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UNSOLVED PROBLEMS AND PROSPECTS OF DENTAL IMPLANTATION IN PATIENTS WITH METABOLIC DISORDERS

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According to the general characteristics of the study population, in total, 90 individuals were included. Among both groups, there were 50 obese patients (29 males and 21 females) and 40 non-obese individuals (23 males and 17 females) as controls. A total of 65 and 51 dental implants were placed in obese and non-obese patients. The age of obese and non-obese individuals was 31–65 years. There was no significant difference in age between both groups. All clinical parameters of inflammatory diseases of the peri-implant zone showed a statistically significant difference between groups with and without obesity. Significantly higher rates of pain syndrome, especially severe, were recorded in the main group during the observation. Such complaints increased over time in both groups, but more severe clinical manifestations of perimucositis and periimplantitis were observed against the background of metabolic disorders. In similar periods of observation in patients with overweight, more often than in the control group, a higher percentage of cases of soft facial tissues tissue edema was observed ($P=0.0192$). In patients with obesity, an increase in the level of patients with hyperemia of the mucous membrane adjacent to the implant zone was also more often recorded— $30.0\pm 7.25\%$ and $70.0\pm 6.48\%$, respectively, in the control group and in the sleep group ($P=0.0001$). The frequency of cases of detection of fibrinous plaque along the suture line in persons suffering from and not suffering from obesity varied. But, at the same time, statistically significant differences between the groups were found on the first day after implantation in terms of the amount of detection of gray-brown plaque. Here, the obtained data were $10.0\pm 4.74\%$ and $34.0\pm 6.70\%$, respectively, in the first and second groups ($P=0.0112$).

Key words: dental implantation, overweight, age-sex characteristics, complications, clinical manifestations

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НЕВИРШЕНІ ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ ДЕНТАЛЬНОЇ ІМПЛАНТАЦІЇ У ПАЦІЄНТІВ З МЕТАБОЛІЧНИМИ ПОРУШЕННЯМИ

За загальними характеристикам досліджуваної популяції всього включено 90 людей. В обох групах в якості контролю знаходилося 50 пацієнтів з ожирінням (29 чоловіків та 21 жінка) та 40 осіб без ожиріння (23 чоловіки та 17 жінок). Усього пацієнтам з ожирінням та без ожиріння було встановлено 65 та 51 зубний імплантат. Вік осіб з ожирінням та без ожиріння становив 31–65 років. Між обома групами не було суттєвої різниці у віці. Усі клінічні параметри запальних захворювань періімплантантної зони показали статистично значущу різницю між групами з надмірною масою тіла, і без неї. В основній групі під час спостереження були зареєстровані значно вищі показники частоти болювого синдрому, особливо тяжкого ступеня. Такі скарги збільшувалися з часом у обох групах, але тяжчі клінічні прояви перимукозиту і періімплантантиту спостерігалися на фоні метаболічних порушень. В аналогічні терміни спостереження у пацієнтів із надмірною масою тіла частіше, ніж у контрольній групі, спостерігався вищий відсоток випадків набряку м'яких тканин обличчя ($P=0,0192$). У пацієнтів з ожирінням також частіше фіксувалося зростання рівня пацієнтів з гіперемією слизової оболонки, що прилягає до зони імплантату – $30,0\pm 7,25\%$ та $70,0\pm 6,48\%$, відповідно у групі контролю та в основній групі ($P=0 0001$). Частота випадків виявлення фібринозного нальоту по лінії швів у осіб, які страждають і не страждають на ожиріння, варіювала. Однак, при цьому статистично значущі відмінності між групами були виявлені в першу добу після імплантації за кількістю виявлення нальоту сіро-коричневого кольору. Тут отримані дані склали $10,0\pm 4,74\%$ та $34,0\pm 6,70\%$, відповідно у першій та другій групах ($P=0,0112$).

Ключові слова: дентальна імплантація, надлишкова маса тіла, віково-статеві ознаки, ускладнення, клінічні прояви.

According to the World Health Organization (WHO), more than 2 million deaths have been identified due to pathological conditions such as hypertension, diabetes mellitus, often associated with obesity or overweight, and according to the forecasts presented by this organization, a total of half of the population of the globe by 2030 will suffer from metabolic disorders and overweight [5, 15]. The continuing increase in the prevalence of obesity, as well as its diversity in terms of etiopathogenetic factors and clinical manifestations, determines the relevance of deep scientific research in this area. In particular, it is necessary to note the increased interest of specialists in the study of the interdependence of obesity and inflammatory periodontal diseases (PD) [8]. At the same time, in this contingent of patients, compared with persons with normal body weight, severe forms of inflammatory and destructive PD are more often diagnosed, which is associated in some cases with an increase in the insulin resistance index [1], with the synthesis and the release of interleukins, pro-inflammatory mediators, against the background of activation of the immune system [3].

Studies and meta-analyses have revealed significant destruction of periodontal tissues in overweight and obesity, as well as bone resorption, and a positive relationship between such metabolic disorders and the level of lost teeth [9]. In recent years, great progress has been made in various areas of clinical dentistry, including the improvement of surgical protocols for dental implantology, which has become an integral part in the treatment of adentia and restoration of the functional state of the dentition [7]. But, despite all these achievements, as a result of the development of a chronic inflammatory process

of soft and hard tissues in the area of the dental implant, severe bone resorption, cases of failure and rejection of dental implants began to be observed, the frequency of such cases, according to various data, may vary within certain limits [4, 6].

As important etiological factors associated with unsuccessful dental implantation and the development of perimucositis and periimplantitis, experts consider both local factors, such as functional overload and bacterial contamination, and systemic factors, that is, somatic pathology, which contributes to a decrease in immunological reactivity, bone resorption around implants and their loss [10]. If at this stage, excess body weight, as indicated by some scientists, is considered a risk factor for periodontopathy, then a number of other authors have revealed the negative impact of obesity on the result of dental implantation and the association between excess weight and the development of complications in the form of an inflammatory process in peri-implant tissues [11]. The relevance of studies devoted to the analysis of the results of dental implantation in patients with metabolic disorders is also proved by the inconsistency of the available data on the results of dental implantation in patients with obesity [2, 13].

The purpose of the study was to identify the features of the course of the postoperative period of dental implantation in patients with obesity based on the analysis of clinical criteria.

Materials and methods. Clinical examination and treatment of orthopedic patients was carried out in the period 2019–2023 on the basis of the Dental Clinic and according to the scientific plan of the Department of Orthopedic Dentistry of the Azerbaijan Medical University.

The inclusion criteria: patients of both genders, over the age of 30 years, with various defects in the dentition, dental implantation, being overweight, as well as providing each patient with detailed information about the goals and objectives of the work being carried out and informed consent of patients to participate in the study.

The exclusion criteria: severe concomitant pathology of the internal organs, oncological diseases, viral infection, tuberculosis, the presence of pathological conditions affecting bone metabolism, as well as the patient's refusal to undergo examination. Screening for inclusion in the study of patients was carried out among 90 patients, of which 50 were overweight and 40 were examined with normal body weight. The study included patients with obesity, and such combined manifestations of metabolic disorders and implantation complications were more often recorded in the age group of 51 years and older, compared with their opponents in previous groups, composed of young people, which is proved by the data obtained–12.0 %, 30.0 % and 58.0 %, in the first, second and third age groups, respectively. The control group included 40 practically healthy individuals (23 men, 17 women). The distribution by sex and age of the persons included in the study is presented in Table 1.

Table 1

Distribution of the examined by gender and age

Gender/Age	Control group (n=40)		Basic group (n=50)	
	N	%	N	%
Male	23	57.5	29	58.0
Female	17	42.5	21	42.0
31–40	5	12.5	6	12.0
41–50	14	35.0	15	30.0
Up to 51	21	52.5	29	58.0
Total	40	100.0	50	100.0

Dental status was assessed based on the dynamics of hygiene and periodontal indices: a simplified hygiene index; determination of the degree of gum bleeding; measurement of the depth of periodontal pockets; determination of pathological tooth mobility; definition of gingival recession. Anthropometric indicators were assessed using data on body weight, height and calculation of body mass index (BMI). BMI was calculated as the ratio of body weight (kg) to human height (m) squared (kg/m²) [15]. According to WHO recommendations for BMI:

- 24.9–29.9–overweight
- 30.0–34.9– degree I obesity
- 35.0–39.9–degree II obesity
- ≥40.0–degree III obesity (morbid).

The studies were carried out with the written consent of the patients in compliance with the norms of biomedical ethics set forth in the Declaration of Helsinki "Ethical Principles of Medical Research Involving Humans", developed by the World Medical Association, "Universal Declaration on Bioethics and Human Rights (UNESCO)".

The obtained data were statistically processed using the Microsoft Excel and Statistica 7.0 software package. The indices are presented as their mean values and mean error ($M \pm m$). Statistical significance

of differences between samples was determined using the Student's t-test and Fisher's exact test was used to select the most informative features. Differences in the compared indicators were considered significant at $p < 0.05$.

Results of the study and their discussion. In the course of research, the quality of implants and the clinical assessment of the state of oral tissues in the early postoperative period were evaluated in patients of the main group suffering from overweight and metabolic disorders, and in a comparative aspect among representatives of the control group, which represented practically healthy individuals with normal body weight. Table 2 presents statistical data characterizing the level and frequency of occurrence of pathological disorders of inflammatory origin in peri-implant tissues immediately on the first day after the completion of the dental implantation procedure.

Table 2

Pathological changes in peri-implant tissues in patients with overweight and normal body weight

Clinical signs	Control group (n=40)		Basic group (n=50)		P
	N	%	N	%	
subfebrile temperature	13	32.5±7.41	20	40.0±6.93	0.5143
pain:	17	42.5±7.82	39	78.0±5.86	0.0009*
– moderate	14	35.0±7.54	28	56.0±7.02	0.057
– severe	3	7.5±4.16	11	22.0±5.86	0.007*
facial swelling	16	40.0±7.75	33	66.0±6.70	0.0192*
mucous membrane swelling	7	17.5±6.01	21	42.0±6.98	0.0211*
mucosal hyperemia	12	30.0±7.25	35	70.0±6.48	0.0001*
Fibrous plaque:	19	47.5±7.90	36	72.0±6.35	0.0289*
– light	15	37.5±7.65	19	38.0±6.86	0.8152
– taupe	4	10.0±4.74	17	34.0±6.70	0.0112*

Note: * – statistically significant differences between two groups ($P < 0.05$, according to Fisher's exact test).

According to the table values, the frequency of occurrence of the inflammatory process around the implant and its severity were more pronounced in patients of the main group.

At the same time, the indices for all the studied clinical factors, but against the background of an increase in body weight, significantly exceed the indicators recorded in the control group. So, some patients in both groups in the early periods after implantation complained of severe pain in the wound area.

Comparative analysis of the data obtained showed that in the main group, almost 22.0±5.86 % of patients with overweight were characterized by pain, while in the control group, represented by implanted persons with a normal physique, the number of such patients was only 7.5±4.16 %, which was almost 3 times less common ($P=0.007$). There were no statistically significant differences between the groups when comparing the data on the incidence of moderate pain—35.0±7.54 % and 56.0±7.02 %, respectively, in the control and main groups ($P=0.057$). As for the statistical significance of differences in general indicators in terms of the number of pain symptoms in the groups, they turned out to be significant— $P=0.0009$.

In the course of initial studies, edema of the maxillofacial region, soft tissues of the face, after dental implantation was detected in 66.0±6.70 % of patients with signs of obesity, which is statistically significant and more often than in the control group, where a similar inflammatory reaction in the response to the development of pathological changes was observed only in 40.0±7.75 % of patients ($P=0.0192$). On visual examination, pronounced postoperative edema of the mucous membrane in the main group of patients was observed in 42.0±6.98 % of patients, which turned out to be more significant and statistically significant in relation to the lower rates recorded in the control group—17.5±6.01 %, that is, the indicators obtained here were almost 2.5 times higher ($P=0.0211$).

It is important to note a considerable level of registration of hyperemia of the oral mucosa along the line of sutures and its varying severity in the compared groups. So, if in the main group of persons suffering from excess weight and adipose tissue, such signs of the inflammatory process were observed during the examination of 70.0±6.48 % of implanted patients, then among practically healthy persons in the control group, the indicator was significantly lower and amounted to 30.0±7.25 % of cases ($P=0.0001$). Statistically significant differences were found in the frequency of manifestation of a general inflammatory reaction in the compared groups and the formation of fibrinous plaque, but only gray-brown, while in terms of the number of cases of detection of light plaque, the results obtained by groups differed little, and the difference in intergroup data was not significant ($P=0.8152$). A similar picture emerged when assessing the frequency of diagnosing Subfebrile temperature in patients, according to which unreliable distinguishing features were recorded on the first day in the postoperative period ($P=0.5143$).

Thus, the pain symptom, edema and hyperemia of the mucous membrane in the perioperative zone, as well as fibrinous plaque are clinical manifestations of a local inflammatory reaction, which were most often detected in patients with metabolic disorders.

In the presence of chronic organismal diseases of a local and systemic nature, the likelihood of pathological changes and inflammatory and destructive complications in the postoperative period during dental implantation increases. This can also take place against the background of the development of metabolic disorders and overweight, often associated with the formation of excessive body fat and with severe forms of obesity [6, 12].

Very important from the point of view of prevention, reducing the risk of developing possible and most serious complications requires timely identification of course features and a quantitative approach to clinical, laboratory and instrumental assessment with the development of reliable methods for predicting the severity of the course of the earliest post-implantation period [4]. At the same time, the above pathological conditions and various complications that arise with the direct participation of these pathologies in the early postoperative period, as foreign authors point out, have an adverse effect on reparative processes in bone tissue and in more remote periods, reducing osseointegration, the quality of engrafted implant and significantly worsening both the dental and general quality of life of prosthetic patients [7, 14]. Timely implementation of a set of preventive measures aimed at reducing the risk of complications of dental implantation in patients with metabolic disorders can significantly improve the quality of this popular type of prosthetics.

Conclusions

1. In similar periods of observation in patients with overweight, more often than in the control group, a higher percentage of cases of soft facial tissues edema was observed ($P=0.0192$).
2. In patients with obesity, an increase in the level of patients with hyperemia of the mucous membrane adjacent to the implant zone was also more often recorded ($30.0\pm 7.25\%$ and $70.0\pm 6.48\%$, respectively, $P=0.0001$).
3. Statistically significant differences between the groups were found on the first day after implantation in terms of the amount of detection of gray-brown plaque ($10.0\pm 4.74\%$ and $34.0\pm 6.70\%$, respectively, $P=0.0112$).

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