitation of patients should be considered reflexology, whose conceptual principles have been tested for thousands of years. It can be used at all stages of patient rehabilitation and in almost all fields of medicine [3]. The most common method of reflexology is needling (acupuncture) and cauterization. Acupressure (from the Latin *acus* – point + *pressura* – pressure) is point massage, one of the many methods of reflexology, in which a targeted therapeutic effect on the organs and tissues of the body is



carried out by mechanical stimulation of biologically active points (BAP). Acupressure (AP) works with the same points and meridians as acupuncture. Both AP and acupuncture are based on the same fundamental principle of activating acupuncture points along the meridians. The only difference between the two interventions is that AP stimulates BAP with finger pressure rather than fine needles [4].

AP, as a component of ancient Eastern medicine, known in China as finger zhen, in Japan as “shiatsu”, has justified itself over the centuries and has not lost its significance to this day [5-7]. The essence of the method consists in pressing (pressing) with the pads of the fingers on reflexogenic zones (acupressure points) that are energetically connected to various internal organs and systems. No wonder F.M. Houston figuratively called AP acupuncture without needles [6]. Under the influence of pressure at an effective point, an effect can be expected, which is similar to the effect of acupuncture [8] and in many cases is not inferior to the effectiveness of classical acupuncture [7]. Finger zhen is simpler than acupuncture [5], does not require special equipment and tools [6, 7, 9-11], does not cause pain like a needle, does not cause bleeding, and makes it impossible to introduce infection into the body when pressed with a finger [4]. AP has many advantages: it is used both independently and in combination with acupuncture, physiotherapeutic procedures, drug therapy and physical therapy. It is important to note that a well-founded and successful combination of AP with drug therapy (integrative medicine) allows in practice to significantly reduce the dose of drugs, and sometimes to abandon the use of some drugs and increase the effectiveness of treatment [3, 10, 11]. AP can also be used to provide emergency care [5-10].

In the available literature, there is no evidence base regarding the use of AP in diseases of the gastroduodenal zone. Most of the existing publications are devoted to the use of acupuncture in patients with chronic gastritis and peptic ulcer disease [5, 9]. Among domestic publications, only a few works are devoted to the use of finger zhen in the pathology of the digestive organs. In particular, it was established that the inclusion of the AP course in the complex rehabilitation of patients with chronic pancreatitis and diabetes mellitus in outpatient conditions led to a higher level of efficiency according to a number of qualitative and quantitative indicators [12].

There are many publications in the English-language literature regarding the efficacy and safety of AP, but all of them relate to the strategy of treating symptoms or syndromes, as traditional Chinese medicine uses a comprehensive approach to treating patients based on individualized treatment using the concept of “syndrome differentiation.” In 2011, a group of scientists published the results of a systematic review of 43 randomized controlled trials (between January 1, 2000 and January 31, 2010) that examined the effectiveness of acupressure for the treatment of a range of symptoms in adults with a variety of disorders and conditions: nausea and vomiting in patients during pregnancy and chemotherapy; pain in patients with dysmenorrhea, during childbirth and after trauma; shortness of breath; fatigue and insomnia. It is

concluded that AP may be a useful strategy for the treatment of many symptoms in different patient populations, but rigorous trials are needed. Including AP as an intervention can improve patient outcomes [13]. It is appropriate to note that a year ago the publication “An Effective and Feasible Alternative Treatment for Anxiety During the COVID-19 Pandemic” appeared [14]. This problem is extremely relevant today: anxiety is very widespread not only during the COVID-19 pandemic and in the post-Covid period, but also in the conditions of martial law, which the entire Ukrainian people are experiencing today. Also, anxiety can be a consequence of both somatic (in general) and gastroenterological pathology (in particular). This once again confirms the symptomatic approach to the use of AP as a non-invasive strategy for the treatment and rehabilitation of patients.

Unfortunately, today there is a significant lack of knowledge about the use of AP, despite a generally positive attitude towards its inclusion in the treatment plan [13]. To support AP as an important component of complementary and alternative medicine in the near future and expand its use, we must shed more light on the therapeutic functions of AP and implement it in medical practice [4].

## AIM

To assess the effectiveness and safety of acupressure in the complex rehabilitation and treatment of patients with gastroduodenal pathology.

The task of the work was to study the effect of acupressure on the clinical course, tolerability and side effects in patients with pathology of the gastroduodenal zone. The primary endpoint of the treatment and rehabilitation period was complete absence or improvement of symptoms at the end of treatment [15-17].

## MATERIALS AND METHODS

This study is based on a retrospective analysis of the results of examination and treatment of 40 outpatients for uncomplicated gastroduodenal pathology: 7 patients with chronic gastritis associated with *H. pylori*, 13 had chronic gastritis with accompanying duodenogastric reflux (biliary gastritis), and 20 patients with erosive-ulcerative lesions of the gastroduodenal zone. There were 12 (30%) men, 28 (70%) women.

The criteria for the inclusion of patients in the study were persons of mature age (from 22 to 60 years) with clinical manifestations of abdominal and/or dyspeptic syndromes of varying severity.

Patients with “worrying” symptoms, severe comorbid pathology, adolescents, persons over 60 years of age, pregnant women, patients who abused alcohol were excluded from the study. The study did not include people who underwent surgical interventions (in particular, gastric resection, cholecystectomy), that is, with so-called secondary biliary reflux.

Verification of the diagnosis was based on general clinical data, results of FEGDS with biopsy, pH-metry, determination of *H. pylori* infection, histopathological examination, ultrasound of abdominal organs, etc. During FEGDS, endoscopic signs of gastropathy were assessed, including erythema, edema,

erosions or ulcers, and the presence of bile in the stomach. The diagnosis of pathological duodenogastric reflux was established according to the criteria of Lin JK et al. (2003) at FEGDS [18].

To solve the task, the patients received a course of AP according to the scheme developed by the authors (acupressure protocol) based on the recommendations of F. M. Houston, which included both local and remote AP points (trunk, head, hands) related to the stomach and duodenum [6]. The method of AP is described in detail in the copyright patents of Ukraine and the innovation [15-17]. The duration of treatment is 10-14 days (5-7 sessions of pressure points).

In 34 (85%) patients from the total number of patients with *H. pylori* infection, AP was used in combination with a 10-day course of three-component anti-helicobacter therapy, and in 6 patients with a negative test – without medicinal combination.

AP effectiveness was assessed according to the following criteria: speed of pain relief; speed of elimination of the main clinical manifestations of dyspeptic and asthenovegetative syndrome, disappearance of endoscopic signs of biliary reflux and erosive-ulcerative changes of the mucous membrane in the control FEGDS after comprehensive treatment.

Statistical processing of the obtained observation results was carried out according to the algorithm of statistical data analysis, description and provision of qualitative variables [19-21] using the MedCalc Software Ltd, Ostend, Belgium – 2022 program package [22].

In patients, an analysis of the frequency of manifestation of a number of qualitative indicators (clinical syndromes before and after treatment, the risk of developing a side effect from the use of AP) was carried out, where the variable sign has only two values – “yes/no”, “there are side effects/absent”, etc. Such qualitative data, which are analyzed in medical research and have only two values, are called binary or dichotomous variables [19, 20].

When describing qualitative variables of the binary type, for each of its values, the absolute value was indicated, as well as the percentage share of the feature in the structure of the entire population (point estimate of the frequency of manifestation of the feature) with the calculation of the interval estimate of this value – 95% confidence interval (95% CI) or 95% CI (from English “confidence interval”) [19, 20].

To determine the effect of AP on the change in the frequency of manifestations of the main clinical syndromes, against the background of the disappearance of endoscopic signs of reflux biliary or erosive ulcerative gastropathy, the non-parametric McNemar test was used for related (dependent) observation groups, in which patients act as their own control or in studies of the type “before and after” [19-22].

The risk assessment of the side effect of AP was carried out on the basis of the determination of the significance level of 95% CI for the proportion taking into account the binomial distribution of the characteristic (“presence-absence of complication”) [21].

The use of statistical analysis made it possible to confirm or reject the decision made and to formulate statistical hypotheses.

To test statistical hypotheses, the null hypothesis  $H_0$  was formulated [19,20]: the proposed method of rehabilitation and treatment is not effective and safe. Accordingly, the alternative hypothesis  $H_a$ , which is accepted in case of rejecting the null hypothesis, is [19,20]: the proposed method of rehabilitation and treatment is effective and safe. To test the null hypothesis, the McNemar test was used (for connected groups when describing the results of the study in paired observations – “before and after”) [19, 20, 22].

Based on the results of the examination, the committee on ethical issues and biomedical ethics of the Poltava State Medical University believes that the work meets the requirements of the Helsinki Declaration on Human Rights.

## RESULTS

Clinically, three main syndromes were observed in patients with pathology of the gastroduodenal zone: manifestations of abdominal syndrome were found in 30 patients ((75.0 ± 6.85%); 95% CI 50.6-107.1%), dyspeptic syndrome (nausea, vomiting with bile, a feeling of fullness in the stomach, heaviness in the stomach, discomfort in the epigastrium, bitterness in the mouth, belching, heartburn, bloating, decreased appetite, etc.) – in 36 patients ((90.0 ± 4.7%); 95% CI 63, 03-124.6%), asthenovegetative syndrome (reduced working capacity, rapid fatigue, emotional instability, sleep disturbances, anxiety, etc.) – in 28 patients ((70.0 ± 7.2%); 95% CI 46.51-101.17%).

The effectiveness of AP in patients with gastroduodenal pathology was evaluated. The frequency of manifestations of the main clinical syndromes was determined before and after the use of AP. The results of a comparison of the frequencies of binary features in two related (dependent) observation groups (the case of paired observations) using the McNemar test and exact probability (binomial distribution) are presented in Table 1.

Tolerability of AP in all patients was good. No side effect of the intervention was detected in any patient when using AP. In calculations that are based on the use of a normal sample distribution, this means that the estimate of the risk of an adverse effect, as well as the 95% CI, is equal to zero [21]. But this goes against common sense.

That is why calculations of 95% CI for the share were carried out on the basis of the binomial distribution (Figure 1) [21], which allows to assess the risk of side effects of AP.

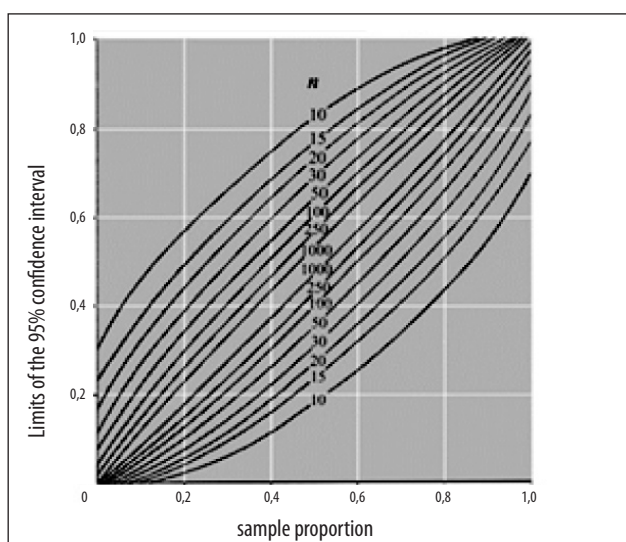
To do this, first, on the horizontal axis, it is necessary to find a point that corresponds to the sample proportion  $\hat{p}$  (in this case, zero). Then, from this point, a perpendicular should be drawn to the points of intersection with a pair of curves that correspond to the number of the sample volume. The vertical coordinates of the intersection points and are the 95% CI limits. In our case, for  $n = 40$ , the lower limit of CI is 0, and the upper limit is about 0.09. So, with a probability of 95%, we can say that the risk of developing a side effect from the use of AP does not exceed 9%.

## DISCUSSION

AP is a non-invasive and non-pharmacological intervention for painless treatment and rehabilitation of many diseases

**Table 1.** Changes in the frequency of manifestations of abdominal, dyspeptic and asthenovegetative syndromes in patients with pathology of the gastroduodenal zone during treatment and the main criteria for comparison

Stages of observation	Abdominal syndrome		Dyspeptic syndrome		Asthenovegetative syndrome		totally
	present	absent	present	absent	present	absent	
Before treatment, n (%)	30 (75)	10 (25)	36 (90)	4 (10)	28 (70)	12 (30)	40
After treatment, n (%)	2 (5)	38 (95)	2 (5)	38 (95)	3 (7,5)	37 (92,5)	40
McNemar criterion, % 95% CI	-70 From -84,2 to -55,8		-85 From -96,07 to -73,93		-62,5 From -77,5 to -47,5		
Significance (p)	< 0,0001		< 0,0001		< 0,0001		

**Figure 1.** 95% CI for proportions calculated on the basis of the binomial distribution (S. Glanz, 1999:214-5)

[4, 6, 7, 9-14]. According to traditional Chinese medicine, acupressure uses pressure to stimulate certain acupuncture points for therapeutic purposes, and the stimulation of these points can correct imbalances between Qi channels and subsequently treat diseases. By the way, Qi permeates everything and is the vital energy of life. Rebalancing Qi achieves therapeutic benefits by improving the physiological functions of body systems or Zang-fu (the state of internal organs) [4]. Zang-fu is a combined term for human internal organs [11]. In accordance to traditional Chinese medicine, acupressure uses pressure to stimulate specific acupoints for therapeutic purposes and stimulating these points can correct imbalance between Qi through channels and subsequently treat the diseases. Qi permeates everything and it is vital energy of life. Re-equilibrium of Qi achieve therapeutic benefits by improving the physiological functions of body systems or Zang-fu in the process [4]. Zang-fu is a combined term for human internal organs [4].

It is known that the effectiveness of finger zhen depends on the ability to find AP points on the body, their skillful combination with each other, as well as the choice of technique

and method of exposure. Correct diagnosis and selection of the appropriate acupuncture point is the most important task of AP [4]. It is appropriate to mention that the acupuncture point is the point closest to the surface of the skin, and the activation of the acupuncture point is the main stage of AP [4]. It is important to note that each acupuncture point is recognized as having a specific therapeutic effect, but a combination of acupuncture points is often stimulated to produce a therapeutic effect [23]. And the optimal combination of the most effective vital points of the AP allows to correctly eliminate various disorders of the body's functions [5, 7, 11].

As noted by Mehta P et al., the selection and activation of a specific AP point and the pressure to activate it are extremely important: high-intensity pressure can damage any part of the body, while low-intensity pressure may not be effective in relieving pain [4]. The intensity of pressing should gradually increase from light to moderate with the desired appearance of predicted sensations (similar to acupuncture), which are extremely important both for control of the intervention and for a successful therapeutic effect [5, 6, 11]. It should be remembered that these feelings do not occur in all patients. In 10% of cases, they are absent, and therefore the intervention is somewhat complicated.

If the predicted sensations appear, then they are present when pressing on all points of the AP protocol. This is an important psychological factor for the doctor, while it has a psychotherapeutic effect for the patient. It is the presence of predicted sensations that is the key to achieving a quick therapeutic effect from pressing AP points.

Therefore, from a practical point of view, the first AP session is extremely important, as it allows for a preliminary assessment of the patient's reaction to the pressure of strictly defined BAP. As a rule, already after the first AP session in most patients, abdominal pain first disappeared and the main manifestations of dyspeptic syndrome decreased. A simple finger press on the BAP of the AP protocol not only relieves pain during the first 15-30 minutes of the intervention, but also significantly improves the well-being of patients and improves their quality of life. In the future, in order to consolidate the treatment results and achieve positive clinical and endoscopic changes, it is advisable to repeat

AP sessions during the next 2-3 days, and then with an interval of two to three days.

AP as a means of eliminating pain in patients with pathology of the gastroduodenal zone has advantages over acupuncture due to the achievement of a long-lasting and stable pain-relieving effect, its use is non-threatening with regard to the transmission of infectious diseases that have a blood-contact transmission mechanism (HBV, HCV, AIDS), and can be used both for treatment and rehabilitation of the patient.

Our results of rapid pain relief are consistent with the literature, as pain is known to be the most important reason for treatment, and AP is one of the most common ways to relieve pain [4,13]. According to world data, the fastest and most pronounced effect of finger zhen is observed in painful conditions [4-11, 13, 24, 25]. Frank Warren noted that pressing (pressing) in the areas of acupuncture points with a finger can reduce or completely stop abdominal pain of various origins [8]. As noted by Mehta P et al. each meridian is associated with different organs and tissues of the human body, and the activation of a certain point on the meridian with pressure helps to reduce pain in a local place, and also reduces pain from other parts of the body [4]. Each meridian is connected to various organs and tissues of the human body. Activation of specific points on the meridian by pressure facilitates pain reduction at the local site and also reduces the pain from other parts of the body. That is why AP can be a useful alternative strategy to combat pain in patients with gastroduodenal pathology, which corresponds to the literature on the possibility of using non-pharmacological approaches (among which AP is one of the 4 possible) for the treatment of pain, which can complement or even replace pharmacological therapy of some types of pain [3, 10, 11].

Usually AP not only relieves pain, but also shortens the duration of the illness, eliminates functional disorders of the digestive organs, in particular, disorders of gastroduodenal motility. This is confirmed by the effectiveness of AP in biliary reflux gastropathy or biliary gastritis, which are based on functional motility disorders of the upper parts of the digestive tract.

At the end of the two-week course of treatment, clinical manifestations of abdominal and dyspeptic syndrome completely disappeared in 95% of patients (38/40), and symptoms of asthenovegetative syndrome – respectively, in 92.5% of patients (37/40). Only two patients had intermittent pain or slight discomfort in the epigastrium or heaviness in the stomach. At the end of treatment, 92.5% of patients rated the treatment effect as very good (complete absence of symptoms), and 7.5% – as good (significant reduction of symptoms).

The effectiveness of treatment is confirmed not only by subjective, but also by endoscopic studies (disappearance of signs of biliary reflux and erosive-ulcer gastropathy in FEGDS), which contributes to stable and long-term remission.

It is known that to determine the effect of treatment on the change in the frequency of manifestation of the syndrome, the nonparametric McNemar test is used for related samples (studies “before and after” treatment) [19,20,22]. At the end of treatment with the use of AP in patients with gastroduodenal

pathology, statistically significant changes in the frequency of manifestations of all three clinical syndromes were found (respectively, two-sided values of  $p < 0.0001$  according to McNemar’s test). This is evidence that there is a significant difference between these two proportions [20, 22]. The conducted statistical analysis shows the effectiveness of AP, which allows quickly and effectively eliminating the main clinical manifestations in patients with pathology of the gastroduodenal zone. That is why the null statistical hypothesis about the absence of a clinical effect of AP is rejected and an alternative hypothesis is accepted [19, 20]: the proposed method of rehabilitation and treatment is effective.

Tolerability of AP in all patients was good. Side effects of AP were not registered in patients. With a probability of 95%, we can state that the risk of developing a side effect from the use of AP does not exceed 9%. The obtained data are consistent with the literature on the safety of AP [4-7, 13, 24] and only some authors indicate minimal side effects associated with the using of too much pressure [25].

## CONCLUSIONS

1. AP is a non-invasive and non-pharmacological intervention for painless treatment and rehabilitation of many diseases. It can be a useful alternative strategy to combat pain in patients with chronic gastritis associated with *H. pylori*, biliary gastritis and in the presence of erosive-ulcerative lesions of the gastroduodenal zone.
2. AP increases the effectiveness of rehabilitation and treatment of patients with gastroduodenal pathology: it contributes to the rapid disappearance of the main clinical manifestations and endoscopic signs of the disease, stable and long-term remission, which allows to significantly improve the general condition of patients and improve their quality of life.
3. AP not only relieves pain, but also shortens the duration of the illness, eliminates functional motility disorders of the upper parts of the digestive tract in biliary reflux gastropathy and biliary gastritis.
4. The proposed method of rehabilitation and treatment is not only effective, but also safe: with a probability of 95%, it can be stated that the risk of side effects of AP does not exceed 9%.

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#### ADDRESS FOR CORRESPONDENCE:

**Olga O. Hutsalenko**

Poltava State Medical University

23 Shevchenko Str., 36011 Poltava, Ukraine

phone: +38 (066) 862 83 63

e-mail: gutsalenko.olga@gmail.com

#### ORCID ID and AUTHORS CONTRIBUTION

0000-0001-8313-3201 – Olga O. Hutsalenko (A, B, C, D, E, F)

0000-0003-3765-4895 – Ivan P. Katerenchuk (B, D, E, F)

0000-0002-8675-8896 – Ulia A. Kostrikova (B, D, E, F)

0000-0003-3958-7980 – Iryna V. Tsyganenko (B, D, E, F)

0000-0002-7428-0223 – Tetyana I. Yarmola (B, D, E, F)

0000-0001-9356-6385 – Lidia A. Tkachenko (B, D, E, F)

0000-0003-1089-2834 – Ludmila K. Ovcharenko (B, D, E, F)

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article

# Complex Rehabilitation of Orthodontic Pathology Combined with Temporomandibular Joint Disorders

## Kompleksowa rehabilitacja schorzeń ortodontycznych u osób z zaburzeniami skroniowo-żuchwowymi

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Yuriy Rybert<sup>1</sup>, Anatoliy Potapchuk<sup>2</sup>, Lidiia Minko<sup>1</sup>, Nataliya Magera<sup>1</sup>, Yaryna Semchyshyn<sup>1</sup>, Maksym Dubas<sup>1</sup>, Vasyl Almashi<sup>2</sup>

<sup>1</sup>Danylo Halytsky Lviv National Medical University, Lviv, Ukraine

<sup>2</sup>Uzhhorod National University, Uzhhorod, Ukraine

### SUMMARY

**Aim:** Improving the quality of diagnosis and treatment orthodontic pathology in patient with temporomandibular joint disorders.

**Materials and Methods:** Analysis – to determine objectives and study plan; clinical-diagnostic methods that include dental and radiological examination (to establish the clinical diagnosis of patients with temporomandibular disorders), electronic axiography (to determine the features of the movements of the articular heads of the mandible), instrumental study the models of jaws in the articulator (to diagnose the state of functional occlusion), statistical (to calculate averages and assess the probability of the results).

**Results:** After developed and implemented algorithm total dental rehabilitation we have eliminated functional disorders in the masticatory muscles and temporomandibular joints, completely restored the lost function of the masticatory apparatus.

**Conclusions:** Creation of occlusal relations, which are harmoniously combined with the function of masticatory muscles and temporomandibular joints, allowed to achieve the long period of remission, absence of the complications and recurrences of the disease in the near and long term. These points became the criterions that improved effectiveness of scientifically based individual treatment of mandibular disorders.

**Key words:** temporomandibular joint disorders (TMDs), malocclusion, individual treatment management

**Słowa kluczowe:** zaburzenia skroniowo-żuchwowe (TMD), wada zgryzu, indywidualizacja terapii

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### INTRODUCTION

Different types of malocclusion could lead to pathological occlusal relations and play a significant role in the pathogenesis of a temporomandibular disorder (TMD) [1-6]. According to the criteria of the DAI index, 10-11% need mandatory orthodontic care, which should be taken into account when developing and implementing a set of preventive measures and treatment of orthodontic pathology [7]. Pathogenic malocclusion in such patients cause proprioceptive changes, which reflexively lead to tension and spasm of the muscles attached to the lower jaw, which contributes to the development of masticatory muscle disorders.

Prolonged change in kinematic occlusal relationships stimulates a stable effect of the total load vector by compression type, leads to adaptive remodelling of musculoskeletal and bone tissues creating conditions for the progression of adaptation mechanisms and subsequently leads to persistent morphological changes in the structure of the disc, articular

surfaces, intra-articular connection of the bilaminar zone, which subsequently leads to a spatial change in the position of the disk [8, 9]. There are persistent changes in muscle tone and biological activity of the masticatory muscles, which leads to pain, noise and other symptoms of temporomandibular disorder in the future [10].

Treatment and rehabilitation of adult patients with TMD associated with orthodontic pathology is a difficult problem due to the lack of diagnostic algorithms to assess the patient's dental apparatus and its relationship with functional occlusion [11, 12].

The sequence of actions or their combinations in the diagnosis and treatment of such patients, especially in adulthood, is insufficiently definite. Adults have been other types of oral pathology join orthodontic pathology, that were not treated in childhood or were not completed, such as: pathology of eruption of third molars, partial loss of teeth, secondary deformities, periodontitis, etc [13, 14].

Therefore, patients with orthodontic and TMD require a specific approach to diagnosis and treatment that would normalize occlusal, muscular, and articular relationships, followed by reconstruction of static and functional occlusion by prosthodontic techniques.

### AIM

The aim of the research is improving the quality of management orthodontic pathology in patient with temporomandibular joint disorders.

### MATERIALS AND METHODS

Present article is based on thesis with ID number of UDK: 616.314.272-02:616.724]-07-08; the research was executed in department of therapeutic dentistry and orthodontic based on Centre of Dentistry Danylo Halytsky Lviv National Medical University, Ukraine. The study protocol was approved by the Commission on Ethics of Scientific Research, Experimental Developments and Scientific Works of Danylo Halytskyi Lviv National Medical University. Also, a medical consent was filled by each contributor and all procedures were required for treatment plans.

In this observational/case-control clinical study, we have treated 44 patients with orthodontic pathology as the leading cause of dysfunction, including 17 men (38.6%) and 27 women (61.4%), who were examined in detail and treated.

The age of these patients was: men - from 17 to 57 years and women - from 18 to 48 years. The largest number of patients, male and female, was between the ages of 20 and 40-12 men (70.59%) and 19 women (70.37%).

The diagnostic protocol of the examined patients included: production of control models of jaws, orthopantomography, zonography with closed and open mouth, ultrasonography (temporomandibular joint (TMJ)), muscles and surrounding soft tissues), cone beam computed tomography and magnetic resonance imaging of the TMJ. Functional study with recording the movements of the articulated axis of the articular heads was performed in a Cadiax Compact (Gamma Dental CADIAX).

Kinematic occlusion relationships were analysed in an individually tuned Artex CR Articulator (Amamm Girrbach). Orthodontic treatment of malocclusion managed with hybrid splints, which allowed to move the teeth while maintaining the centric relation. Photo documentation was performed during diagnostic and treatment, 12-18 month after treated.

### RESULTS

Carrying out a diagnostic protocol, we have revealed the features of the manducatory apparatus in adult patients with orthodontic pathology associated with temporomandibular disorders. Thus, in this group of subjects, identical pathologies combined with orthodontic disease are observed in both men and women, in particular, the same combination of orthodontic pathology, masticatory muscle and neck muscle pathology. This combination was found in 3 men (17.65%) and 7 women (25.93%), which is the highest rate. The same combination of two pathologies, orthodontic and masticatory muscles, was found in 2 men (11.77%) and 4 women (14.82%). Among women, mostly identical pathologies were observed, compared

with men. Thus, 3 women (14.82%) were diagnosed with 4 types of the same combinations of pathologies: orthodontic pathology, masticatory muscles, neck muscles; in contrast to men, where this combination was found in only 1 patient; 5 identical varieties in the combination of orthodontic pathology, pathology of eruption of the third molars, masticatory muscles, neck muscles, meniscus displacement were diagnosed in 2 women (7.41%), in the combination of orthodontic pathology, meniscus displacement also in 2 women (7, 41%). Among men, 4 identical types of combination pathologies were diagnosed in 2 people (11.76%). A total of 44 combinations of pathology were observed in 44 patients with orthodontic pathology and musculoskeletal dysfunction, which averaged 2.14 pathologies per examinee, of which 17 men had 34 types of pathology (2.0 pathologies per person). and 27 women - 60 types of combined pathology (2.2 pathologies per person). Therefore, this group of patients requires a balanced approach to diagnosis and prediction of the expected outcome of treatment.

Given the different combinations of pathological conditions of the oral cavity in adult patients with orthodontic pathology combined with temporomandibular disorders, the complex of treatment of adult patients with temporomandibular disorders associated with orthodontic pathology included a wide range of treatment protocols which aimed at normalizing muscle and joint function and kinematic occlusal relationships.

Our treatment algorithm depending on orthodontic pathology and TMDs included such treat approaches:

- Therapeutic and surgical training included treatment of caries, its complications, treatment of periodontal pathology with the use of photodynamic therapy [15], removal of teeth III-IV degree of mobility, removal according to the indications of 3 molars (from one to four).
- Occlusal therapy with the involvement of different types of occlusal splints: disconnecting, muscle relaxing, repositioning, distraction, stabilizing.
- Orthodontic treatment with the use of splintline therapy, hybrid orthodontic splints.
- Correction of occlusion by selective grinding of teeth, to create a balanced occlusion and, if necessary, restoration of crowns with composite materials using silicone templates. According to the indications were used veneers, and other prostheses.
- Reconstruction of occlusion, which included prosthetics with fixed structures, as well as, if indicated, the use of cover prostheses with fixation on telescopic crowns.
- Permanent dental splint (occlusal splint), which according to medical indications, or if the patient refuses to continue prosthetic rehabilitation was used for its permanent use (night, day-and-night).

Analysis of the applied methods of treatment in patients of this group shows that only occlusal therapy was used in 20.0% of patients, and only splintline therapy in 12.0%, while the combination of occlusal therapy with subsequent splintline therapy in 52% of patients.

The distribution of patients with orthodontic pathology and masticatory muscle disorders by treatment methods is given in Table 1.

**Table 1.** The distribution of patients with orthodontic pathology and masticatory muscle disorders by treatment methods

Treatment methods	Men		Women		Together	
	N	%	N	%	N	%
	<b>8</b>	<b>32.0</b>	<b>17</b>	<b>68.0</b>	<b>25</b>	<b>100.0</b>
Occlusal therapy	2	8.0	3	12.0	5	20.0
Splintline therapy	0	0.0	3	12.0	3	12.0
Occlusal therapy + splintline therapy	4	16.0	9	36.0	13	52.0
Occlusal therapy + prostheses	1	4.0	1	4.0	2	8.0
Occlusal therapy + splintline therapy + prostheses	1	4.0	1	4.0	2	8.0

Note. Interest is calculated from the survey group.

**Table 2.** Distribution of patients with orthodontic pathology combined with joint and combined disorders by treatment methods

Treatment methods	Men		Women		Together	
	N	%	N	%	N	%
	<b>9</b>	<b>47.4</b>	<b>10</b>	<b>52.6</b>	<b>19</b>	<b>100.0</b>
Occlusal therapy	2	10.5	3	15.8	5	26.3
Splintline therapy	0	0.0	1	5.3	1	5.3
Occlusal therapy + splintline therapy	4	21.1	5	26.3	9	47.4
Occlusal therapy + splintline therapy + prostheses	0	0.0	1	5.3	1	5.3
Occlusal therapy + telescopic copings	1	5.3	0	0.0	1	5.3
Occlusal therapy + permanent dental splint	2	10.5	0	0.0	2	10.5

Note. Interest is calculated from the survey group.

There is important to combine the treatment of temporomandibular disorders with the simultaneous elimination of orthodontic pathology in patients of this group.

Splintline therapy was aimed at normalizing static and dynamic occlusion and function of the temporomandibular joint in the central ratio of the jaws.

Orthodontic treatment with the use of "splintline therapy" consisted in the use of a series of orthodontic splints (Clear Alginer Protocol [16]), made of transparent thermoplastic material, according to the projected plan made in the articulator adjusted to individual function. The articulator was programmed using the upper jaw topography register (AmmanGirrbach external facial arch) and the central jaw ratio register, reproducing dynamic occlusion with different movements, taking into account the physiological position of the temporomandibular joints. The series of orthodontic splints consists of three items, each of which is designed for 7 days of use and has a specified displacement of 0.33 mm. Splints were fixed due to a tight fit in shape to most of the dentition, the rest of the teeth were subjected to the predicted movement in the desired direction.

Most of the teeth on the model with the initial situation were left unchanged for the purpose of stable fixation, and the other teeth (smaller part) were given the predicted movement due to fix on the model heat-resistant wax to ensure a predicted

movement. Splints were made by thermoplastic vacuum stamping.

After using each series of splints, as a result of which the selected tooth or group of teeth was predictably shifted by 1 mm, the patient visited the doctor for complete removal of accurate impressions of the upper and lower jaws, which were monitored and corrected. The number of items of orthodontic splints depended on the degree of deformation of the patient's dentition.

In the presence of pain for orthodontic correction of occlusion used hybrid splints, which allowed to move the teeth while maintaining the central ratio of the jaws. Correction of hybrid splints was performed after each stage of tooth movement.

As a result of the application of splintline therapy, the predicted dynamics of changes in the position of a single tooth or a group of teeth with correction or correction of dentition deformation was achieved.

The distribution of patients with orthodontic pathology and with combined temporomandibular disorders by treatment methods is given in Table 2.

These data have showed that only occlusal therapy was performed in 26.3% of patients, and only splintline therapy - in 5.3%, while occlusal therapy followed by splintline therapy - in 47.4% of cases.



**Table 3.** Treatment measures are applied in the examined patients

Treatment methods	Men		Women		Together	
	n	%	n	%	n	%
	<b>17</b>	<b>38.6</b>	<b>27</b>	<b>61.4</b>	<b>44</b>	<b>100.0</b>
Occlusal therapy	16	36.4	22	50.0	38	86.4
Splintline therapy	9	20.5	18	40.9	27	61.4
Permanent dental splint	2	4.6	0	0.0	2	4.6
Prostheses	2	4.6	3	6.8	5	11.4
Telescopic copings	1	2.3	0	0.0	1	2.3

Note. Interest is calculated from the survey group.

In the Table 3 presents generalized therapeutic measures used in the treatment of patients.

As can be seen from the Table 3 there were used occlusive therapy using, according to the indications, different types of splints in 38 (86.4%) patients, and the method described above (splintline therapy) was used in 27 (61.4%) patients.

This is due to the fact that quite often, to normalize the muscle and joint relationship, treatment began with one of the options of occlusal splints, and then, when positive results were achieved, switched to splintline therapy or the use of hybrid orthodontic splints.

## DISCUSSION

Temporo-mandibular problems are frequently occurring disorders with 45 to 70% of the general population showing some signs of it, 30% being aware of its presence, but only 3 to 12 % seeking treatment for it [12].

The presence of temporo-mandibular disorders on the background of orthodontic pathology in adult patients requires the use of modern diagnostic methods for treatment planning aimed at the simultaneous normalization of both the musculoskeletal complex and the treatment of orthodontic pathology. In patients of this group it is important to combine the treatment of temporo mandibular disorders with the simultaneous elimination of orthodontic pathology. The authors [13] verified that the most individuals (54,5%) with orthodontic pathology presented a mild TMG problems, 17,9% showed moderate TMG problems and 2,6% had a severe TMG problems.

We found that among 175 patients with musculoskeletal dysfunction who asked for treatment after a detailed examination orthodontic pathology was diagnosed in 44 persons (24.14%): 17 men (38.6%) and 37 women (61.4%). Analysis of the applied methods of treatment in patients of this group shows that only occlusal therapy was used in 20.0% of patients, and only splintline therapy in 12.0%, while the combination of occlusal therapy with subsequent splintline therapy - in 52% of patients.

The results of our data indicate that in the case of orthodontic pathology, which is accompanied by musculoskeletal dysfunction in adult patients, to normalize the musculoskeletal relationship, it is advisable to start treatment with one of the options of occlusal splints, and then, when positive results are achieved,

to continue treatment with splintline therapy or to the use of hybrid orthodontic splints.

In most cases, the use of distraction-repositioning splint complaints (pain and crunch in the joint during opening the mouth and chewing) decreased in two weeks after treatment and stopped after 2 months, mouth opening increased up to 3.5 mm.

After provided treatment Pain and crunch in the joint when opening the mouth and chewing decreased two weeks after treatment and stopped after 2 months, mouth opening increased to 3.5 mm.

After 2 months, after re-analysis of the functional occlusion in the individually adjusted articulator, the occlusal tire was repaired with an increase in distraction by 1.5 mm. Dynamic monitoring of functional occlusion, as well as clinical manifestations of the disease was performed once a month. After 6 months of treatment, no complaints, the mouth opens 42 mm.

## CONCLUSIONS

The presence of temporomandibular disorders associated with orthodontic pathology in adult patients requires their careful examination using modern methods of diagnosis and treatment aimed at the simultaneous normalization of both the muscle and joints complex and the treatment of malocclusion.

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**ADDRESS FOR CORRESPONDENCE:**

**Vasyl Almashi**

Uzhhorod National University

60a Station St., 88000 Uzhhorod, Ukraine

phone: +380663734736

e-mail: almasi.vaszil@gmail.com

**ORCID ID and AUTHORS CONTRIBUTION**

0000-0003-4417-9252 – Yuriy Rybert (A, B, C)

0000-0001-9857-1407 – Anatoliy Potapchuk (D, E)

0000-0002-1631-478X – Lidiia Minko (A, B, C, D)

0000-0003-3814-255X – Nataliya Magera (B, C, D, E)

0000-0002-58469165 – Yaryna Semchysyn (C, E)

0000-0001-5042-0052 – Maksym Dubas (C, E)

0000-0002-2943-4844 – Vasyl Almashi (E)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



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# Rehabilitation Care: Opportunities for Integration Into Clinical Practice

## Opieka rehabilitacyjna: możliwości integracji z praktyką kliniczną

DOI: 10.36740/ABAL202204114

**Tatiana V. Mostepan, Victoria V. Horachuk**

Shupik National Healthcare University of Ukraine, Kyiv, Ukraine

### SUMMARY

**Aim:** To investigate how legislative changes to rehabilitation implemented in secondary health care facilities. The subject of the study: the nosological structure of hospitalized morbidity; the state of organization, technologies and resources of rehabilitation in secondary health care facilities.

**Materials and Methods:** The materials of the study were administrative data, local regulations and protocol records for the rehabilitation of secondary health care facilities in Kyiv in 2021. The calculation of relative values of quantitative data in percent is carried out. Content analysis, graphic and modeling methods were used.

**Results:** The nosological structure of hospitalized morbidity was formed, in particular, diseases of the circulatory system – 18.2%, neoplasms – 13.7%, diseases of the digestive system – 9.7%, injuries, poisoning – 6.7%. The needs are likely to increase as a result of military events in Ukraine. A shortage of human resources, multidisciplinary rehabilitation teams, personalized rehabilitation technologies based on evidence-based medicine, digital communication technologies, infrastructure and financial support for rehabilitation has been identified. The introduction of a rehabilitation center into the structure of the secondary medical care institution, the involvement of extrabudgetary funding and the training of rehabilitation personnel can significantly improve the performance of rehabilitation tasks.

**Conclusions:** The high need of patients for rehabilitation and the variety of rehabilitation tasks require the concentration of several elements in one rehabilitation center. The main functional unit of the center should be multidisciplinary rehabilitation teams using individual rehabilitation programs and evidence-based technologies.

**Key words:** rehabilitation center, needs of patients, multidisciplinary rehabilitation teams, rehabilitation resources

**Słowa kluczowe:** ośrodek rehabilitacyjny; potrzeby pacjentów, wielodyscyplinarny zespół rehabilitacyjny, sprzęty rehabilitacyjne

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### INTRODUCTION

The widespread introduction of rehabilitation is one of the effective ways to improve the health of the population. Rehabilitation is aimed at optimizing the functioning of people with diseases in everyday life and reducing disability [1]. Rehabilitation needs are high and associated with acute or chronic somatic pathology, surgery, physical and psychological trauma, burns, age-related changes. This requires an appropriate response from health systems and direct health care providers.

The World Health Organization (WHO) Rehabilitation 2030 program confirmed the importance of broad rehabilitation coverage for all people in need. The program declares the achievement of rehabilitation priorities, strengthening at the level of governments and the integration of rehabilitation

measures in the health sector [2]. At the same time, the WHO evaluation mission showed the low efficiency of the rehabilitation system in Ukraine in 2015 [3].

In response, some changes took place in the legal regulation, training and financial support of rehabilitation in Ukraine during 2016-2021. Therefore, positive steps could be expected to integrate rehabilitation directly into the activities of health care facilities, in particular, secondary health care. Changes in actual clinical activity in response to policy decisions have not been studied. This is the reason for the relevance of this study. The relevance is enhanced by the military events in Ukraine, which will probably lead to an increase in the need for rehabilitation due to explosive injuries, burns, long-term squeezing syndrome, and psychological disorders.

## AIM

The aim was to investigate how legislative changes in rehabilitation are implemented in secondary health care facilities. The subject of the study: the nosological structure of hospitalized morbidity; the state of organization, technological and resource provision of rehabilitation in secondary care hospitals.

## MATERIALS AND METHODS

Administrative data of secondary health care institutions in Kyiv for 2021 were selected as research materials. The materials contained data from a review analysis of the population's needs for rehabilitation in the acute and post-acute periods of diseases and available resources.

A detailed analysis of the implementation of rehabilitation was carried out in four randomly selected multidisciplinary city clinical hospitals in Kyiv. Local regulatory documents on the organization of rehabilitation and protocol records were used and their content analysis was performed.

The units of content analysis selected data on rehabilitation on the topics: "Staffing"; "Types of rehabilitation"; "Infrastructure"; "Financial support"; "Use of rehabilitation standards and individual rehabilitation programs"; "Management". Typical facts and patterns of activity were determined. Quantitative data are processed by medical and statistical method. Licensed Microsoft Office Word and Microsoft Office Excel 10 software used. The calculation of relative values in percent was performed; the graphical method and the simulation method were used.

Ethics commission Shupik National Healthcare University of Ukraine, Kyiv, Ukraine

concluded the study complies with the current standards and principles of the "Code of Ethics of the Ukrainian Doctor", current regulations of Ukraine and the requirements of the Declaration of Helsinki (04.07.2022 protocol of Ethics commission No 7).

## RESULTS

It was found that 414,153 patients were treated in inpatient departments of secondary health care institutions in 2021. The structure of hospitalized morbidity is presented in Figure 1.

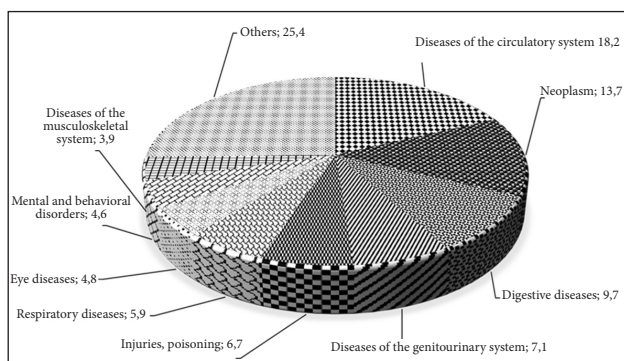


Figure 1. The nosological structure of hospitalized morbidity

The structure of these diseases consisted of diseases of the circulatory system – 18.2%, neoplasms – 13.7%, diseases of the digestive system – 9.7%, diseases of the genitourinary system – 7.1%, injuries, poisoning – 6.7%, respiratory diseases – 5.9%, eye diseases – 4.8%, mental and behavioral disorders – 4.6%, diseases of the musculoskeletal system – 3.9%, others diseases – 25.4%.

A total of 146,517 (35.4%) patients underwent surgery for various reasons.

The spectrum of diseases and their specific weight in the structure proved the high level of rehabilitation needs of hospital patients.

The infrastructure of secondary health care institutions intended for rehabilitation consisted of rehabilitation beds (in 6 out of 20 hospitals), physiotherapy departments (in all city secondary health care facilities), and physical therapy departments (in 4 out of 20 inpatient facilities).

Full-time positions of specialists – potential members of multidisciplinary rehabilitation teams – were allocated in secondary health care facilities: six positions of nutritionists, 19.25 positions of physiotherapists, 4.25 positions of doctor of physical and rehabilitation medicine, 1.5 positions of reflexologist, 3 positions of psychotherapists, 10.25 positions of psychologists. Four nutritionists, 15 physiotherapists, a reflexologist, two psychotherapists, and 7 psychologists actually worked. Only three doctors of physical and rehabilitation medicine, one occupational therapist worked in all health care facilities in Kyiv.

Positions of assistants of doctors of physical and rehabilitation medicine and occupational therapists were not introduced. At the same time, 107 nurses worked in physiotherapy departments with 144.25 full-time positions.

The provision of rehabilitation specialists in four randomly selected multidisciplinary city clinical hospitals was also insufficient: the doctor of physical and rehabilitation medicine worked in only one of the four facilities; doctors – physical therapists – in three institutions; occupational therapists and psychologists – in two hospitals; psychotherapist – in one hospital.

According to protocol records, specialized short-term rehabilitation of high intensity is provided to patients with myocardial infarction, stroke, spinal cord injury, burns, severe trauma, pain after stabilization of vital functions directly in the intensive care unit of each department. Rehabilitation measures are provided by the existing staff of rehabilitation specialists, in their absence – by a physiotherapist and nurses of physiotherapy departments. Rehabilitation is carried out in a consultative form, according to the appointment of a doctor who is the curator of the patient. Multidisciplinary teams of rehabilitation care professionals have not been formed. The interaction of physicians involved in the provision of rehabilitation care does not involve the use of digital means of communication. These tools are used only when conducting training activities in general in the institution.

The rehabilitation inpatient department with a capacity of 20 orthopedic beds operated in one of the

four studied institutions. Outpatient departments of post-acute rehabilitation with a day hospital operated in three other hospitals: a neurological profile with 30 beds; neurological profile for 6 beds; traumatological profile for 5 beds.

The infrastructure for post-acute rehabilitation of the studied institutions also included physiotherapy departments, halls of therapeutic physical culture, massage rooms, psychotherapy rooms. The occupational therapist's office functioned in only one institution.

Rehabilitation equipment in terms of range and quantity corresponded to the industry tables of medical equipment both in full and by less than 50.0%, depending on the institution.

Rehabilitation was financed from the state budget by the National Health Service of Ukraine in packages for patients with musculoskeletal and nervous system disorders. Rehabilitation in the acute period of stroke and myocardial infarction was financed in combination with medical and diagnostic measures. Rehabilitation of patients with other diseases took place at the expense of individuals (patients and/or their relatives).

Individual rehabilitation programs in accordance with industry standards and clinical protocols based on evidence-based medicine are developed for treatment cases financed from the state budget. Treatment and rehabilitation protocols, developed both on the basis of evidence-based medicine and expertly, are used for patients with other pathologies. Treatment and rehabilitation measures are agreed with patients and/or their representatives, which is confirmed in writing. Recommendations for continuing rehabilitation in another health care facility or at home are provided to the patient after the end of post-acute rehabilitation in an inpatient or outpatient setting. However, permanent medical support for rehabilitation at home has not been established.

The management of each institution is acquainted with the current sectoral regulations on rehabilitation. Rehabilitation assistance measures are included in the long-term and annual work plans, but relevant changes in the redesign of activities and structure have not been developed to implement rehabilitation.

The medical director is responsible for the organization of rehabilitation in the health care institution, the head of the department is responsible for the rehabilitation of patients of the department. Multidisciplinary rehabilitation teams as functional and organizational units for the provision of rehabilitation care in the acute and post-acute periods of disease have not been established. Instructions for rehabilitation specialists are presented in the general block of local regulatory acts that regulate the performance of production tasks.

Issues of the effectiveness of rehabilitation care are considered sporadically at meetings of the management of institutions and representatives of the staff, as evidenced by protocol decisions. Rehabilitation is monitored by

heads of specialized departments. Additional incentives and compensation payments to rehabilitators are not provided.

## DISCUSSION

It is known that the need for rehabilitation is determined, in particular, by the structure of the prevalence of diseases, their contribution to the formation of disability and mortality. The analysis of the nosological structure of hospitalized morbidity showed that the need for rehabilitation assistance for patients of secondary medical care institutions is high both in the acute and post-acute period due to the most severe and common diseases – cardiovascular system, oncological diseases, diseases of the digestive organs, bone muscular system, injuries, mental and behavioral disorders. The results of this study are confirmed by the data of other authors that coronary heart disease, stroke, cardiomyopathy, liver cirrhosis, road traffic injuries, lung cancer, low back pain, suicide, mental and behavioral disorders due to alcohol consumption contributed the most to disability and mortality Ukrainians in 2009-2019 [4].

At the same time, the widespread introduction of rehabilitation care in the most widespread network of secondary health care hospitals (on the example of Kyiv, where there are 20 such institutions), as of 31.12. 2021 was not observed. International recommendations of 2015 and changes in the legal regulation of rehabilitation in the field of health care in Ukraine since 2016 have not been taken into account.

Slow restructuring of rehabilitation staffing is shown. Until January 1, 2019, the heads of institutions did not appoint doctors who received the specialty “Physical Rehabilitation” to the positions of occupational therapists and physical therapists, who will then undergo rehabilitation specialization for the next five years. At the same time, world-class research has proven that adequate human resources will allow the introduction of rehabilitation medicine into clinical practice. Rehabilitation medicine is fundamentally different from other medical specialties, so it needs specially trained professionals [5].

The consequences of insufficient staffing are the lack of multidisciplinary functional-oriented approach to rehabilitation, the traditional preservation of rehabilitation measures as one of the components of treatment, rather than a set of unique and specific methods of recovery, adaptation, compensation, training, communication [6-9].

Rehabilitation coverage of a limited number of patients is practiced, depending on the package of rehabilitation services financed from the state budget. Rehabilitation infrastructure is not developed in every secondary care hospital. Evidence-based medicine data are of limited use in the provision of rehabilitation care, in particular, in the development of individual rehabilitation programs. This indicates the low availability of post-acute rehabilitation for patients due to lack of specialists, financial support and evidence-based technology. At the same time, the data of scientific research indicate the possibility of significant cost

savings due to rehabilitation, which is carried out using the appropriate infrastructure, the skills of specialists and access to rehabilitation [10].

The management of secondary care hospitals does not function in the direction of priority implementation of acute and post-acute rehabilitation, as rehabilitation care is not actually implemented in the activities of institutions, but operates according to the old scenario, despite new industry requirements. At the same time, there are generally accepted practices of strengthening health care systems in the implementation of rehabilitation in the world, which include leadership as one of the main functions of management [11, 12].

The authors see the introduction of a possible conceptual model of a rehabilitation center as a component of a secondary medical care hospital as a promising direction for solving the identified problems (Figure 2).

According to the authors, a rehabilitation center should be established in every multidisciplinary facility of secondary medical care, as rehabilitation care should become a priority of activity. The head of the center should be a doctor of physical and rehabilitation medicine. The variety of functions and tasks of providing rehabilitation require a branched structure with concentration in one center. The tasks and functions of the center are aimed at meeting the needs of patients in rehabilitation at various stages of the disease (acute, post-acute), in various conditions (outpatient, inpatient), by specialists of various specialties and providing various rehabilitation measures (physical rehabilitation, occupational therapy, psychotherapy, diet therapy, speech and speech therapy and others). This requires, in turn, the involvement and coordination of significant number of staff, management of several elements of infrastructure, rehabilitation technologies, material values, communication with doctors of other specialties and external stakeholders.

The multidisciplinary rehabilitation team should be a functional and organizational unit of the center. The format of the team should be mobile. The authors suggest that the telecommunication rehabilitation and distance learning department is an important component of the rehabilitation center. The tasks of this department will be to provide counseling services to patients at the stages of long-term rehabilitation at home, coordinate the activities of secondary and primary health care on the consequences of rehabilitation and educational work among patients, their relatives and physicians using digital technologies and electronic devices.

Limitations for the implementation of the model may be insufficient financial allocations for rehabilitation, which currently only affect a few diseases. At the same time, attracting extra-budgetary funding will allow considering the proposed model as quite real for implementation in health care institutions of secondary medical care.

## CONCLUSIONS

1. The nosological structure of hospitalized morbidity showed high needs of patients in rehabilitation measures.

2. Priority implementation of rehabilitation in the health care sector requires greater activity and persistence of heads of secondary health care facilities. The tasks are to accelerate staffing, form a full multidisciplinary rehabilitation team, implement personalized rehabilitation technologies based on evidence-based medicine and digital communication technologies, build an extensive infrastructure, financial support for rehabilitation.
3. The diversity of tasks for the provision of rehabilitation requires redesign of the structure of secondary care facilities. It is advisable to deploy rehabilitation centers in their composition. This will allow patients to meet the needs of rehabilitation in the acute and post-acute period, in the outpatient and/or inpatient stages, to use individual rehabilitation programs and evidence-based technologies.
4. The department of telecommunication rehabilitation and distance learning should become an essential component of the rehabilitation center. The activities of the department will increase the availability of rehabilitation to patients, improve communication between doctors of secondary and primary care, provide ongoing support for the educational level of patients and their families.

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#### ADDRESS FOR CORRESPONDENCE:

**Victoria V. Horachuk**

Shupik National Healthcare

University of Ukraine

9 Dorohozhytska St., 04112 Kyiv, Ukraine

phone: +38-044 205499

e-mail: gorachuk@ukr.net

#### ORCID ID and AUTHORS CONTRIBUTION

0000-0001-6588-2452 – Tatiana V. Mostepan (A, B,C, D)

0000-0003-3592-5479 – Victoria V. Horachuk (E, F)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



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# Tendency of Dynamics of Physical and Mental Working Capacity of Law Enforcement Officers at Different Stages of their Professional Activities

## Kierunki zmian fizycznej i psychicznej zdolności do pracy funkcjonariuszy organów ścigania na różnych etapach ich aktywności zawodowej

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Valentyn V. Bondarenko<sup>1</sup>, Ivan M. Okhrimenko<sup>1</sup>, Nataliia O. Bilevych<sup>1</sup>, Mariia M. Rohovenko<sup>1</sup>, Oleksii P. Tsurkan<sup>2</sup>, Volodymyr A. Holyk<sup>2</sup>

<sup>1</sup>National Academy of Internal Affairs, Kyiv, Ukraine

<sup>2</sup>Kryvyi Rih Research Education Institute of Donetsk Law University of Internal Affairs, Kryvyi Rih, Ukraine

### SUMMARY

**Aim:** To carry out the comparative analysis of the indicators of working capacity (physical and mental) of law enforcement officers in the conditions of educational process and service activities.

**Materials and Methods:** The research of physical working capacity was carried out using the Harvard step test and mental working capacity was assessed by means of the correction test. The cadets (n=72) who studied at the higher educational institution for 3 years (2017-2021) and served in the practical police units after the training were involved in the testing. The testing was carried out in 3 stages: 1st – the beginning of the first training year (2017); 2nd – the end of the third training year (2020); 3rd – after 1 year of service (2021).

**Results:** Significant (p 0.05) deterioration after 1 year of their service (by 1.9 % and 5.4 % respectively) was established.

**Conclusions:** It was found that the organization of the educational process in higher educational institutions is quite effective in improving both physical and mental working capacity of future law enforcement officers. However, the decrease of their working capacity after 1 year of service indicates the complexity and extremity of service activities in practical units.

**Key words:** physical and mental working capacity, law enforcement officer, cadet, professional activity

**Słowa kluczowe:** fizyczna i psychiczna zdolność do pracy, funkcjonariusz organów ścigania, kadet, aktywność zawodowa

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### INTRODUCTION

Educational and service activities of law enforcement officers place increased demands on the level of physical and mental capacity of persons [1, 2]. This is due to the specifics of these activities. Educational activities are carried out in higher educational institutions (HEI) with specific training environment; it applies mainly to cadets i.e. future law enforcement officers. Educational activities are characterized by a significant academic load, especially in the course of mastering the disciplines of professional and practical area of focus, frequent shifts in daily details, service in the protection of public safety and order, and so on [3, 4]. These conditions require the future law enforcement officer to possess a high level of both mental and physical working capacity.

The analysis of the educational process shows that future law enforcement officers with a low level of mental and physical working capacity are much worse at mastering educational material, the formation of their professional and applied skills is imperfect. Cadets with a low level of working capacity fail to perform complex technical actions, which, among other things, require a sufficient level of development of physical qualities. The aforementioned also applies to service situations in which low levels of physical working capacity impair the effectiveness of the vast majority of service tasks [5, 6].

The conditions of service activities of law enforcement officers are characterized by irregular working hours, constant psychological and physical overload [7, 8]. Police officers have to be in constant contact with various segments of the



population, apply preventive police measures and coercive measures in the process of performance of their service duties; there is a possibility of attack by aggressive offenders, which can result in injury, wounding and even death of law enforcement officers [9, 10]. The scientists state that the appropriate level of mental and physical working capacity of law enforcement officers contributes to less fatigue and is a determining factor not only in the quality of mastering the learning material during the educational process, but also the success in accomplishing their tasks in conditions of service activities and, consequently, increase of public confidence in law enforcement agencies [11, 12].

The analysis of literature sources shows the availability of a significant amount of research related to the study of the peculiarities of educational and service activities of law enforcement officers and identifying ways to improve their effectiveness [13, 14]. At the same time, the problem of increasing the level of mental and physical working capacity of future law enforcement officers in modern conditions is insufficiently revealed and needs to be studied, which determined the relevance of our research.

### AIM

The aim is to carry out the comparative analysis of the indicators of working capacity (physical and mental) of law enforcement officers in the conditions of educational process and service activities.

### MATERIALS AND METHODS

The research involved 72 cadets (men) majoring in "Law Enforcement" of the National Academy of Internal Affairs, who studied in the HEI for 3 years (2017-2021) and served in the practical police units after the training. The testing was carried out in 3 stages: 1st – the beginning of the first training year (2017); 2nd – the end of the third training year (2020); 3rd – after 1 year of service (2021).

A set of modern methods was used to achieve the aim of the research: theoretical (methods of conceptual and comparative analysis, structural and system analysis, synthesis, generalization); empirical (pedagogical observation, testing), methods of mathematical statistics. Theoretical methods made it possible to systematize and generalize the information on the research topic, to compare the obtained results with the existing works of many scientists. Empirical methods were used to determine the level of physical and mental capacity of law enforcement officers in the process of their training in the HEI and during their service activities.

The assessment of physical working capacity was performed using the Harvard Step Test. Its essence is the registration of heart rate after dosed exercise, which allows you to assess the course of recovery processes. According to the test conditions, the research subject climbed a step of fixed height (50 cm for men). Climbing time was 5 minutes, frequency of climbing up and down with changing legs accounted 30 times per minute. Heart rate was recorded for three times during 30 s in a sitting position immediately after the exercise: the first time from the 60<sup>th</sup> to the 90<sup>th</sup> second from the recovery period, the second –

from the 120<sup>th</sup> to the 150<sup>th</sup> second, the third – from the 180<sup>th</sup> to the 210<sup>th</sup> second. The test results were determined in the form of the Harvard Step Test Index (HSTI):  $HSTI = t \times 100 / (f_1 + f_2 + f_3) \times 2$ , where  $t$  is the time of climbing a step in seconds,  $f_1 + f_2 + f_3$  – heart rate within the aforementioned periods of the recovery period. The level of physical working capacity was assessed as follows: low, if  $HSTI < 55$  c.u., below average – 55-64 c.u., average – 65-79 c.u., above average – 80-89 c.u. and high – 90 c.u.

Mental working capacity was assessed using the Bourdon-Anfimov correction test. The cadets received blank forms with 1480 characters (37 lines of 40 characters each). The task was to look through the lines of letters horizontally and sequentially underline the letters K and cross out the letters H in each line. It was necessary to process as many characters as possible and make as few mistakes as possible. The task was performed for 10 minutes. The following aspects were assessed: the total number of correctly processed characters, erroneously crossed out and omitted letters. Mental working capacity (MWC) was defined as the aggregate quantity of the accuracy indicator (A), which determined the number of erroneously crossed out and omitted letters, and the total number of processed characters (S) according to the formula:  $MWC = A \cdot S$ . The level of mental working capacity was assessed as follows: low, if  $MWC < 960$  c.u., below average – 961-1110 c.u., average – 1111-1257 c.u., above average – 1258-1405 c.u. and high – 1406 c.u.

The research was carried out in accordance with the requirements of the Regulations on academic integrity at the National Academy of Internal Affairs. Prior consent to participate in the study was obtained from all respondents.

### RESULTS

The results of assessing the level of physical and mental working capacity of law enforcement officers at different stages of their professional activities with the help of the HSTI and the correction test are shown in Table 1. The analysis of the obtained data shows that cadets' HSTI was  $71.3 \pm 0.98$  c.u. and corresponded to "average" level of physical working capacity at the first stage. The HSTI significantly ( $p < 0.001$ ) improved at the second stage of the research for 5.5 c.u. and was  $76.8 \pm 0.84$  c.u., but the level of physical working capacity of future employees did not change and was assessed as "average". The positive HSTI dynamics gives grounds to state the effectiveness of practical training sessions in various academic subjects, including special physical training in the HEI, which are aimed not only at developing motor skills and habits of police measures application, but also developing physical qualities of cadets and improving their physical working capacity. The employees showed insignificant deterioration of the HSTI by 1.5 c.u. at the third stage of the research. The HSTI revealed at the third stage remained significantly better, compared only with the indicator recorded at the first stage ( $p < 0.01$ ).

The dynamics of the indicators of mental working capacity of law enforcement officers has a similar trend to the indicators of physical working capacity i.e. a significant ( $p < 0.001$ ) improvement in the indicators of the correction test of cadets

**Table 1.** Dynamics of physical and mental working capacity of law enforcement officers at different stages of their professional activities (n=72), X±SD, c.u. Studied indicators

	Stages of research			Significance of the difference		
	1st	2nd	3rd	p1-p2	p2-p3	p1-p3
	Physical working capacity					
HSTI	71.3±0.98	76.8±0.84	75.3±1.01	<0.001	>0.05	<0.01
	Mental working capacity					
Correction test	1007.3±24.71	1316.5±22.04	1244.8±23.92	<0.001	>0.05	<0.001

Note: X – arithmetical average, SD – standard deviation, p1-p2 – the significance of the difference between the indicators of the 1st and 2nd stages of the research, p2-p3 – the significance of the difference between the indicators of the 2nd and 3rd stages of the research, p1-p3 – the significance of the difference between the indicators of the 1st and 3rd stages of the research

during the period of their training in the HEI by 309.2 c.u. and insignificant ( $p>0.05$ ) deterioration after 1 year of their service by 71.7 c.u. The indicators at the third stage are also significantly ( $p<0.001$ ) better than at the first stage by 237.5 c.u. (Table 1). At the same time, the analysis of the results of the correction test shows that the level of mental capacity of cadets was assessed as “below average” at the first stage, as “above average” at the second stage and as “average” at the third stage. This shows that the organization of the educational process in the HEI with specific learning environment is quite effective in improving both physical and mental working capacity of future law enforcement officers. However, the reduction of the level of physical and mental working capacity after 1 year of service allows us to talk about the complexity and extremity of the service activities of law enforcement officers in practical units. Such activities, which take place over many years, can result in a significant reduction in these types of working capacity, deterioration of health indicators and reduction of the length of professional life.

Analysing the ratio of levels of physical working capacity of law enforcement officers, it should be noted that the largest number of cadets (68.1 %) had an “average” level of physical working capacity at the first stage of the research (Table 2); 13.9 % of cadets – “below average”, 9.7 % – “above average” and 8.3 % – “low”. No cadets with a “high” level of physical working capacity were identified at the first stage. These results are due to the requirements of the HEI, which train law enforcement officers to the level of physical fitness and health of candidates for admission, as professional training involves significant

physical and psychological stress. Correspondingly, persons with a sufficient level of physical fitness and, accordingly, an “average” level of physical working capacity are selected for training. There is a significant increase in the number of cadets with “above average” (to 26.9 %) and “high” (to 7.4 %) levels of physical working capacity at the second stage. It is important to note that most cadets who had a “high” level of physical working capacity at the end of training in the HEI were engaged in sports activities in various sports events (athletics, sambo and kettlebell lifting). The percentage of cadets with “average” and “below average” levels decreased to 62.7 % and 3 %, respectively. At the same time, no cadets with a “low” level were identified at the second stage. The following ratio of levels of physical working capacity was revealed at the third stage of the research: 2.1 % were workers with a “low” level; 4.2 % – “below average”; 66.7 % – “average”; 22.8 % – “above average” and 4.2 % – “high”. Such results are due to the reduction of time for exercise, constant workload of law enforcement officers of practical units, eating disorders, significant emotional stress, and so on.

The research of the ratio of levels of mental working capacity of law enforcement officers shows that the largest percentage made cadets with a “below average” level of mental working capacity at the first stage (65.2 %); 18.1 % of cadets had a “low” level, 9.7 % – “average” level; 5.6 % – “above average” level and 1.4 % – “high” level. There was an increase in the number of cadets with “average” (by 11.1 %), “above average” (by 47.2 %) and “high” (by 6.9 %) levels of mental working capacity at the second stage. The third stage was

**Table 2.** The ratio of levels of physical and mental working capacity of law enforcement officers at different stages of their professional activities (n=72), %

Stages of research	Levels of working capacity				
	Low	Below average	Average	Above average	High
	Physical working capacity				
1st	8.3	13.9	68.1	9.7	0
2nd	-	3.0	62.7	26.9	7.4
3rd	2.1	4.2	66.7	22.8	4.2
	Mental working capacity				
1st	18.1	65.2	9.7	5.6	1.4
2nd	2.8	15.3	20.8	52.8	8.3
3rd	4.2	16.7	56.8	18.1	4.2

characterised by a decrease in the number of employees who have “above average” (to 18.1 %) and “high” (to 4.2 %) levels of mental working capacity. The largest percentage was presented by cadets with an “average” (56.8 %) level of mental working capacity.

## DISCUSSION

Maintaining a proper level of a person’s physical and mental working capacity requires compliance with certain conditions, including a rational regime of the day, a sufficient level of physical activity and rest, active participation in mental activity, abandonment of bad habits and more [15, 16]. The quarantine restrictions imposed on HEI taking into consideration the Coronavirus Pandemic have a negative impact on the quality of the educational process, the level of motor activity and, consequently, the physical and mental working capacity of cadets [17, 18].

The issue of quality diagnosis of the level of working capacity of law enforcement officers at different stages of their professional activities is of immediate interest. The scientific and methodological literature covers a significant number of different methods for determining the level of physical and mental working capacity. They differ in complexity, informative value, require special equipment, time and compliance with certain conditions.

Studying the conditions that allow to maintain physical and mental working capacity and effectiveness of professional activities during self-isolation, the scientists focus on the appropriate combination of a balanced diet, exercise and mental work [19, 20]. Increasing the level of physical and mental working capacity of future law enforcement officers during their training in the HEI is due to the specifics of the educational process and daily routine. A significant number of classroom theoretical and practical training sessions involve the development of mental and physical qualities in the conditions of the educational process. The key role within the extracurricular work was played by independent and sectional activities on professional and applied sports and the systematic conduct of sporting and mass participation as well as fitness and health recreation events among cadets.

In the conditions of service activities, the maintenance of the proper level of physical and mental working capacity of law enforcement officers takes place in the process of their service development through training sessions on physical education and individual preparation in various disciplines. However, according to regulatory documents, 90 % of physical education training sessions require mastering skills in self-defence and personal safety. Overall physical training, which is a key factor in the development of working capacity of law enforcement officers, occupies only 10 % [21, 22]. In addition, the constant service workload of the vast majority of law enforcement officers does not allow them to regularly attend physical education training sessions and allocate enough time for independent training in order to maintain an adequate level of physical and mental working capacity. The aforementioned was confirmed by the results of our research, which indicate that there is a decrease in the

level of both physical and mental working capacity of law enforcement officers after graduating the HEI. This necessitates additional research to substantiate the areas of recovery and maintenance of working capacity of law enforcement officers in the process of their service activities.

## CONCLUSIONS

The comparative analysis of the indicators of working capacity (physical and mental) of law enforcement officers in the conditions of educational process and service activities was carried out. Significant ( $p < 0.001$ ) increase in the level of physical (by 7.2 %) and mental (by 23.5 %) working capacity of law enforcement officers in the process of their training at the higher educational institution and insignificant ( $p > 0.05$ ) deterioration after 1 year of their service (by 1.9 % and 5.4 % respectively) was established. The level of physical working capacity of employees was assessed as “average” at all stages of the research. The level of mental working capacity was assessed as “below average” at the first stage, as “above average” at the second stage and as “average” at the third stage.

The results obtained show that the organization of the educational process in the HEI with specific learning environment is quite effective in improving both physical and mental working capacity of future law enforcement officers. However, the reduction of the level of physical and mental working capacity after 1 year of service allows us to talk about the complexity and extremity of the service activities of law enforcement officers in practical units. Such activities, which take place over many years, can result in a significant reduction in these types of working capacity, deterioration of health indicators and reduction of the length of professional life.

We see prospects for further scientific research in the study and justification of effective means for restoring and maintaining the physical and mental working capacity of law enforcement officers in the process of their service activities.

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**ADDRESS FOR CORRESPONDENCE:**

**Ivan M. Okhrimenko**

National Academy of Internal Affairs  
1 Solomyanska Square, 03035 Kyiv, Ukraine  
e-mail: ivango-07@ukr.net

**ORCID ID and AUTHORS CONTRIBUTION**

0000-0002-0170-2616 – Valentyn V. Bondarenko(A, D)  
0000-0002-8813-5107 – Ivan M. Okhrimenko (A, D)  
0000-0002-1285-4527 – Nataliya O. Bilevich(A, B)  
0000-0001-6380-3095 – Mariia M. Rohovenko (D, E)  
0000-0002-0273-1902 – Oleksii P. Tsurkan (C, F)  
0000-0001-8879-4025 – Volodymyr A. Holyk (C, F)

A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article



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Info

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# Current Issues of the Implementation of Complementary Medical and Health-improving Methods in Medical Rehabilitation: on what are Attachment and Mistrust Based?

## Aktualne problemy wdrażania komplementarnych i poprawiających zdrowie metod w rehabilitacji medycznej: na czym opiera się przywiązanie i nieufność

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**Olga Ye. Kovalenko<sup>1,2,4</sup>, Olha Ye. Yuryk<sup>3,4</sup>, Olena V. Litvin<sup>2,4</sup>, Liliana V. Klymenko<sup>1</sup>**<sup>1</sup>Shupyk National Healthcare University of Ukraine, Kyiv, Ukraine<sup>2</sup>State Institution of Science «Research and Practical Centre of Preventive and Clinical Medicine», Kyiv, Ukraine<sup>3</sup>State Institution "Institute of Traumatology and Orthopedics of the National Academy of Medical Sciences of Ukraine", Kyiv, Ukraine<sup>4</sup>Ukrainian Association of Reflexotherapy and Medical Acupuncture (UARMA), Kyiv, Ukraine

### SUMMARY

**Aim:** To sharpen the attention of doctors and rehabilitation specialists on the wide possibilities of alternative/complementary methods in modern medicine.

**Materials and Methods:** The main method used in the preparation of this work is bibliosemantic. We conducted an analysis of modern literary data and studied the experience of leading clinics in both Europe and China. Researched leading works on the validity of using reflexology for improved treatment compliance. The directions of medical rehabilitation for the restoration of impaired functions in various nosologies were presented, along with this, the question of the feasibility of using alternative methods in the rehabilitation of patients with various diseases was considered.

**Conclusions:** The modern theoretical and practical evidence base for the effectiveness of methods in rehabilitation, which is based on the anatomical and physiological mechanisms of action of acupuncture and related non-invasive methods of reflexotherapy, was considered, and the reasons for insufficient commitment of the population and doctors of related specialties to the use of the methods were analyzed. References are given to some existing protocols for the use of acupuncture in various pathological conditions, which is explained by the evidence base of the method.

**Key words:** medical rehabilitation, acupuncture, reflexotherapy, reflexology, UARMA

**Słowa kluczowe:** rehabilitacja medyczna, akupunktura, refleksoterapia, refleksologia, UARMA

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### INTRODUCTION

According to the definition of WHO, rehabilitation is defined as «a set of interventions designed to optimize functioning and reduce disability in persons with diseases in interaction with their environment.» That is, rehabilitation helps people of all ages to be as independent as possible in daily activities and to participate in education, work, recreation, and meaningful life roles such as family care. This is done by addressing underlying conditions (such as pain) and improving a person's functioning in everyday life by helping them overcome difficulties with thinking, vision, hearing, communication, eating or movement [1].

Rehabilitation is highly person-centered, meaning that the intervention and approach chosen for each person depends on their goals and preferences. Rehabilitation can be provided in many different settings, from inpatient or outpatient hospitals, to private clinics or community facilities, as well as at home. The rehabilitation workforce consists of, including but not limited to, a variety of medical professionals, physical therapists, occupational therapists, speech and language therapists, orthopedists and prosthetists, clinical psychologists, physical medicine and rehabilitation physicians, and rehabilitation nurse. That is, rehabilitation is a socio-medical problem that includes a number of aspects: medical, including psychological; professional (labor,

production); socio-economic [1-6]. It has been studied that socio-economically vulnerable segments of the population do not return to work more often after medical rehabilitation. These inequalities are less pronounced for certain types of rehabilitation care and usually relate to the active role of the care system. However, there is a need for further studies of effect modification by treatment type [6].

It is no secret that the medical rehabilitation of patients with various pathologies, in particular, after the most common acute vascular disasters (heart attacks, strokes), injuries, surgical interventions, as well as with various chronic diseases, etc., needs further continuous improvement. As practice shows, not in every clinical case the patient receives the necessary rehabilitation measures or even sufficient information about them. Unfortunately, not all potential effective directions of rehabilitation are involved in the world to a sufficient extent, and among them are the so-called alternative (complementary) methods originating from traditional oriental medicine and in Ukraine and some other countries are called “methods of reflexotherapy”.

### AIM

The aim of the article is to sharpen the attention of doctors and rehabilitation specialists on the wide possibilities of alternative/complementary methods in modern medicine.

### MATERIALS AND METHODS

The main method used in the preparation of this work is bibliosemantic. We conducted an analysis of modern literary data and studied the experience of leading clinics in both Europe and China. Researched leading works on the validity of using reflexology for improved treatment compliance. The directions of medical rehabilitation for the restoration of impaired functions in various nosologies were presented, along with this, the question of the feasibility of using alternative methods in the rehabilitation of patients with various diseases was considered.

### REVIEW AND DISCUSSION

The results of our survey of the population showed that medical rehabilitation in the imagination of many of them mainly looks like the occupation of patients in specialized medical centers with bulky and inexpensive equipment (exercise machines) located in large cities and with extremely high efficiency (!), but small access of patients to it due to the high cost in the absence of insurance. The idea of home rehabilitation mostly looks like performing certain physical exercises for the affected part of the body (limbs, back, face) prescribed by a medical professional.

Unfortunately, among the widespread descriptions of personnel and material support for medical rehabilitation in Western medicine, one cannot usually find either acupuncture or related methods based on the foundations of traditional Eastern medicine. Although, as proven by many years of experience and the attention of international organizations [7-9], they can make a significant contribution to measures of primary and secondary prevention and rehabilitation in chronic diseases and in the period of convalescence after

acute diseases. The use of reflex methods (reflexotherapy, RT) in clinical practice should be recognized as unjustifiably insufficient. Often, these methods in the minds of doctors of various specialties and patients are traditionally associated exclusively with acupuncture and, possibly, with some hardware methods (electropuncture, laser acupuncture). And what exactly stops the wider introduction into clinical medicine of methods based on TEM, in particular, traditional Chinese medicine (TCM)?

It is known that due to its own internal laws of development, Chinese medicine is more prone to empirical medicine during a relatively long historical period. It is believed that it lacks objective and unified clinical practice guidelines, and the associated difficulties in diagnosis and assessment of therapeutic effect have limited its further imitation, development and international communication. Therefore, over the years, researchers have worked to improve the standardization theory and methodology of CM, as well as to improve relative methods for further application, which are based on the stratified evidence assessment method. The researchers have already applied this method to 45 issued guidelines, including 5 national guidelines, 3 industry guidelines, and 37 social organization development/review guidelines. The stratified evidence assessment method has been recognized and is widely used. This helps academics and practitioners to better study, formulate, publish and popularize clinical practice guidelines for acupuncture therapy, thus contributing to the further development of the acupuncture method [10]. Standardization was also studied in relation to wormwood heating, a technique related to acupuncture [11], significant importance is also attached to the training of specialists in the world [12, 13], but, in our opinion, it is acupuncturists who should be trained by higher medical institutions and acupuncture should be practiced by specialists with a basic higher medical education.

It is for the sake of scientific argumentation and adaptation to Western medicine that semiotics has been used for many years, which by definition explains the key mechanism of action of methods of stimulating active points and zones in clinical practice. So, the concept that has been used in Ukraine for more than 40 years, reflexotherapy is a treatment and prevention system based on the assessment of the parameters of peripheral reflexogenic zones (acupuncture points) and their influence in order to regulate functional systems. It is fundamental that the interpretation of the concept of “reflexotherapy” has a conceptual theoretical-philosophical and anatomical-physiological foundation and corresponds to the essence of the speciality of the doctor-reflexotherapist, which has existed for several decades in Ukraine.

The very concept of “reflex”, which means the body’s response to a stimulus, is the terminological basis of the concept of “reflexotherapy”. Although it is not enough to explain all the phenomena of the TEM and TCM methods only by reflex, the undeniable presence of a reflex mechanism in them puts them at the level of scientifically based [14, 15].

Unfortunately, in foreign literature, one can find a narrowed use of the concept with the word “reflex” at the

base - "reflexology" to denote the method of point and zonal influence on the distal parts of the limbs, mainly feet, which impoverishes the broad possibilities of applying the concept of "reflex" [15]. Reflexology, also known as zone therapy, is an alternative medical practice involving the application of pressure to specific points on the feet, ears, and/or hands [16]. This is done using thumb, finger, and hand massage techniques without the use of oil or lotion [17]. The effort to standardize the qualification requirements revealed that everyone who uses the method calls himself a reflexologist [18]. The lack of scientific evidence also causes skepticism, which, in our opinion, may be related to insufficiently developed methodology and the probable lack of basic medical training among the performers.

Along with acupuncture and possibly some hardware methods (electropuncture, laser acupuncture), such methods of influencing points and reflexogenic zones, which are non-invasive, that is, do not cross the skin, such as point and vacuum massage, vacuum acupuncture, pressure on points (shiatsu), moxa-therapy, surface acupuncture with multi-needle applicators, etc. also belong to reflexotherapy methods [19]. If invasive methods (acupuncture), where, in addition to a specific performance technique, more complex recipes for combining points in one session are usually used, which are selected individually in each specific case, in a number of countries, only a doctor with a special education should be performed, then simple symptomatic recipes for point massage, point heating (for example, with headache of one or another localization, dizziness, pain in the joints, etc fatigue, runny nose, etc.), as well as surface needling, in addition to a doctor, can be performed by both a middle-level medical worker and the patient himself, provided that he receives certain instruction or training by a specialist who himself is familiar with non-invasive therapeutic RT methods. It is important to emphasize once again that in Ukraine and some other countries, full use of RT (acupuncture and related methods) is allowed only to specialists with a higher medical education – reflexotherapists, who usually also have a basic medical specialty of a medical profile (neurologist, therapist), who can timely and professionally monitor the rehabilitative and therapeutic effects of RT, prevent complications and prescribe complex drug therapy [15]. Unfortunately, in some countries, acupuncture is used by persons without medical education, having completed a certain course of study at relevant courses, which significantly reduces the public's confidence in it.

Our survey of different strata of the population (students, people of mental and physical labor of different ages, patients of several medical institutions of Ukraine) showed insufficient awareness of the possibilities of using RT methods to improve the level of health, especially the involvement of patients in the process of self-healing (performance of appropriate physical exercises, point self-massage and chi-therapy, post-isometric relaxation, etc.) by medical professionals was rare.

Unfortunately, non-drug methods do not have the same publicity as pharmacotherapy for obvious reasons. Of course, it is difficult to overestimate pharmacotherapy in emergency

conditions, on the other hand, the rehabilitation of patients with chronic pathology will not be able to achieve a sustainable positive effect without non-pharmacological reflex methods, the implementation of which should involve the patients themselves.

As experience has shown, the specific terminology used in this field contributes to the reduction of trust in RT. Since RT is a conceptual regulatory system, the action of which is aimed at restoring the disturbed balance of body functions ("yin-yang energies" according to ancient Eastern terminology), the concept of "yin-yang", according to the formulations of modern medicine, corresponds to the concept of homeostasis, the balance of vegetative sympathetic parasympathetic relationships [14, 15]. An in-depth analysis of the mechanism of action of the method proved that the use of RT has a wide range of indications and a minimum of contraindications [16].

The reflexotherapy effect begins with the stimulation of the receptor apparatus at the acupuncture point by physical or chemical factors. In the future, a complex cascade of neurohumoral reactions develops, which, in addition to the peripheral, cover both the segmental and suprasedgmental levels of the nervous system. RT effects include general (increase in general non-specific resistance to various stressors, increased immunity, etc.) and selective (specific) effects on a certain organ or system. The latter is based on the phenomenon of convergence of afferent pathways on common neuronal elements that provide mutual switching of multimodal information of both somatic and visceral systems on the basis of metameric-segmental organization and form an integrated image of information under the influence of which adaptive motor programs are formed. This provides opportunities to control the sensory and motor functions of the body. There are different levels of convergence of native modal afferents: spinal, trunk, thalamo-cortical. It is known that artificially induced somatic signals are capable of inhibiting visceral afferentation [14, 17, 18, 20].

The humoral factor is also of great importance in the effects of reflexology. At the central level, stimulation of the hypothalamus contributes to the release of the hypothalamic releasing factor, which in turn affects the pituitary gland with the subsequent release of adrenocorticotrophic hormone, followed by a complex sanogenetic reaction of the body. Based on the complex pathogenetic phenomena of neurohumoral regulation, RT affects the nociceptive and antinociceptive systems due to the mediated secretion of opioid and non-opioid peptides (vasopressin, oxytocin, neurotensin, etc.) [21, 22].

Therefore, the body's reaction to the stimulation of acupuncture points occurs by irritating specific and non-specific anatomical structures, not only exclusively pain receptors. The use of various other methods and means of influence on acupuncture points and reflexogenic zones allows to activate other receptors (light, barometric, specific and complex sensitivity) even more widely, thereby obtaining qualitative and quantitative sanogenetic reactions from the body. It is at the level of the thalamus that the signal is transmitted

from specific afferents - visual and auditory thanks to the lateral and medial geniculate bodies, respectively. Thanks to their connections, the ventral nuclei participate in the transmission of information from the cerebellum to the cortex, from the midbrain to the limbic system, as well as somato-visceral afferentation, the convergence of nociceptive signals, thus participating in the modulation of the excitability of projection motoneurons of the cortex, in the integration of emotional- visceral information of the limbic system and emotional-sensory information of the thalamo-cortical system, implementation of trigeminal and vagal somato-visceral convergence [17, 18, 20, 23].

Thus, adequate somatic afferentation, which is formed by drawing up a therapeutic prescription (stimulation by various factors of a set of certain points and zones in one session according to the appropriate rules), causes in response a complex somato-visceral and autonomic reaction with the expected regulation of functions, which is conceptually based on its effect does not contradict the theoretical concepts of Eastern medicine [17, 20, 23, 24].

Theoretical ideas born in ancient Eastern philosophy and medicine, which served as the basis for modern reflexology, upon detailed analysis are consistent with existing provisions, in particular, with the concept of neuroplasticity, i.e. a set of processes aimed at remodeling and adapting the nervous system to physiological and pathological external changes or/ and internal environment [21, 25].

Recently, the results of global research prove the existence of the so-called primary vascular system (PVS), which, according to scientists, can be an organic substrate for the action of acupuncture. Studies have shown that the PVS system is different from the circulatory and lymphatic systems; spread throughout the body, from the surface layer of the skin to the internal organs. Composed of primary nodes and vessels, it can claim to be the anatomical substrate of acupuncture points and meridians. Liquid circulates inside the primary vessels, the components of which are precursors of stem cells, hormones, amino acids, lipids, and hyaluronic acid [26].

As mentioned, the RT system includes a whole list of methods that differ in physical characteristics of the methods of exposure and stimulation of various receptors. Along with well-known acupuncture, which should be performed only by a doctor, there is a whole list of RT methods, which do not involve crossing (piercing) the skin - non-invasive RT methods (NIRT) [17, 19].

Non-invasive RT methods have a wide range of advantages, namely: effectiveness in comprehensive rehabilitation, treatment, prevention of various diseases; the possibility of long-term use in chronic diseases; harmlessness; the possibility of complex application with other methods, including medicinal ones; possibility of application to people of different ages; a differentiated possibility of application both by medical workers and directly by the patients themselves; high efficiency.

Thus, the scientifically proven effectiveness of acupuncture and related non-invasive methods in various diseases served as the basis for the creation of a whole list of clinical guidelines and recommendations in the world, which largely relate to the

treatment of pain syndromes, even in oncology [22, 27-30], depressive and other disorders [31-34]. Although, in our opinion, the optimal step would be to integrate them into the general protocols of medical care for various diseases.

So, the question arises, why, with proven priorities and even the presence of regulatory documents, acupuncture and related methods still do not gain due recognition among the population, doctors and state medicine and their use in medical rehabilitation does not reach the deserved level? Of course, this primarily concerns not only Ukraine, but also European countries and America, since for most countries of the Southeast these methods belong to widely used traditional medicine. Undoubtedly, one of the pressing issues should be considered the fact that in most countries acupuncture is allowed to be practiced by people without higher medical education or with secondary education. Ukraine is one of the few countries where only doctors are allowed to practice acupuncture and related methods! Even, despite specific and not always successful medical reforms, Ukraine still retains a small number of government positions, unlike other countries, where this method is practiced only in private institutions and not always by people with a medical education!

Fortunately, there is an international public association ICMART, which takes care of the professional level of specialists in the field of acupuncture and related methods in Europe, and unites only doctors!

In Ukraine, the public organization "Ukrainian Association of Reflexotherapy and Medical Acupuncture" (PO "UARMA") takes care of this issue, which was created almost 30 years ago on the initiative of Professor Yevgenia L. Macheret [15].

In order not to lose this direction in Ukraine, where the reorganization in medicine in the last decade has led to a significant reduction in the rates of doctors-reflexotherapists in state medical institutions, and the retraining of doctors also needs to be better due to many objective reasons, as well as to allow consideration of these issues under the conditions of their countries to relevant foreign specialists, we continue to investigate acute issues in this area. Namely: the question of commitment and mistrust of doctors and potential patients to the use of non-medicinal methods - acupuncture and related methods in medical rehabilitation for various diseases. The results of the survey of the population and patients already have some preliminary results.

Among the interviewed doctors, all 98% answered that they know RT methods: 25% of the interviewed believe that these methods are effective only in Eastern countries, the rest claim that they are effective to some extent: they know positive results for dorsalgia and in general for pain syndromes, of which 12% recommended to their patients in these cases; 12% - heard about effectiveness in strokes; 18% believe that this is a purely psychotherapeutic effect, which also deserves attention. Insufficient scientific justification (57%) and lack of scientific basis at all (8%) are considered a disadvantage.

Among 100 ordinary citizens - persons on a random sample, 76% said that they have this or that information about the methods; 7% - used it themselves (5% were satisfied with the result, 1% could not decide whether there was an effect,



1% – no effect). In 23% – they were used by acquaintances (18% – for pain syndromes, 7% for neuritis of the facial nerve, 3% – for after stress). Interestingly, the same people (70% of those who used) usually used and underwent repeated treatment, which can be explained by the fact that after receiving a positive therapeutic and rehabilitation effect, they sought it again even with another problem. So, the research is ongoing and its results will be published in the near future.

How can reflexotherapy methods, which originate from traditional Eastern medicine, enrich modern rehabilitation and medicine in general?

The answer refers directly to treatment and rehabilitation measures that, on the one hand, are performed by a medical professional: some methods are exclusively performed by a doctor (acupuncture), and some can be performed by a nurse and/or paramedics (point and zone massage, chi therapy, etc.), and on the other hand, the patient performs it himself, being trained or instructed by a specialist. In the first case, the patient is the object of influence, and in the second - the subject. That is, such methods of influencing points and reflexogenic zones, which are non-invasive, that is, do not cross the skin, such as point and vacuum massage, vacuum puncture, pressure on points (shiatsu), moxa-therapy, superficial acupuncture (in particular, Lyapko multi-needle dissimilar metal applicators), etc. can be widely used not only by medical professionals, but also to a certain extent directly by patients. It is extremely important to spread knowledge among the population, teach them self-help using methods of reflexology and oriental medicine on their clinical basis, and in the educational process.

It is the non-invasive RT methods that can be widely used in primary care. Given the possibility of synergistic action, properly selected reflexotherapy tactics in complex therapy can significantly increase the effectiveness of treatment and rehabilitation. It is important to actively further integrate the methods into the everyday lifestyle and education in different countries of the world.

As part of preventive measures, a family doctor (neurologist, therapist, and doctors of other specialties) can use various types of information delivery to the population: individual conversations (both with patients of risk groups and their family members); speeches in front of the community (group seminars, where there can be both large and small groups); appearances in mass media and communication (print publications, radio, television, Internet); printed leaflets and information sheets.

The information conveyed to the population must be clear, well-argued, supported by statistical indicators, in particular, comparative ones, etc.

Reflexotherapy methods are especially relevant and reveal their possibilities in rehabilitation during the war in Ukraine. Reflexotherapy specialists prepare trainings and leaflets for help and self-help training for the affected population and defenders of our land.

## CONCLUSIONS

Thus, the doctor's possession of information on complementary methods of rehabilitation and treatment of patients will help solve the following problems:

- how to increase the level of rehabilitation of patients with various diseases;
- what to do when a person has a polyvalent allergy or when the situation requires urgent medical assistance, even in extreme military conditions, and the necessary first-aid drugs are not available or are insufficient, or the person cannot tolerate them;
- how to better rehabilitate patients with chronic diseases;
- how to directly involve the patient himself in the process of recovery and protection (preservation) of health.

In our opinion, an extremely important prospective issue should be the integration of a whole list of existing guidelines in the world with the use of acupuncture and related methods in the rehabilitation of general medical care protocols for various diseases, as well as further scientific research and the creation of new protocols.

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#### ADDRESS FOR CORRESPONDENCE:

**Olena V. Litvin**

Research and Practical Centre of Preventive and Clinical Medicine

5 Verhnya St., 01000 Kyiv, Ukraine

phone: +380973997799

e-mail: litvinolena1970@gmail.com

#### ORCID ID and AUTHORS CONTRIBUTION

0000-0002-5927-5565 – Olha Ye. Kovalenko (A, D)

0000-0093-2245-9333 – Olha Ye. Yuryk (E, F)

0000-0002-5002-046 – Olena V. Litvin (B)

0000-0001-6749-113 – Liliana V. Klymenko (A, E)

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article

# Organizational and Legal Principles of Providing Medical Assistance for the Rehabilitation of Servicemen of the Armed Forces of Ukraine

## Organizacyjno-prawne zasady udzielania pomocy medycznej, w tym rehabilitacji, żołnierzom Sił Zbrojnych Ukrainy

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**Olena O. Terzi, Igor V. Shpak**

Odesa National Medical University, Odesa, Ukraine

### SUMMARY

**Aim:** To investigate the organizational and legal principles of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine.

**Materials and Methods:** During the conducted research, a following complex of general scientific and special scientific methods was used: the formal legal method was used to analyze the organizational and legal principles of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine; the comparative legal method helped to clarify the approaches of national legislation and international standards to the provision of medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine; the method of forecasting and modeling was used to develop practical recommendations for the provision of medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine in connection with the escalation of the Russian-Ukrainian armed conflict; the method of system analysis allowed to investigate the organizational and legal principles of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine; the historical and legal method made it possible to reveal the peculiarities of the evolution of the organizational and legal regulation of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine.

**Conclusions:** Rehabilitation is an important component of clinical/medical assistance in situations of armed conflict and emergency and is necessary to mitigate the significant amount of disability that follows the surge of traumatic injuries and exacerbation of chronic diseases with devastating consequences for individuals, families and communities, resulting from insufficient access to rehabilitation.

**Key words:** medical assistance, rehabilitation, armed conflict, armed forces, legal regulation

**Słowa kluczowe:** pomoc medyczna, rehabilitacja, konflikt zbrojny, siły zbrojne, regulacje prawne

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### INTRODUCTION

Armed conflicts and emergencies, especially natural disasters that occur suddenly, can lead to a sharp increase in injuries that put a strain on health care systems and leave a legacy of disability behind. Meeting the needs of affected people can be a difficult task in the context of limited health care and rehabilitation infrastructure, where armed conflicts and emergencies occur. Health professionals who provide rehabilitation in conflict conditions face a wide range of problems connected with physical and mental health, limited national rehabilitation capacity, damaged infrastructure, reduced workforce, disruptions in service delivery, violation of procurement and coordination mechanisms. In connection with various injuries received in the conflict, it may be necessary

to adapt surgical and rehabilitation practices and protocols [1]. Rehabilitation is increasingly recognized as a necessary aspect of medical response and patient-centered care, as evidenced by its inclusion in the Classification and Minimum Standards for Foreign Emergency Medical Teams [2].

### AIM

This article aims to investigate the organizational and legal principles of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine.

### MATERIALS AND METHODS

Research methods were selected taking into account the research aim. In order to establish the objectivity and validity of scientific statements and conclusions, during the conducted

research a following complex of general scientific and special scientific methods was used: the formal legal method was used to analyze the organizational and legal principles of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine; the comparative legal method helped to clarify the approaches of national legislation and international standards to the provision of medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine; the method of forecasting and modeling was used to develop practical recommendations for the provision of medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine in connection with the escalation of the Russian-Ukrainian armed conflict; the method of system analysis allowed to investigate the organizational and legal principles of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine; the historical and legal method made it possible to reveal the peculiarities of the evolution of the organizational and legal regulation of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine [3, p. 84]. The scientific and heuristic potential of such philosophical research methods as analysis, synthesis, deduction, induction, abstraction and others was also used.

## REVIEW AND DISCUSSION

The Ukrainian legislation classifies rehabilitation as staged medical rehabilitation in centers (sanatoria), final medical rehabilitation in centers (sanatoria), medical-psychological rehabilitation and medical rehabilitation. Staged medical rehabilitation in centers (sanatoria) is defined as a course of medical rehabilitation conducted between courses of inpatient treatment or between a course of treatment and a control examination by a military medical commission. It is assumed that the person receiving rehabilitation will return to the medical and preventive institution that sent him or her for rehabilitation [4].

Final medical rehabilitation in centers (sanatoria) is medical rehabilitation carried out after the completion of inpatient treatment and aims to achieve the fastest possible recovery of a serviceman's body before returning to professional activities or being discharged from military service.

Medical-psychological rehabilitation includes a complex of medical, psychological, and general health measures, which are carried out to restore health and correct psychophysiological functions, obtain the optimal level of combat capacity (work capacity) of military personnel, as well as create favorable conditions for the restoration of social activity, development and affirmation of the individual.

Medical rehabilitation is understood as a system of medical measures aimed at restoring impaired or lost functions of a person's body, identifying and activating the body's compensatory capabilities to ensure the conditions for a person's return to normal life, preventing complications and recurrence of the disease [5]. The Law of Ukraine "On social and legal protection of servicemen and members of their families" establishes that during the period of martial law, servicemen who took a direct part in the implementation

of measures necessary to ensure the defense of Ukraine, the protection of the safety of the population and the interests of the state in connection with the military aggression of the Russian Federation against Ukraine, while being directly in the implementation areas of the specified measures, may be sent for further medical assistance or medical-psychological rehabilitation to medical institutions located outside of Ukraine, according to the conclusion of the military medical commission. The specified servicemen and their accompanying medical personnel are not subject to restrictions on the departure of Ukrainian citizens outside of Ukraine. The Cabinet of Ministers of Ukraine shall establish the procedure for providing servicemen with medical assistance or medical-psychological rehabilitation in medical institutions outside of Ukraine and payment for such medical assistance services. Reimbursement of the travel cost and payment for the provision of such medical assistance services or medical-psychological rehabilitation is carried out at the expense of the state budget, except in cases of providing the specified assistance at the expense of the host country. If, during the process of psychological rehabilitation, it is planned treatment that requires medical intervention and measures to prevent post-traumatic stress disorder. The measures for the psychological rehabilitation of servicemen of the Armed Forces of Ukraine must be carried out according to the Procedure for the use of funds, approved by the Resolution of the Cabinet of Ministers of Ukraine of July 12, 2017 No. 497 and the Procedure for conducting psychological rehabilitation, approved by the Resolution No. 1057 of the Cabinet of Ministers of Ukraine of December 27, 2017. In addition, the Ministry of Social Policy of Ukraine adopted such orders as "On the approval of the Requirements for entities providing psychological rehabilitation services and the form of the act of providing psychological rehabilitation services at the expense of budget funds" No. 597 of April 27, 2018, "On establishing the maximum cost of services for psychological rehabilitation of participants in the anti-terrorist operation and affected participants of the Revolution of Dignity in 2018" No. 591 of April 26, 2018; "On the approval of the Standard of psychological diagnosis and forms of documents for the organization of psychological rehabilitation of participants in the anti-terrorist operation and affected participants of the Revolution of Dignity" No. 810 of June 1, 2018; "On the approval of a model contract for the provision of psychological rehabilitation services" No. 598 of April 27, 2018. The Resolution No. 528 of the Cabinet of Ministers of Ukraine of August 23, 2016 regulates the procedure for monetary compensation payment for the cost of travel to rehabilitation institutions and back.

The Instructions on the organization of sanatorium-resort treatment, medical and medical-psychological rehabilitation in the Armed Forces of Ukraine, approved by the Order of the Ministry of Defense of Ukraine No. 591 of November 4, 2016, contain a list of categories of persons who are sent for sanatorium-resort treatment, medical and medical-psychological rehabilitation, the period of sanatorium-resort treatment, medical and medical-psychological in centers (sanatoria), the procedure for selection and referral of

persons for sanatorium-resort treatment, the procedure for selection and referral for medical rehabilitation to the center (sanatorium), the procedure for planning sanatorium-resort treatment, medical and medical-psychological in the Armed Forces of Ukraine, the procedure for selection and referral of servicemen for medical psychological rehabilitation to the center (sanatorium), the procedure for selection and referral of persons to sanatorium-resort facilities intended for sanatorium-resort treatment of persons with spinal disabilities, the list of documents required in case of referral of persons to centers (sanatoria), the information on the work organization of sanatorium-resort selection commissions, the procedure for admission and discharge of persons from centers (sanatoria), the procedure for admission to centers (sanatoria) together with parents for rest and recovery of children of servicemen, veterans of military service and employees of the Armed Forces of Ukraine, the procedure for calculations for sanatorium-resort vouchers.

The Resolution of the Cabinet of Ministers of Ukraine "On the approval of the Military Medical Doctrine of Ukraine" No. 910 of October 31, 2018 enshrines the principle of the Military Medical Doctrine of Ukraine, which states that unified views on prevention, diagnosis, provision of medical and psychological assistance, evacuation, treatment, medical and psychological rehabilitation of the wounded (affected, sick), prevention of combat stress (preventive rehabilitation) are statewide. The military medical factor as the basis of the Military Medical doctrine of Ukraine determines the unity of views on the organization, tactics and procedure for the use of forces and means of medical services and the civilian health care system both in peacetime and during armed conflict and crises [6]. The organization of military medical support is also based on the following principles: 1) carrying out treatment and preventive measures according to the standards of medical care (medical standards), clinical protocols and military medical standards to achieve the maximum possible result of treatment and rehabilitation; 2) unified approaches to the prevention and diagnosis of diseases, provision of medical assistance, treatment and rehabilitation of the wounded [6].

Regarding the organizational and legal principles of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine, the Military Medical Doctrine of Ukraine states that in wartime, functional associations of health care institutions of the Ministry of Defense, the Ministry of Internal Affairs, other military formations and the civilian health care system are formed to provide all types of medical care and medical-psychological rehabilitation of the wounded (sick).

The military medical doctrine of Ukraine contains provisions on scientific support for the development of the health care system of servicemen and the solution of military medicine problems is carried out by the National Academy of Medical Sciences together with the Ministry of Defense and the Ministry of Health, ensuring the development and implementation of modern medical technologies for the provision of medical assistance, treatment and rehabilitation

of servicemen and civilians in case of wounds, injuries and diseases both in the field and in hospital conditions.

It is extremely important to harmonize the normative and legal regulation of providing medical assistance for the rehabilitation of servicemen of the Armed Forces of Ukraine with NATO standards. Therefore, it is necessary to build a medical support system to provide adequate medical support to all defense forces. Firstly, it means creating a medical support system capable of providing appropriate medical support to all tasks facing the defense forces of Ukraine, functioning according to NATO standards, and capable of contributing to functionally compatible medical capabilities for joint missions with NATO [7]. Secondly, it covers the achievement of necessary capabilities for searching for the wounded, their medical evacuation and providing the necessary assistance and treatment. Thirdly, it is about the implementation of modern technologies for the provision of medical assistance and treatment of the wounded in the activities of the military medical services according to the standards of medical assistance, clinical protocols and other industry standards in the field of health care. Fourthly, it needs the normalization of the issue of using the capabilities of the health care system in the state to provide medical assistance, treatment and medical rehabilitation of the wounded within the framework of a unified medical space; the creation of a medical rehabilitation system, which ensures the restoration of physical, psychological and social functions to return to the performance of military service duties or social and labor adaptation. Fifthly, it means the improvement of the system of training and retraining of military medical personnel for the defense forces, and the introduction of military medical training, which will ensure effective training in the standards of providing medical assistance for combat trauma (pathology). Sixthly, it implies the creation of a medical information system for the defense forces, covering all stages of medical evacuation and patient flow management processes, and complies with NATO standards, doctrines and recommendations [7].

It should be noted that Ukraine has recognized the ad hoc jurisdiction of the International Criminal Court, and the Rome Statute of the International Criminal Court requires the establishment of "principles relating to reparations to, or in respect of, victims, including restitution, compensation and *rehabilitation*" [8]. The Assembly of States Parties to the Rome Statute has established a trust fund for the benefit of victims of crimes subject to the Court's jurisdiction and the families of such victims, and authorizes the Court to "protect the safety, physical and psychological well-being, dignity and privacy of victims" and allow victims to participate in all "stages of the proceedings determined to be appropriate by the Court" [8].

According to the national legislation and international law and taking into account individual circumstances, victims of gross violations of international human rights norms and serious violations of international humanitarian law should, in appropriate cases and proportion to the gravity of the violation and the circumstances of each case, be provided with full and effective reparation, as set out in principles 19-23

of the Basic Principles and Guidelines on the Right to a Remedy and Reparation for Victims of Gross Violations of International Human Rights Law and Serious Violations of International Humanitarian Law, which include the following forms: restitution, compensation, rehabilitation, satisfaction and guarantees of non-repetition [8]. The Basic Principles and Guidelines on the Right to a Remedy and Reparation for Victims of Gross Violations of International Human Rights Law and Serious Violations of International Humanitarian Law indicate that rehabilitation should include medical and psychological assistance, as well as legal and social services. It should be noted that the categories of victims during the armed conflict include wounded and sick combatants, prisoners of war and the civilian population. Therefore, rehabilitation is a form of reparation for victims of gross violations of international human rights law and serious violations of international humanitarian law during an armed conflict [9].

## CONCLUSIONS

Rehabilitation is an important component of clinical/medical assistance in situations of armed conflict and emergency and is necessary to mitigate the significant amount of disability that follows the surge of traumatic injuries and exacerbation of chronic diseases with devastating consequences for individuals, families and communities, resulting from insufficient access to rehabilitation.

Emergency medical personnel working in situations affected by armed conflict need to identify the ways of referral and/or local health professionals who can complete patient rehabilitation after the emergency medical assistance team has finished.

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### ADDRESS FOR CORRESPONDENCE:

**Olena O. Terzi**

Odessa National Medical University  
2 Valikhovskiy Lane, 65000 Odessa, Ukraine  
phone: +38 (048) 723-22-65  
e-mail: terzi.elena@ukr.net

### ORCID ID and AUTHORS CONTRIBUTION

0000-0003-4120-6526 – Olena O. Terzi (A, D, E, F)  
0000-0001-9239-5609 – Igor V. Shpak (B)

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical review of the article, F – Final approval of article

# Development of the Training of Rehabilitation Services Specialists in Ukraine

## Rozwój szkolenia specjalistów świadczących usługi rehabilitacyjne w Ukrainie

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Natalia V. Kharchenko<sup>1</sup>, Inna E. Shaparenko<sup>2</sup>, Pavlo V. Khomenko<sup>2</sup><sup>1</sup>Poltav State Medical University, Poltava, Ukraine<sup>2</sup>Poltav National Pedagogical University Named by V.G. Korolenka, Poltava, Ukraine

### SUMMARY

**Aim:** To define and reveal the content, specificity and peculiarities of rehabilitation services in Ukraine.**Materials and Methods:** Analysis and generalization of literary sources and Internet data on the implementation of rehabilitation services, systematic analysis and synthesis.**Conclusions:** After analyzing literary sources and Internet data, we found that rehabilitation services are a set of measures aimed at the functional restoration of a person and his impaired state.**Key words:** rehabilitation services, doctor, nurse, doctor-psychologist, psychologist, physiotherapist, occupational therapist, speech therapist, prosthetics technician**Słowa kluczowe:** świadczenia rehabilitacyjne, lekarz, pielęgniarka, lekarz-psycholog, psycholog, fizjoterapeuta, terapeuta zajęciowy, logopeda, technik protetyk

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### INTRODUCTION

Medical care is aimed at disease prevention. Rehabilitation services are all medical services aimed at preventing, eliminating, reducing or compensating for disability or the need for care, preventing their worsening or mitigating their consequences. Rehabilitation and preventive services can be provided on an outpatient or inpatient basis; they can be paid at home, at a recognized rehabilitation clinic or in an inpatient facility.

Different terminology is applied to the rehabilitation workforce in Ukraine, it is diverse and constantly changing. The National Classifier of Professions simultaneously uses both modern and older terms. Modern terms include, for example, physical therapy, physical rehabilitation medicine, and older ones include therapeutic gymnastics, medical therapist.

Therefore, qualitatively new professional training of physical rehabilitation specialists and improvement of the existing system of its implementation is necessary. According to our definition, complex rehabilitation is a complex multifactorial process that includes various, closely related and complementary types, including medical, physical, psychological, social, professional, economic, pedagogical, sports, household, technical, health and legal rehabilitation [1].

Physical therapy programs have dominated Ukraine since 1994, and approximately 80,000 people have received training in physical rehabilitation at 60-70 different universities in Ukraine.

Since 2015, the Ministry of Health has recognized the professions of physical and rehabilitation medicine, physical and occupational therapy (occupational therapy). Educational standards in physical and rehabilitation medicine, physical therapy, occupational therapy, and prosthetics and orthotics received increased attention and support.

Speech therapy remains in the education system, and currently little attention is paid to its integration into the health sector. The profession of prosthetist and orthotist is related to social services; Prosthetic technicians or prosthetic engineers are not recognized by the Ministry of Health, and their employment remains within the framework of the Ministry of Social Policy.

WHO notes: "There is a wide range of health professionals who provide rehabilitation interventions, including physical therapists, occupational therapists, speech and language therapists, orthopedic and prosthetic technicians, and physical medicine and rehabilitation physicians" [2].

The Ministry of Health and the Ministry of Education and Science are two ministries involved in the training of medical professionals. The Ministry of Health is responsible for undergraduate medical training and postgraduate medical specialization and continuing professional development, while the Ministry of Education and Science (Directorate of Higher and Adult Education) is involved in the following aspects of training:

- training of personnel for the rehabilitation system (bachelor's degree);
- definition of medical specialties;
- development of education standards (bachelor, master, PhD);
- attestation (minimum qualification level) [2].

In the modern world of globalization, the competition of national educational services must be ensured by a complex of various measures: legal, organizational, financial, etc. Legal direction, domestic norms should correspond to similar, uniform rules and practices of the most effective state (regional, international) systems. The effectiveness of this message is especially evident for the fields of knowledge and professions, their professional and educational support, which can be evaluated from the standpoint of universal content. Medicine is a clear confirmation of that. Indeed, fundamental medical standards are universal civilizational values [3].

Complex socio-political conditions caused by military actions in Ukraine do not contribute to the development of large-scale educational migration of students from other countries to obtain higher education in Ukrainian higher educational institutions [4].

### AIM

To define and reveal the content, specificity and peculiarities of rehabilitation services in Ukraine, as well as to establish opportunities and directions for their improvement.

### MATERIALS AND METHODS

Analysis and summarization of literary sources and Internet data on the implementation of rehabilitation services, systematic analysis and synthesis.

### REVIEW AND DISCUSSION

In 2015, the field of study of physical and occupational therapy shifted from education to health. Previously, graduates

of this profession, which had the name “physical rehabilitation specialist”, were included in the list of professionals of the Ministry of Social Policy, and accordingly did not have the right to work in hospitals or medical institutions. In modern terminology, these are physiotherapists and orthopedists. Table 1 presents the areas of training and program subject areas of higher education in Ukraine.

The Ministry of Education and Science issues licenses to educational institutions for training. Table 2 summarizes the number of educational institutions licensed to provide different levels of education in the rehabilitation sector.

Detailed information on the number and location of specialists in physical and rehabilitation medicine, physiotherapists, occupational therapists, speech therapists and prosthetists/orthopedics working in Ukraine is not yet available. But when assessing the rehabilitation workforce in Ukraine, Table 3 presents the data.

Information on the number of applicants and graduates of training programs related to rehabilitation can indicate trends in the workforce.

Table 4 provides information on the number of entrants in 2019.

In 2019, a new training program for doctors of physical and rehabilitation medicine was introduced. Physicians with a specific specialization in rehabilitation can obtain a secondary specialization in physical and rehabilitation medicine through an “accelerated” (four-month) retraining program. This program is offered at five medical universities: in Kyiv, as well as in Dnipro, Kharkiv, Vinnytsia, and Zaporizhzhia. Since September 2020, three more universities have been added: Lviv, Odesa and Ternopil.

In 2018, the project “Creation of prosthetic and orthopedic education in Ukraine” was launched. Upon successful completion of the program and skill assessment, experts of the International Society of Prosthetics and Orthopedics (ISPO) award the international qualification of associate prosthetist/orthologist and issue a certificate. Table 5 provides information on the number of entrants to training courses for associate prosthetists/orthopedics.

The Ministry of Health does not recognize the profession of prosthetics and orthotics. Therefore, this profession comes under the responsibility of the Ministry of Social Policy.

**Table 1.** Areas of training and program subject areas of higher education in Ukraine

Rehabilitation staff	Field of study (general code)	Code	Educational specialty
Doctor	Health care (22)	222	medicine
Nurse	Health care (22)	223	nursing
Doctor-psychologist	Health care (22)	225	Medical psychology
Psychologist	Social and behavioral sciences (05)	053	Psychology
Physiotherapist	Health care (22)	227	Physical therapy, occupational therapy
Occupational therapist	Health care (22)	227	Physical therapy, occupational therapy
Speech therapist	Education (01)	016	Special education
Prosthetist technician	Chemical and bioengineering (16)	163	Biomedical engineering

Source: [2].



**Table 2.** The number of educational institutions that have a license to conduct rehabilitation training in Ukraine

Educational specialty	Code	The number of educational institutions that have a license for training in an educational specialty			
		Bachelor	Master's degree	Doctor of Philosophy (PhD)	Pre-higher education
Physical therapy, occupational therapy	227	64	39	8	–
Special education	016	36	28	6	–
Psychology	053	139	101	57	–
Medical psychology	225	Н/Д	5	3	–
Medicine	222	Н/Д	36	49	–
Nursing	223	25	8	2	105

Source: [2].

**Table 3.** Estimates of the rehabilitation workforce in Ukraine

Profession	Estimated numbers	Figures from the Center for Medical Statistics (CMS)	Figures of NHSU	Figures of the Ministry of Social Policy	Figures of the Ministry of Education and Science
Specialists in physical and rehabilitation medicine	283	7	200	Not received	–
Physiotherapy	80000	1136	1418	Not received	–
Ergotherapy	Not specified	3	413	Not received	635 in inclusive education
Speech therapists	It is unknown	–	–	Not received	785
Prosthetists/orthopaedists	216	–	–	240	–

Source: [2].

**Table 4.** Rehabilitation personnel who started work in 2019

Subject area	Code	Bachelor applicants of 2019	Master's degree applicants in 2019
Physical therapy, occupational therapy	227	2679	1452 (codes 227.01 and 227.02)
Special education	016	1859	1611
Psychology	053	7569	4568
Medical psychology	225	n/a	195
Medicine	222	n/a	13111
Nursing	223	Entrants for a junior specialist: 9752	

Source: [2].

**Table 5.** Number of entrants to associate prosthetist/orthologist training courses

Origin/place of work of the intern	2018-2019 Study			2020–2022 Study		
	Man	Woman	In total	Man	Woman	In total
Dnipro	–	–	–		1	1
Kharkiv	4	2	6	2		2
Kyiv	2	-	2	3	1	4
Lviv	1	-	1	3		3
Odesa	–	–	–	1		1
Poltava	1	–	1	1		1
Ternopil	–	–	–	1		1
Zaporizhzhia	–	–	–	1		1
TOGETHER	8	2	10	12	2	14

Source: [2].

The majority of prosthetic and orthotic work is based on regional communal enterprises that manufacture prostheses and orthoses. There are 38 manufacturers of prosthetic and orthotic products in Ukraine (12 of them state-owned). In order to obtain a license from the Ministry of Social Policy, everyone must have “qualified” specialists.

Psychologists have two fields of study – one in the field of behavioral sciences and the other in the field of health care. This direction is very important. An unhealthy lifestyle can have long-term consequences for the development of hypertension. In this sense, lifestyle counseling and health literacy focused on weight control are needed for university students who are exposed to social trends of unhealthy habits [5].

The sharp deterioration in the physical development of the younger generation is cause for concern. In comparison with the last century, the morbidity of young people has increased by 29.9%. More than 33% of young men and women, among first-year students, have chronic diseases [6].

Today, there are no trained audiologists in Ukraine. If the educational specialty “cognitive and communicative therapy” is implemented, it will be an entry into the profession of an audiologist.

In the Bachelor of Prosthodontics/Orthopaedics program (code 227), there is a competency standard related to ancillary products. It is valid for four credits (approximately 120 hours) and is “all inclusive”. One of the problems is that very few universities have adequate teaching facilities. There is evidence of separate wheelchair provision training using WHO wheelchair training packages (Table 6).

From January 2020, continuing professional development (CPD) is mandatory for doctors. No other medical profession is required to have CPD, but CPD legislation for all medical professionals is being drafted (Table 7).

In Ukraine, there are many professional associations that deal with rehabilitation. For some professions there is more than one association.

The salary of a physiotherapist or occupational therapist in a state institution is low, at the level of the minimum wage. But according to unofficial information, almost all specialists work in a private institution, or have their own private number of patients.

Accessible facilities and the availability of medical equipment in the institution are mandatory conditions for obtaining permission to finance the NHSU.

Funding for rehabilitation is diverse. The main state mechanisms for financing health care and rehabilitation are the National Health Service, the Ministry of Social Policy and the Ministry of Health. The National Health Service of Ukraine (NHSU) provides three rehabilitation packages (Table 8).

NHSU provides in the amount of the minimum wage per patient for all rehabilitation packages. This amount is fixed. This does not depend on the number of rehabilitation services provided, nor on the duration of inpatient treatment. Each institution calculates the number of patients expected during the year and multiplies it by UAH 6,500. For each rehabilitation package, the NHSU requires a rehabilitation workforce and requires a statement of need for a multidisciplinary rehabilitation team, basic equipment, goal-setting principles

**Table 6.** Number of people trained in wheelchair provision (using WHO training packages)

Dates	Base	Intermediate	The training of trainers is basic	Joint training with the training of trainers of basic graduates
September 2016	16	–	–	–
February 2017	–	14	–	–
July 2018	–	–	7	–
December 2018	16	–	–	3
LDSC (2017–2020)	22	–	–	–
EVERYTHING IS LEARNED	54	14	7	3

Source: [2].

**Table 7.** Summary of regulatory aspects relevant to the rehabilitation workforce

Profession	Scope of practice	Award of the Ministry of Health	A license is required	Continuous professional development is required (CPD)
Physical rehabilitation medicine	Yes	Yes	Yes	Yes
Фізіотерапія	Yes	Yes	No	No
Трудотерапія/ерготерапія	Yes	Yes	No	No
Логопедія	No	No	No	No
Протезування/ортопедія	No	No	No	No

Source: [2].

**Table 8.** Rehabilitation associations in Ukraine

Name of the association	Acronym	Date of creation	Members	Member description	International Affiliation(s)
Ukrainian Society of Physical and Rehabilitation Medicine (www.utfrm.com.ua)	USPRM	2014	150	Doctors of physical and rehabilitation medicine and other doctors	Section and Council of Physical and Rehabilitation Medicine of the European Union of Medical Specialists European Society of Physical and Rehabilitation Medicine (ESPRM) ISPRM
Ukrainian Society of Neurorehabilitation	USNR	2013	150	Specialists in neurorehabilitation	World Federation of Neurorehabilitation (WFNR) \ European Federation of Neurorehabilitation Societies (EFNRS)
Ukrainian Association of Physical Therapy (www.physrehab.org.ua)	UAPT	2007	163	Physiotherapists and students of physical therapy	World physiotherapy 2011
Ukrainian Association of Physical Therapy (www.upta.com.ua )	UPTA	2018	approx.150	Physiotherapists and students of physical therapy	n/a
Ukrainian Society of Occupational Therapists (https://wfot.org/member-organizations/ukraine-ukrainian-society-ofergotherapists)	USET	2016	approx. 49	Persons working or working as occupational therapists; students and teachers of occupational therapy	Associate member of the World Federation of Occupational Therapists (WFOT) since 2017
Ukrainian Society of Speech Therapy	US SLT	2018	approx.10	Ukrainian and American speech therapists	Affiliations with the American Speech-Language-Hearing Association (ASHA)
Public union of the International Society of Prosthetics and Orthopedics (ISPO) - Ukraine (www.ispo.org.ua)	PU "ISPO Ukraine"	2015	Entities; not natural persons	There is no information	ISPO – 2015

Source: [2].

and the use of the International Classification of Functioning, Disability and Health (ICF).

In the Ministry of Social Policy, the main methods of financing rehabilitation support and persons with disabilities are the Pension Fund, social insurance and three national programs related to rehabilitation.

There is no data from the Ministry of Health on rehabilitation costs. Out-of-pocket expenses are unknown [2].

### CONCLUSIONS

The history of the modernization of the health care system is based on the progress of the country’s public administration and health care management within the framework of a sector-wide approach. The WHO European Bureau pays great attention to the development of the National Health Service system during the implementation of their basic policy.

Key topics that will affect the future of rehabilitation in Ukraine include the current health care structure, the culture surrounding disability, international and national sources of involvement, and a revised training program for new and existing rehabilitation professionals. Along with a curriculum that meets international accreditation standards, there needs

to be an influx of employment and career opportunities developed by the government to encourage people to work in the rehabilitation sector.

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**Conflict of interest:**

The Authors declare no conflict of interest

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**ADDRESS FOR CORRESPONDENCE:**

**Nataliya V. Kharchenko**

Poltava State Medical University  
23 Shevchenko str., 36011 Poltava, Ukraine  
phone: +380506191187  
e-mail: nvkharchenko1963@gmail.com

**ORCID ID and AUTHORS CONTRIBUTION**

0000-0001-8668-1596 – Natalia V. Kharchenko (A, B, D)

0000-0002-0960-8894 – Inna E. Shaparenko (E, F)

0000 0003 3065 9095 – Pavlo V. Khomenko (E, F)

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