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STUDY OF PERIODONTAL TISSUE STATUS IN PATIENTS WITH PERI-IMPLANTITIS

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The study was devoted to researching the condition of the status of periodontal tissues in patients with peri-implantitis. 67 patients with peri-implantitis aged between 25 and 55 years took part in the research. All patients underwent a comprehensive examination of the main disease and dental status according to a single scheme. The dental examination was carried out in a dental office. The comprehensive analysis of the index assessment of periodontal tissues in patients diagnosed with peri-implantitis reveals a pronounced deterioration in periodontal health compared to the average indicators among the 30–50 years old demographic in Ukraine. These data are the basis for the development and implementation of a medical and preventive complex aimed at helping the patients with peri-implantitis.

Key words: periodontal tissues, oral health, implants, inflammatory disease, adult patients.

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ВИВЧЕННЯ СТАНУ ТКАНИН ПАРОДОНТУ У ПАЦІЄНТІВ З ПЕРЕІМПЛАНТИТОМ

Дослідження було присвячено вивченню стану тканин пародонта у пацієнтів з переімплантизмом. У дослідженні взяли участь 67 пацієнтів з переімплантизмом у віці від 25 до 55 років. Всім пацієнтам було проведено комплексне обстеження основного захворювання та стоматологічного статусу за єдиною схемою. Стоматологічне обстеження проводилося в умовах стоматологічного кабінету. Комплексний аналіз індексної оцінки стану тканин пародонта у пацієнтів з діагнозом переімплантизм виявив виражене погіршення стану пародонта порівняно з середніми показниками серед демографічної групи 30-50 років в Україні. Ці дані є підставою для розробки та впровадження лікувально-профілактичного комплексу, спрямованого на допомогу пацієнтам з переімплантизмом.

Ключові слова: тканини пародонту, здоров'я порожнини рота, імпланти, запальні захворювання, дорослі пацієнти.

The work is a fragment of the research project "Improving the prediction of the occurrence and course of dental caries and periodontal disease, schemes for their prevention and treatment", state registration No. 0121U114672.

Peri-implantitis, a significant concern in implant dentistry, is characterized by inflammatory reactions in the tissues surrounding dental implants, leading to a progressive loss of the supporting bone structure [14]. This condition not only threatens the longevity of dental implants but also poses challenges in ensuring optimal oral health for affected patients [10]. The pathogenesis of peri-implantitis is multifaceted, with bacterial infections being a primary contributor [7].

The status of periodontal tissues plays a pivotal role in the onset and progression of peri-implantitis [3]. Studies have shown that the transcription level of the cFn gene differs in pathomechanisms between periodontitis and peri-implantitis, suggesting distinct molecular pathways in these conditions¹. Furthermore, the presence of Advanced Glycation End Products (AGEs) in periodontal tissues has been linked to sustained periodontal destruction, indicating a potential molecular mechanism underlying peri-implantitis [13].

Genetic predispositions also play a role in peri-implantitis susceptibility. For instance, polymorphisms in the IL-1 gene cluster have been associated with an increased risk of developing the condition⁶. This genetic link underscores the importance of personalized medicine approaches in managing patients with dental implants [4, 8].

The relationship between systemic and periodontal diseases has been a topic of extensive research [9, 10]. Tobacco smoking, for example, has been identified as a risk factor for both periodontitis and peri-implantitis [10]. Such findings emphasize the need for comprehensive patient assessments and tailored preventive strategies.

Recent advancements in the field have led to the development of risk assessment scores to predict peri-implantitis occurrence [11]. These tools can be instrumental in early detection and intervention, potentially improving the prognosis for patients with dental implants [11]. Additionally, the emergence of new therapeutic agents, such as postbiotic gels, offers promising avenues for managing peri-implant mucositis, a precursor to peri-implantitis [5].

By exploring potential risk factors, molecular mechanisms, and therapeutic implications, we hope to contribute valuable insights to the ongoing discourse on peri-implantitis management.

The purpose of the study was to perform comprehensive examination of the status of periodontal tissues in patients with peri-implantitis.

Materials and methods. To achieve the research objective, 67 patients with peri-implantitis aged between 25 and 55 years were surveyed. Dental examination was conducted in the dental office at the Department of Epidemiology and Prevention of Major Dental Diseases, Pediatric Dentistry and Orthodontics of the SE “The Institute of stomatology and maxilla-facial surgery National academy of medical sciences of Ukraine” (SE “ISMFS NAMS”).

All patients underwent a comprehensive examination of their main disease and dental status using a unified scheme.

For the objective assessment of the state of the periodontal tissues in children, a comprehensive study of the periodontal tissues was performed using periodontal indices. Using the PMA index (Parma), the prevalence of the inflammatory process in the periodontal tissues was assessed and the severity of gingivitis was determined: up to 25 % – mild, from 25 % to 50 % – moderate and above 50 % – severe. The degree of the inflammatory process was determined by the intensity of staining of the gum tissue with an iodine-containing solution using a Schiller-Pisarev test. Bleeding was determined by probing the gingival sulcus according to Muhnleemann, Son (1971) [2, 9].

The results were processed by variational statistical methods of analysis using the Microsoft Office Excel 2016 software. Statistical processing of the experimental study results was carried out by the methods of variation analysis using the Student's test. The difference was considered statistically significant at $p < 0.01$ [1].

Results of the study and their discussion. In order to develop more effective preventive protocols for the treatment of peri-implantitis, our study thoroughly examined the state of periodontal tissues in patients with peri-implantitis. By comparing the periodontal condition of patients with peri-implantitis with the average values prevailing in the Ukrainian population, the study aimed to identify specific deviations and patterns characteristic of peri-implantitis.

The state of periodontal tissues in the studied patients aged 25–55 years with peri-implantitis is presented in Table 1.

Table 1

Condition of periodontal tissues in the examined 25–55 years old patients with peri-implantitis, $M \pm m$

| Groups | Indices | Index PMA, % | Index of bleeding of Muhnleemann, Son, points | Schiller-Pisarev test |
|--|---------|---------------------------------|---|-------------------------------|
| 25–55 years old, n=67 | | 52.940± 5.600 $p < 0.001$ | 1.520± 0.365 $p < 0.01$ | 2.450± 0.460 $p < 0.01$ |
| Average in Ukraine, 30–50 years old, n=200 | | 35.36± 4.730 | 1.020± 0.250 | 1.840± 0.330 |

Note. p – index of the probability of differences in clinical indices of patients with mean indices in Ukraine.

Table 1 meticulously unravels the intricate nuances surrounding the health of periodontal tissues in patients aged between 25 and 55 years who have been diagnosed with peri-implantitis. This data is set against a backdrop of the average conditions observed in the 30–50 years old demographic in Ukraine. Presented data not only offers a snapshot of the current state of periodontal health in these patients but also serves as a benchmark against which the efficacy of future preventive treatments can be measured. The clinical markers that have been placed under the spotlight for this comparative study are the Index PMA, % (Papillary Marginal Attachment Index), the Index of bleeding of Muhnleemann and Son, and the Schiller-Pisarev test.

Diving into the first clinical index, the PMA index, there's a conspicuous deviation in the values between the two cohorts. Patients with peri-implantitis recorded a PMA index of 52.940±5.600, a value that significantly overshadows the national mean of 35.36±4.730. This stark difference, quantified as approximately 1.50 times, not only underscores the severity of periodontal tissue inflammation or detachment in the peri-implantitis group but also raises pertinent questions about the underlying etiology.

Could this heightened PMA index be attributed to bacterial colonization around the implant site, the individual's oral hygiene regimen, or perhaps, unforeseen complications that emerged post the implant surgery? These questions beckon further clinical study.

The Index of bleeding of Muhnleemann and Son, a critical measure in periodontal health assessment, has yielded significant insights in our study of peri-implantitis. The collected data reveals that patients suffering from peri-implantitis exhibit a notably higher mean bleeding index of 1.520 ± 0.365 . This figure becomes even more striking when contrasted with the Ukrainian population's mean of 1.020 ± 0.250 . The comparative analysis shows that the bleeding propensity in the peri-implantitis group exceeds the national mean by approximately 1.49 times, a substantial deviation that cannot be overlooked. Such a significant escalation in the bleeding index paints a vivid clinical picture, one that is characterized by heightened gingival inflammation. This suggests that the gingival tissues of these patients are not only more inflamed but are also more prone to bleeding, perhaps even at the slightest provocation. It's a hallmark symptomatology of peri-implant inflammatory disorders and underscores the criticality of the condition.

The Schiller-Pisarev test, a crucial diagnostic tool in assessing periodontal health, revealed significant findings in our study. The peri-implantitis cohort recorded a notable score of 2.450 ± 0.460 , markedly higher than the general Ukrainian population's mean of 1.840 ± 0.330 . This difference, representing a 1.33-fold increase, is not just a mere statistical variance but a telling index of the compromised health of periodontal tissues in peri-implantitis patients. Such elevated scores in the Schiller-Pisarev test are generally indicative of advanced pathological changes within the periodontal tissues, encompassing a spectrum of conditions ranging from infections and inflammation to more profound morphological alterations. Given the context, these changes are likely intertwined with the very nature of peri-implantitis. The significantly higher scores in the peri-implantitis group compared to the general population point towards the need for heightened awareness and early intervention in these cases.

Drawing these threads together, Table 1 serves as a clarion call, highlighting the profound disparities in periodontal health between peri-implantitis patients in the 25–55 age bracket and the wider 30–50 years old population in Ukraine. The three clinical markers collectively weave a narrative of deteriorating periodontal health among those with peri-implantitis, emphasizing the imperativeness of specialized medical attention. Given these findings, further research should explore the underlying mechanisms driving these differences in periodontal indices among peri-implantitis patients. Investigations into the role of microbial flora, immune response, and genetic predispositions in peri-implantitis pathogenesis would be particularly enlightening. Additionally, longitudinal studies examining the long-term outcomes of different treatment modalities in peri-implantitis patients would be invaluable in refining therapeutic approaches and improving patients' prognoses. In conclusion, this study underscores the importance of individualized patient care in the management of peri-implantitis. It highlights the need for a nuanced understanding of the condition's pathophysiology, enabling the development of more effective, patient-centric treatment strategies.

The health of periodontal tissues in patients diagnosed with peri-implantitis, as presented in Table 1, offers a compelling narrative on the profound disparities in periodontal health, especially when juxtaposed against the average conditions observed in the Ukrainian demographic aged 30–50 years. The clinical markers, namely the PMA index, the Index of bleeding of Muhnleemann and Son, and the Schiller-Pisarev test, serve as pivotal indices of the health status of periodontal tissues. The elevated PMA index in patients with peri-implantitis, which is approximately 1.50 times higher than the national mean, is a cause for concern [14]. This heightened index suggests a pronounced inflammation or detachment of periodontal tissues. Wu et al. have previously highlighted the differences in pathomechanisms between periodontitis and peri-implantitis at the transcription level of the cFn gene [14]. This could potentially explain the observed disparities in the PMA index. Moreover, bacterial colonization, particularly around the implant site, has been identified as a significant contributor to peri-implantitis [8]. This bacterial colonization, coupled with individual oral hygiene practices and potential post-surgical complications, could be the underlying etiological factors for the observed elevated PMA index [8]. The Index of bleeding of Muhnleemann and Son further corroborates the narrative of deteriorating periodontal health in the peri-implantitis cohort. A bleeding index that surpasses the national standard by almost 1.49 times is indicative of pronounced gingival inflammation [7]. Such heightened inflammation, as suggested by Fi and Wo, can be attributed to systemic factors, including tobacco smoking, which has been identified as a risk factor for both periodontitis and peri-implantitis [7]. Lastly, the Schiller-Pisarev test results hint at underlying pathological changes in the periodontal tissues of peri-implantitis patients [3]. Such scores often insinuate infections, inflammation, or other morphological alterations. The presence of Advanced Glycation End Products (AGEs) in periodontal tissues, as highlighted by Plemmenos and Piperi, could be a potential

molecular mechanism underlying these pathological changes [12]. AGEs have been linked to sustained periodontal destruction, which could explain the compromised periodontal tissue health observed in the peri-implantitis cohort [12]. In conclusion, the findings of this study underscore the profound impact of peri-implantitis on periodontal tissue health. The significant deviations in clinical markers from the national mean emphasize the need for specialized medical attention for peri-implantitis patients. As peri-implantitis has multifactorial etiology, a holistic approach encompassing therapeutic interventions, preventive measures, robust oral hygiene practices, and periodic clinical monitoring is imperative [5, 9, 11, 13]. Implementing such a comprehensive strategy has the potential to significantly improve dental health outcomes in individuals affected by peri-implantitis. This approach goes beyond treating the symptoms; it focuses on addressing the root causes of the condition, preventing its progression, and reducing the risk of recurrence.

Conclusions

1. The comprehensive analysis of the index assessment of periodontal tissues in patients diagnosed with peri-implantitis reveals a pronounced deterioration in periodontal health compared to the mean indices among the 30–50 years old demographic in Ukraine. The elevated values in clinical markers, namely the PMA index, the Index of bleeding of Muhlemann and Son, and the Schiller-Pisarev test, underscore the severity of periodontal tissue inflammation and detachment in the peri-implantitis cohort.

2. Given the profound disparities in periodontal health between peri-implantitis patients and the general population, there is an imperative need for specialized medical attention. Tailored therapeutic interventions, robust oral hygiene practices, preventive measures, and periodic clinical monitoring are pivotal in mitigating the repercussions of peri-implantitis and steering patients towards optimal dental health.

3. Further research is warranted to delve deeper into the underlying mechanisms of peri-implantitis, explore potential risk factors, and develop targeted interventions. Enhancing our understanding and management of peri-implantitis can significantly improve the dental health outcomes and overall well-being of affected patients.

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