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RELATIONSHIP BETWEEN IDIOPATHIC SCOLIOSIS OF THE SPINE AND DENTOGNATHIC ANOMALIES IN ADOLESCENTS

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ABSTRACT

Introduction: According to the data of the national statistics, the disease of the musculoskeletal system among the teenagers takes the third place among the main types of diseases. So, we decided to analyze and study the connection between the idiopathic scoliosis of the spine and dentognathic anomalies in children aged 12-15 years old in Uzhhorod (Ukraine).

The aim: To determine the characteristic violations of the dentognathic system in adolescents with idiopathic scoliosis of the spine, taking into account the anatomical type of lesion.

Materials and methods: 225 people were examined, including 190 girls and 35 boys. All patients were under the control of an orthopedic physician.

Results: The most common type of scoliosis is found to be thoracolumbar, which is noted in 114 patients. As a result of analysis it was found that the most characteristic disorders of the dentognathic system in patients with thoracolumbar scoliosis were distal bite ($80 \pm 2.0\%$), sagittal gap ($37.5 \pm 2.1\%$), deep bite ($22.5 \pm 2.3\%$). In the group of healthy children, without scoliosis, the prevalence of dentognathic anomalies is 2.6 times lower than in patients with idiopathic adolescent scoliosis.

Conclusions: Regardless of the localization of deformation in the spine under scoliosis, all the groups of patients are characterized by the following signs: sagittal gap, shortening of the upper dentition, distal bite, crowding of the teeth on the lower jaw.

KEY WORDS: age group 12-15 years, scoliosis, dentognathic anomalies, spine, bite

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INTRODUCTION

According to the data of the national statistics, the disease of the musculoskeletal system among the teenagers takes the third place among the main types of diseases. They are mainly scoliosis, flat foot, rheumatoid arthritis and others. According to the investigations, the prevalence of posture and scoliosis disorders among the children varies from 5% to 46% [1]. Scoliosis leads to the serious spine and chest deformations and it tends to the progress of the disease especially when the child stops growing. Scientific researches of the last years have showed that the metabolic osteopathy occurs mainly in the childish period [2]. Children who suffer from scoliosis have problems with biotransformation of the main structural components of the connected tissue, caused by the integral reaction of the organism to the combination of the two pathologies: osteopenia and scoliosis. Modern scientific literature confirms that osteopenia, which accompanies scoliosis, progresses in peak periods of intense growth and regresses in the post-adolescence period, indicating the importance of violations of the morphofunctional state of bone tissue in the pathogenesis of scoliosis [3,4]. The symptoms of the osteopenia are: the decrease of the minerals and the mineral density of the bone tissue, the changes in the metabolism that lead to the progress in the spine's deformations. The dentofacial system as a part of the musculoskeletal system faces the same metabolic changes that the bone tissue of our organism does [5,6].

The dentognathic anomalies are widespread among children who have problems with their posture (1,5 times frequency) and in 2,5 times more frequent among the children who suffers from the scoliosis. Among the children who suffers from the scoliosis the dentognathic anomalies occur from 69 to 82,5 % [7]. Some authors consider that this is because of the wrong fixed facts about the influence of the postural reflexes on the development of the occlusion anomalies. In those patients, the position of the head changes, the sublingual bone is distal, which in turn contributes to the distal shift of the mandible, the tongue loses contact with the palate, lies at the bottom of the oral cavity, there is a decrease in the tone of the *m. orbicularis oris*. When the mineralization in the bone tissue decrease the form of the bones changes as well. As a result, posterior occlusion, transversal anterior occlusion and aggregation of the teeth develop [8].

THE AIM

Aim of research – to determine the characteristic violations of the dentognathic system in adolescents with idiopathic scoliosis of the spine, taking into account the anatomical type of lesion.

MATERIALS AND METHODS

225 children have been examined at the age of 12 to 15 (190 of them were girls ($84,4 \pm 3,3\%$) and 35 - were boys ($15,6 \pm 2,1\%$).

All patients were under the control of an orthopedic physician.

In studying the spine deformity, the subjects analyzed: anatomical type of deformation; side of arc of deformation; degree of deformation severity; the value of the arc curvature of the spine [9].

In the course of investigation great attention was paid on: the type of the closure of dental rows in three positions (sagittal, horizontal and vertical); the dentognathic anomalies of the dental rows and of the separate teeth; the defect in functions and esthetics.

The position of the occlusion and of the separate teeth has been investigated by means of the Angle's classification and WHO recommendations (1997) [10].

All calculations were performed on a PC using a licensed software for operating system Windows and standard software package STATISTICA 6.1. Statistical data processing was carried out using Student's probability *t*-test.

RESULTS

According to the anatomical types, the patients who suffer from scoliosis have been divided into 3 groups: with thoracic deformation, thoracolumbar deformation, lumbar deformation. The fourth group was almost healthy children without deformations. As a result, the most frequent type of scoliosis turned out to be a thoracolumbar one (114 patients suffering it). The data of the prevalence of the patients who suffer from scoliosis is in the Table 1.

Groups of patients were formed in accordance with the revealed orthopedic symptom complex, with the following characteristics of the violations of the dentognathic system.

The evaluation of the occlusion among the patients of the Group 1 (the thoracic deformation) has showed that the most frequent type of teeth occlusion in the sagittal position is the 2 classification according to Angle's classification. The distal occlusion occurred among 29 patients ($63,0 \pm 2,0\%$). Neutral occlusion has been examined among 11 patients ($23,9 \pm 2,2\%$).

Sagittal gap has been examined among 17 patients ($36,6 \pm 2,1\%$). The deep bite occurred among 9 patients ($19,6 \pm 2,3\%$). In the course of investigation, the cross occlusion appeared to be among 5 patients ($10,9 \pm 2,6\%$). On the level of the dental rows in the sagittal position the most frequent is the decrease of the lower row (12 people - $26,1 \pm 2,2\%$) and the upper one (9 people - $19,6 \pm 2,3\%$). In the horizontal position the narrowing of the upper dental row has been investigated (11 people - $23,9 \pm 2,2\%$). The lack of the placement of the front dental row has been found among 28 people ($60,9 \pm 2,1\%$). Diastema on the lower and upper jaws has been examined among 6 children ($13,0 \pm 2,4\%$). The replacement of the central line has been examined among 17 patients ($36,9 \pm 2,1\%$), deformation of the spine on the right (40 people - $86,9 \pm 2,0\%$), it has been also examined the shifting of the central line of the lower jaw on the left among 6 patients ($13,0 \pm 2,4\%$) and on the right only in 2 cases ($4,3 \pm 4,3\%$).

As a result of the research it have been found out that

the most frequent deformation of the dentofacial system is among the patients with the thoracic scoliosis: distal occlusion ($57,8 \pm 5,9\%$), sagittal gap ($38,3 \pm 5,7\%$), deep bite ($18,4 \pm 4,6\%$).

The Group II of patients with left-sided and right-side thoracolumbar scoliosis of the spine was 114 persons ($50,7 \pm 2,0\%$). Right-hand localization of the spine deformity is characteristic for 47 ($41,2 \pm 2,0\%$), left-handed for 67 patients ($58,8 \pm 2,0\%$).

In assessing the bite in the sagittal plane in Group II, it was found that distal bite is characterized for 68 people ($59,6 \pm 2,0\%$). In the 10 patients ($8,8 \pm 2,2\%$) mesial bite was detected. Sagittal gap was found in 59 patients ($51,8 \pm 2,0\%$). In the vertical plane deep bite was predominant (32 people - $28,1 \pm 2,0\%$), open bite was detected in 12 examined ($10,5 \pm 2,2\%$). In the study of occlusion in a horizontal plane was established a cross bite in 8 persons ($7,0 \pm 2,3\%$). Extension of the upper dentition was diagnosed in 13 patients ($11,4 \pm 2,2\%$), the lower dentition in 5 people ($4,4 \pm 2,6\%$). The shortening of the upper dentition was detected in 14 patients ($12,3 \pm 2,1\%$), shortening the lower tooth row - in 29 cases ($25,4 \pm 2,0\%$). At the level of dental rows in the horizontal plane, the narrowing of the upper dental arc was characterized for 20 surveyed ($17,5 \pm 2,1\%$). The deficit of place (mainly the front group of teeth) was diagnosed in 48 patients ($42,1 \pm 2,0\%$). In 49 people ($43 \pm 2,0\%$) oral displacement was noted, and 28 patients ($24,6 \pm 2,1\%$) had a vestibular displacement of teeth. The diastema and the trema on the upper and lower jaw were noted in 25 ($21,9 \pm 2,1\%$) and 19 ($16,7 \pm 2,1\%$) patients respectively. The deficit of the place for teeth was noted in 22 cases ($19,3 \pm 2,1\%$).

The Group III - the scoliosis of the lumbar spine is represented by a group of 40 patients, which is $17,8 \pm 2,0\%$ from all the examined patients. It was found that in 13 patients was neutral bite ($32,3 \pm 2,2\%$), in 32 ($80 \pm 2,0\%$) - distal. Sagittal gap was observed in 15 patients ($37,5 \pm 2,1\%$). Deep bite was diagnosed in 9 people ($22,5 \pm 2,3\%$). In the sagittal plane at the level of dentition, the shortening of the lower tooth row was observed in 8 patients ($20 \pm 2,3\%$), the shortening of the upper dentition was observed in 6 persons ($15 \pm 2,4\%$), the extension of the upper dentition had 8 ($20 \pm 2,3\%$). At the level of dental rows in the horizontal plane, the narrowing of the upper dental arc was determined in 10 people ($25 \pm 2,2\%$). In studying the state of individual teeth, vestibular displacement was detected in 15 people ($37,5 \pm 2,1\%$), oral displacement of the anterior teeth - in 22 ($55 \pm 2,1\%$). The diastema and the trema were noted in 8 ($20 \pm 2,3\%$) and 2 ($5 \pm 4,3\%$) patients respectively. The deficit of the place of teeth was in 18 surveyed ($45 \pm 2,1\%$). The displacement of the middle line is characteristic for 19 people ($47,5 \pm 2,1\%$).

As a result of the analysis of the obtained data, it was found that the most characteristic disorders in the Group IV (practically healthy children without scoliotic spine deformation) were distal bite ($24 \pm 2,6\%$), sagittal gap ($16 \pm 2,8\%$), deep bite ($12 \pm 3,2\%$), shortening of the lower tooth row ($16 \pm 2,8\%$), oral position of the teeth ($12 \pm 3,2\%$).

Table 1. The prevalence of the patients who suffer from scoliosis

Group of patients	Examined boys		Examined girls		Total amount of examined patients	P±m %
	Abs.	%	Abs.	%		
I - Thoracic scoliosis	7	15,2±2,4	39	84,8±2,0	46	20,4±2,0
II - Thoracolumbar scoliosis	18	8±2,1	96	42,7±2,0	114	50,7±2,0
III - Lumbar scoliosis	6	2,7±2,4	34	15,1±2,0	40	17,8±2,0
IV - Control group (Almost healthy children)	4	1,8±2,8	21	9,3±2,1	25	11,1±2,1
Total amount	35	15,6±2,0	190	84,4±2,0	225	100

DISCUSSION

As a result of analysis of the obtained data, it was found that the most characteristic disorders of the dentognathic system in patients with lumbar scoliosis were distal bite ($80 \pm 2.0\%$), sagittal gap ($37.5 \pm 2.1\%$), deep bite ($22.5 \pm 2.3\%$).

The analysis of the comparison of distal occlusion prevalence in the groups of patients with different types of scoliosis allowed to establish that the most commonly distal bite met with the thoracic scoliosis.

However, the degree of severity of bite violations, the characteristic symptom of which is the sagittal gap between dental rows, is highest in patients with thoracolumbar scoliosis. Deep bite is most commonly encountered in patients with deformation of the lumbar part of spine.

The deficiency of the place for the teeth was most often noted in patients with lumbar and thoracic deformation of the spine.

These studies are in accordance with what affirmed by Lippold et al. (2003), [11] that the scoliotic curves occur in the frontal plane and - through the head posture that is tilted sideways - play an important role in the development of the different dentofacial asymmetries.

Shifting of the central line of the lower jaw on the left is noted for thoracic scoliosis.

Frequency of dental anomalies does not depend on the severity of scoliosis deformation and is 100%.

In such patients, the main type of disruption of bite is distal closure of dental rows. At the level of the dentition, violations such as shortening of the upper dentition, shortening of the lower tooth row, narrowing of the upper tooth row are detected.

In the group of healthy children, without scoliosis, the prevalence of dentognathic anomalies is 2.6 times lower than in patients with idiopathic adolescent scoliosis. Segatto et al. (2008) analyzed also other occlusal characteristics of the frontal region of dental arch and found some other significant differences between the scoliotic and the health groups. In particular, the subjects with scoliosis showed a significant higher overjet and a higher midline deviation respect to the control group. Then, the scoliotic group was characterized by lower overbite compared to the determined mean values (3.10 mm) of the control health group [12].

In addition to the studies that compared scoliotic to healthy subjects, other investigations underlined a relation between the occlusion and the vertebral column alignment, also in not scoliotic subjects [13].

CONCLUSIONS

Regardless of the localization of deformation in the spine under scoliosis, all the groups of patients are characterized by the following signs: sagittal gap, shortening of the upper dentition, distal bite, crowding of the teeth on the lower jaw, predominantly in the anterior. Dentist during the examination of children and adolescents knowing violation of the dentition, which most commonly found in scoliosis may recommend the patient to see a orthopedic - traumatologist doctor to detect scoliosis.

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The Authors declare no conflict of interest

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