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Differences of the Bacterial, Biological and Immunological Aspects of Periimplantitis and Periodontitis. Literature Review. Part 1

Відмінності бактеріологічних, біологічних та імунологічних аспектів пародонтальної та періімплантитної патологій. Огляд літератури. Частина 1

**Nastych O.¹, Melnychuk I.², Pryshlyak V.³,
Goncharuk-Khomyn M.², Siegfried L.³**

¹Private practice, New York, USA

²Uzhgorod National University, Ukraine

³Pavol Jozef Safarik University, Head
Kosice, Slovakia

Настич О.І.¹, Мельничук І. Д.², Пришляк В.³,

Гончарук-Хомин М.Ю.², Зігфрід Л.³

¹Приватна практика, Нью-Йорк, США

²Ужгородський національний університет,
Україна

³Університет Павла Йозефа Шафарика в
Кошицях, Словаччина

Адреса для кореспонденції:

Nastych Oksana

e-mail:nastych@msn.com

Purpose: To compare the differential impact of biological, bacterial and immune factors on the peculiarities of periodontitis and peri-implantitis, and their role in the prediction of pathologies occurrence based on a retrospective analysis of published data; to compare the results of previously published studies about the risk of peri-implant lesions development among patients with periodontal pathology in anamnesis, and determine the impact of periodontitis on the dental implants success rate. **Methods:** Retrospective analysis of the literature performed using search systems and databases (PubMed, BIOSIS Previews via ISI Web of Science, ISI Citation via ISI Web of Science and GoogleScholar) and based on the principle of data sampling due to relevant keywords. Review of the literature conducted using the method of content analysis. Information organization performed using the principles of typological, structural and analytical categorization of obtained data (Predictive Analytics SoftWare Statistics, PASWS 18.0.2, SPSS). **Results:** A differential approach to the evaluation and prognosis of periodontal and peri-implant lesions based on the number of fundamental differences within supporting structures around natural teeth and titanium surface of intraosseous constructions, although each of these pathologies is destructive and progressive by nature, and also associated with the loss of adjacent tissues. Obtained data due to the results of the retrospective analysis of the literature shows significant differences in the nature of biological reactions to the presence and progression of periodontal and implant-associated pathologies. **Conclusions:** Peri-implantitis and periodontal lesions characterized by their specific bacterial, biological and immunological markers that can be used for evaluation of pathology progression, its prognosis and selection of adequate treatment algorithm. Based on the results of literature review it can be stated, that occurrence of peri-implantitis is more relevant to the patients with a history of periodontitis. Due to this fact, verification of microbial content of the oral cavity and its adequate correction is advantageous before dental implantation among patients with periodontal lesion in anamnesis.

Key words: periimplantitis, periodontitis.

Мета: На підставі даних ретроспективного огляду літератури провести диференційне порівняння впливу низки біологічних, бактеріальних та імунних факторів на особливості розвитку та предикції патологій пародонтиту та періімплантиту; порівняти результати попередніх досліджень щодо ризику виникнення періімплантитного ураження у пацієнтів із патологією пародонта в анамнезі та на основі проаналізованих даних визначити вплив пародонтиту на успішність денальної імплантації. **Методи:** Ретроспективний аналіз літературних джерел проводився з використанням пошукових систем та баз даних (PubMed, BIOSIS Previews via ISI Web of Science, ISI Citation via ISI Web of Science та GoogleScholar) за принципом формування вибірки відповідних даних за ключовими словами. Розгляд публікацій проводився з використанням методу контент-аналізу. Систематизацію даних проводили з використанням принципів типологічного, структурного та аналітичного групування результатів дослідження (Predictive Analytics SoftWare Statistics, PASWS 18.0.2, SPSS).

Результати: Диференційний підхід до оцінки пародонтальних та періімплантитних уражень обумовлений низкою принципових відмінностей підтримуючих структур навколо власних зубів та поверхні титанової інфраконструкції, хоча при кожній із патологій відбувається ураження та втрата суміжних тканин. На основі проведеного ретроспективного аналізу літературних джерел вдалось встановити, що дані попередніх досліджень свідчать про значиму різницю у характері біологічних реакцій організму при наявності патологій па-

родонтиту та періімплантиту. **Висновки:** Періімплантитні та пародонтальні ураження характеризуються конкретними бактеріальними, біологічними та імунологічними маркерами, що можуть бути використані для визначення ступеня ураження, прогнозу розвитку та вибору адекватного методу лікування. Під час аналізу фахових публікацій у більшості з них був підтверджений факт підвищення ризику виникнення періімплантитних патологій у хворих з пародонтитом в анамнезі, що свідчить про необхідність детальної верифікації мікробіологічного пейзажу порожнини рота та її адекватної корекції перед початком ятрогенного втручання з приводу встановлення дентальних імплантів.

Ключові слова: періімплантит, періодонтит

INTRODUCTION

A differential approach to the evaluation and prognosis of periodontal and peri-implant lesions based on the number of fundamental differences within supporting structures around natural teeth and titanium surface of intraosseous constructions, although each of these pathologies is destructive and progressive by nature, and also associated with the loss of adjacent tissues. Microbiological content of the peri-implant area with no signs of pathological lesion usually implies the existence of gram-positive facultative cocci and bacillus, along with a possible very small number of anaerobic microrepresentatives. During the progression of peri-implant pathological lesion microbiocenosis begins to change for the predominant prevalence of gram-negative microorganisms. Moreover, among the microbions of peri-implant pathology there is a possible determination of representatives of both red and orange periodontal complexes and other related pathological bacteria. Therefore, the analysis of the characteristics of peri-implantitis and periodontal disease, and their degree of association in terms of bacterial, biological and immunological factors are relevant with respect to the possible risk of peri-implantitis occurrence in patients with periodontitis history. Such analysis is also essential for adequate correction of microbiological compound within oral cavity before problematic iatrogenic

intervention and selection of the appropriate method of dental treatment.

PURPOSE

To compare the differential impact of biological, bacterial and immune factors on the peculiarities of periodontitis and peri-implantitis, and their role in prediction of pathologies occurrence based on a retrospective analysis of published data; to compare the results of previously published studies about the risk of peri-implant lesions development among patients with periodontal pathology in anamnesis, and determine the impact of periodontitis on the dental implants success rate.

MATERIALS AND METHODS

Retrospective analysis of the literature performed using search systems and databases (PubMed, BIOSIS Previews via ISI Web of Science, ISI Citation via ISI Web of Science and GoogleScholar) and based on the principle of data sampling due to relevant keywords. Review of the literature conducted using the method of content analysis, which included the formulation of concept and object of the analysis, assessment of the selected sources with the formation of the researched sample, determination of the empirical models, categorization of the relevant data by the structural units definition, qualitative and quantitative examination of text materials with further interpretation of the results. Information organization performed

using the principles of typological, structural and analytical categorization of obtained data (Predictive Analytics SoftWare Statistics, PASWS 18.0.2, SPSS).

RESULTS AND DISCUSSION

N. Lang (2010) during the commensuration of the biological characteristics indicative for the periodontitis and peri-implantitis concluded that these pathologies are similar due to the action of bacteriological factors, relative phasing progression and treatment planning [1]. However, although the reaction of the soft tissues during peri-mucositis and gingivitis are almost comparable, progressive accumulation of bacterial biofilm around dental implants could trigger a more pronounced inflammatory response than around the dentoalveolar unit under similar conditions. In some experiments initiated peri-implant lesions marked by the periods of rapid progression in which infectious agents were able to reach the area of the bone marrow space of the residual ridge. In such periods of acute progressive destruction of surrounding tissue that are intermittent by nature, specific of peri-implantitis is markedly different from the classical picture of periodontitis. Schaumann et al. (2014) examined the variability of bacterial flora around periodontally-compromised teeth and within the areas affected by peri-implantitis lesions by the pyrosequencing of supragingival and infragingival compounds, and reached the following conclusions: there are more similarities

among supragingival and infragingival plaque components around problematic implants than around troubled teeth; microbial composition of plaque is largely consisting of gram-positive taxa both at the periodontal and peri-implant lesions, however this data differ from the results obtained in the a number of similar previous studies; contamination common species in both plots were presented by *Streptococcaceae* Rothia and *Porphyromonas*, which does not significantly differ by the concentration [2]. Thus, the data obtained during pyrosequencing allows obtain deliberate consideration of microbial landscape of affected areas, but the amount of such data is not enough for the systematic conclusion, so there is an actual need of more experimental research using other methods of laboratory identification of microbiota representatives. de Oliveira Leitão (2005) used PCR during the comparison of clinical signs of bleeding on probing and presence of specific microflora representatives. Due to the obtained results probing parameters may be associated with the presence of periodontal pathogens, such as *Actinobacillus actinomycetemcomitans*, *Porphyromonas gingivalis* and *Prevotella intermedia*, whereby in some cases these types of bacteria were found in patients without any periodontitis history [3]. G. Avila-Ortiz (2015) have even noticed some correlation between probing depth at peri-implantitis region and the level of detected IL-1 β and IL-8 level at peri-implant sulcus [4]. Moreover, although the level of periodontal pathogens was below 1% among other oral microbiota representatives, they often remain unregistered due to the technical limitations of diagnostic methods, and the reaction to the presence of such bacteria is also purely individual. Patients with the polymorphism of coding and production agents of interleukins and necrosis factor alpha demonstrate

quick and severe reaction even at small concentrations of existing periodontal microbial infection, while among other patients similar concentrations of microorganisms can not provoke any clinical symptoms. According to Y. Takeuchi (2013) microflora composition within peri-implantitis defects is more versatile compared to such in periodontitis areas. In addition, in some cases specific types of bacteria, such as *Parvimonas micra* were found only in pathological lesions around the implant, and were not identified in the inside the microbial compounds of periodontally compromised sites [5]. N. Maruyama (2013) conducted studies aimed to evaluate the bacterial microbiota of peri-implantitis and periodontitis sites taking into account individual variations in different patients [6]. At the conclusion it was found that some strains of microorganisms are specific to each disease, and others can register only through additional diagnostic methods and only during certain severity of lesion progression, because advance of pathological process performs parallel to the proliferation of certain types of microorganisms. Thus, representatives of specific microbiota, such as *Prevotella nigrescens*, *Peptostreptococcaceae sp.* and *Desulfomicrobium orale* can act as biological markers not only in terms of differentiation between periodontitis and peri-implantitis, but concentration levels of these microorganisms may indicate the progression and aggressiveness of the process. Collaborative research under the guidance of L. Canullo (2016) stated that *Parvimonas micra* is quite significant predictor of peri-implantitis lesion, even taking into account its polymicrobial nature [7]. Similar results were presented by Heydenrijk et al. (2002) in systematic literature review, during which it was concluded that the microbiological compound of peri-implant region depends on the bacterial

landscape of the oral cavity before dental implantation and on the level of its correction [8]. Also, the presence of periodontal pathogens is not necessarily to provoke a pathological process around implant structure, and in many ways the initiation of peri-implantitis depends on the individual immune response to the bacterial factor. Interesting fact, that the presence of *Staphylococcus aureus* is behavioral mostly for the resistant forms of periodontitis, while cases of acute discharge of pus and bleeding on probing at peri-implant regions also mostly correlated with the impact of this type of microorganisms [1]. Probably the association of *Staphylococcus aureus* and peri-implant lesions based on its affinity to the titanium surface texture features and values of the surface energy, which significantly differ from those in periodontally, compromised teeth. In addition, I. Abrahamsson (2002) studies suggest that laboratory initiated peri-implantitis is more aggressive around implants with modified surface compared with that around untextured implants, confirming previous research data on some implant-associated microorganisms to specific surfaces of titanium infraconstruction [9]. In turn, G. Persson and S. Renvent S. (2009) during their independent studies have shown the importance of a cluster included *Staphylococcus aureus* and *T. forsythia*, such as the unit associated with the occurrence of inflammatory lesion at peri-implant area [10].

According to L.J. Heitz-Mayfield and N.P. Lang (2010) given that peri-implantitis and periodontitis are similar by infectious nature, their treatment must include antibiotic therapy [1]. Given the importance of bacterial complexes in inflammatory lesions around intraosseous titanium constructions and during inflammatory and degenerative changes of periodontally compromised teeth, A. Mouratidou (2011) showed different

susceptibility to microbial complexes during the use of certain antibiotics, compared with the impact of antibiotics on pure cultures of pathogens [11].

However, except the above differences in the impact of bacteriological factors on the development of periodontitis and peri-implantitis, there are a number of

immunological and biological aspects that are also purely specific to each of the described pathologies.

(Продовження у наступному номері)

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