

ОРТОПЕДИЧНА СТОМАТОЛОГІЯ

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THE IMPACT OF FIXED DENTURES ON THE TISSUES OF THE ORAL CAVITY AND THE COURSE OF GASTROINTESTINAL DISEASES

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The paper is written within the scientific research made at the Department of Postgraduate Education for Prosthodontists of Poltava State Medical University (Ukraine), entitled "Individual approach to rehabilitation of patients with pathology of the dentoalveolar system" (State registration number 0122U002533).

Background

The full-arch restoration and total tooth loss are the most important issues of specialized dental care for the population. Prosthetic treatment not only eliminates aesthetic deficiencies and restores the impaired function of the dentoalveolar system but also has significant preventive value in prophylaxis of gastrointestinal diseases [2].

The issue of the interaction between oral cavity tissues and various types of dentures is one of the key concerns in prosthodontics. The use of different types of dental prostheses is an intervention that alters the biological equilibrium in the tissues of the oral cavity and the body as a whole, especially in the case of fixed dentures. The extent and nature of these changes depend on several factors, such as the patient's overall somatic condition, the construction material used for the denture, the prosthetic manufacturing technology, etc. [1].

The materials used for dental prostheses and the technologies for their application are constantly being improved. However, according to literature data, the incidence of complications after prosthetics remains relatively high [6, 12, 13]. Most state-of-the-art construction materials for different types of dental prostheses are not biologically inert to the human body. As a result, in 4-11% of cases, patients experience unpleasant sensations that, in terms of intensity, become the cause of intolerance to dental prostheses. The presence of somatic pathology in the gastrointestinal tract further exacerbates the situation. The analysis of the literature sources has found that wearing dentures causes an increase in pathological manifestations not only in the tissues of the oral cavity but also in complications affecting the tissues of the gastrointestinal tract [2, 7, 9].

The oral cavity and its mucous membrane are

the first link in the human digestive system and come into direct contact with dental prostheses. The processes of absorption also start in the oral cavity and then continue in the esophagus, stomach and intestines. Therefore, ions that enter the oral fluid from the dentures to some extent reach various sections of the gastrointestinal tract and have a certain impact on the condition of the gastric and intestinal mucosa [2, 8].

Our analysis of domestic and foreign studies shows that different types of dental prostheses made from various dental materials can cause three main types of pathological effects on the tissues and organs of the oral cavity and certain organs and systems of the human body, namely, chemical-toxic, electro-galvanic (damage caused by galvanic current) and allergic effects [3, 10]. Some authors, based on specific clinical cases of intolerance to dental materials, argue for the need to examine potential wearer of fixed dentures for compatibility not only with construction materials but also with materials used for retaining such prostheses [12].

In prosthodontics, a wide range of construction materials is used for manufacturing the fixed bridges, including stainless steel alloys, ceramic masses, zirconia, polymer materials, and others. The reason for the development of pathological impact of metal materials in dental prostheses on the condition of the oral cavity is the release of metal alloy ions into saliva [5].

O.I. Roschuk conducted research on the negative consequences of metal and metal-containing fixed dentures on the status of protein-carbohydrate components, oxidant-antioxidant and cytokine homeostasis in patients with duodenal ulcer disease. The author states that the use of fixed dentures made of metals exacerbates somatic pathology, therefore, the further development of effective programs for pathogenetic correction of the adverse ef-

fects of metal and metal-containing fixed dentures on the recurrence of duodenal ulcer disease is relevant. This is especially important considering the progressing tooth loss [11].

Electrochemical corrosion in the oral cavity not only causes changes in the tissues of the oral cavity but also leads to alterations in the immune and enzymatic systems of the body. Corrosion products from stainless steel alter the activity of enzymatic systems in saliva, blood and the immune defense of the mucous membranes throughout the gastrointestinal tract [10].

Purpose

The study aimed at investigating the impact of fixed dental prostheses made from different construction materials on the tissues of the oral cavity and the gastrointestinal tract in chronic gastritis.

Methods and Material

We examined patients from the gastroenterology unit who were admitted for inpatient treatment for chronic gastritis and were using fixed dental prostheses. A total of 86 patients were included in the study.

Prosthetic treatment and the conduct of planned research were carried out in all patients with their informed consent for such treatment and further participation in the study in accordance with the Helsinki Declaration of the World Medical Association regarding ethical principles for medical research involving human subjects [4].

During the examination, we took into account complaints of burning sensation, itching, redness of the gingival mucosa, gingival swelling, increased salivation or dryness in the oral cavity, heightened perception of acidity and the presence of microcurrents in the oral cavity.

During the objective examination, we took into account the type of denture and visually determined the material from which it was made. We also considered the type and number of abutment elements, the compliance of the denture with clinical and technological requirements, the duration of its wearing and the diagnosis of the underlying disease for which the patient was undergoing hospital treatment. Based on these criteria, the patients were divided into groups and subgroups. Group 1 (n=49) involved patients with chronic hyperacid gastritis, while Group 2 (n=37) included patients with chronic hypoacid gastritis. In each group, two subgroups were identified: subgroup A comprised patients wearing fixed soldered bridges and subgroup B comprised patients wearing full-cast bridges.

In all patients, a complete blood count was performed. For the analysis of the oral fluid content of microelements, the samples were collected and examined. To detect elements from the prosthetic materials, a biochemical analysis of gastric juice and urine was conducted using the ionometric method.

Results and Discussion

The objective examination has found that 22 patients of subgroup A, Group 1, were using fixed sol-

dered bridges with titanium nitride coating and acrylic resin veneering. The average duration of wearing dentures was 6 ± 1.35 months. 13 out of 22 patients complained of gum itching, burning sensation, dryness in the oral cavity and increased acidic taste; 4 patients reported itching of the cheek mucosa in contact with the plastic veneering. Laboratory tests revealed metal "intolerance" in 9 patients of this subgroup, which accounted for 40.9%. Allergic stomatitis caused by acrylic veneering was diagnosed in 4 patients (18.2%) of subgroup A. 5 patients of subgroup A, Group 1, complained of the occurrence of microcurrents in the oral cavity, increased salivation and irritability. Based on the results of the objective examination and laboratory tests, galvanic phenomena were identified in these patients.

It should be noted that 18 patients of subgroup A experienced exacerbation of their underlying disease following the first month of wearing dentures.

During the objective examination, it was determined that 3 patients of subgroup B, Group 1, were using full-cast bridges, 5 patients were using full-cast dentures with acrylic resin veneering and 19 patients were using full-cast metal-ceramic bridges. The average duration of wearing dentures in this subgroup was 15 ± 2.46 months.

Patients who were using full-cast metal bridges (3 individuals, 11.1%) did not have any complaints. Among the 5 patients (14.8%) using full-cast dentures with acrylic resin veneering, 4 of them reported gum swelling around the denture, occasional pain, unpleasant odor and burning sensation. Out of the 19 patients (70.3%) who had been using full-cast metal-ceramic fixed dental prostheses, 4 patients (14.8%) experienced complaints of gum itching, burning sensation of the mucous membrane and discomfort while chewing and at rest. Objective examination revealed hyperemia and swelling of the gingival mucosa at the dentures.

In the patients of Group 2, subgroup A, out of 22 patients (59.45%), 9 patients (24.3%) had complaints of oral burning sensation, dryness and changes in taste; 7 patients complained of gum itching, increased perception of acidity, occasional occurrence of electric currents, especially during eating. 6 patients of this subgroup did not have any complaints. The average duration of wearing dentures in this subgroup was 10 ± 1.44 months.

Out of the 15 patients (40.5%) of subgroup B, 12 patients (32.4%) used full-cast metal-ceramic bridges, and 3 patients (8.1%) used full-cast metal dentures. Only 3 patients of this subgroup had complaints, including swelling of the mucosa at the dentures, discomfort during chewing, deterioration of taste sensation, and occasional occurrence of oral burning sensation. The average duration of wearing dentures in subgroup B was 18 ± 1.64 months.

Along with complaints related to wearing dentures reported by patients in both groups, deteriorations in overall well-being related to the underlying disease and changes in blood and gastric juice parameters were also observed.

To eliminate complications associated with wearing dentures, patients of both groups who had the most pronounced pathological symptom complex and laboratory confirmation were offered repeated prosthetic treatment. This was especially recommended for all patients of subgroup A of both groups who were using soldered bridges.

In patients who received treatment for their underlying disease of the gastrointestinal tract without elimination of heterogeneous metals from the oral cavity and removing soldered bridges with titanium nitride coating, a significant increase in the amount of manganese, nickel and lead was found in the gastric juice. Additionally, higher levels of iron and copper were detected in the urine.

In individuals who previously underwent prosthetic treatment with replacement of dental constructions, taking into account their individual characteristics in the choice of prosthetic materials, a decrease in the number of microelements in the gastric juice and urine was observed.

Conclusions

1. The findings of the studies have established that, out of the 86 examined individuals, 44 patients (51.16%) of both groups used fixed soldered bridges, while 42 (48.84%) used full-cast bridges. Pathological manifestations of the negative effect of soldered dentures in the oral cavity and gastrointestinal tract were observed in 41 out of 44 patients, accounting for 47.7% of the total number of the examined individuals.

2. Out of the 42 patients (48.84%) of both groups who used full-cast dentures made of various construction materials, 11 patients (12.8%) experienced certain problems.

3. Soldered bridges during their wearing cause by 35% more complications in the oral cavity and digestive organs compared to full-cast dentures.

4. Patients with hyperacid gastritis experience negative manifestations and exacerbations of somatic pathology by 3 times more frequently when using fixed dentures.

Perspectives of further research

The scientific data obtained from observations regarding the negative impact of the fixed dentures on the tissues of the oral cavity and the gastrointestinal tract require the follow-up in-depth and comprehensive study of pathological lesions to develop mechanisms for their prevention.

Authors' contribution

The authors confirm their contribution to the paper as follows: study concept and design - Davydenko V.Yu., Davydenko H.M.; data collection - Davydenko V.Yu., Davydenko H.M., Khilnich Ye.S., Sylenko B.Yu.; analysis and interpretation of the findings - Davydenko V.Yu., Davydenko H.M., Khilnich Ye.S., Sylenko B.Yu.; statistical analysis of the data - Davydenko V.Yu.; manuscript preparation - Davydenko H.M. All authors have reviewed the findings and approved the final version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

Список літератури

1. Акберли ЛБ. Влияние зубных протезов на гомеостаз полости рта. Вісник стоматології. 2020; 35(1):57-61.
2. Бабеня АА. Особенности проявления стоматологической патологии у лиц с заболеваниями желудочно-кишечного тракта (обзор литературы). Інновації в стоматології. 2015; (1):72-5.
3. Біда ВІ, Гурін ПО, В'юницький ВІ. Вплив рН ротової рідини на адаптацію пацієнтів до різних видів знімних протезів. Современная стоматология. 2012; (4):122-5.
4. Гельсінська декларація Всесвітньої медичної асоціації "Етичні принципи медичних досліджень за участю людини у якості об'єкта дослідження". Електронний ресурс. – Режим доступу до ресурсу: http://zakon4.rada.gov.ua/laws/show/990_005
5. Гоцко ЮМ. Індексна оцінка стану пародонта в носіїв металокерамічних протезів. Сучасна стоматологія. 2020; 1(100):22-5. doi: 10.33295/1992-576X-2020-1-22.
6. Гризодуб ДВ. Аналіз частоти соматичних ускладнень у пацієнтів з непереносимістю конструкційних стоматологічних матеріалів, які користуються незнімними мостоподібними протезами. Проблеми безперервної освіти і науки. 2019; 1(33):64-7.
7. Дворник ВМ, Марченко АВ, Пономаренко ВО, Коваленко ВВ, Литовченко ІЮ, Тесленко ОІ, Єрис ЛБ. Патогенетична профілактика протезних стоматитів у осіб із внутрішніми хворобами. Світ медицини та біології. 2022; (1):48-53.
8. Золотухіна ОЛ, Романова ЮГ. Патогенетичні аспекти розвитку захворювань тканин пародонта на тлі патології шлунка (огляд літератури). Вісник проблем біології і медицини. 2018; (2):23–5.
9. Манащук НВ. Розповсюдженість та клінічний перебіг захворювань пародонта на тлі хронічних колітів. Вісник проблем біології і медицини. 2014; 2(1):239-41.
10. Ніконов АЮ, Омельченко ОА, Ковальчук ЮА, Сергієнко МО. Дослідження слизової оболонки ясен при відновленні дефектів зубних рядів штамповано-паяними конструкціями з нержавіючої сталі. Медицина сьогодні і завтра. 2015; 68(3):30-4.
11. Рошук ОІ. Ефективність комплексної профілактики втрати зубів у хворих на виразкову хворобу дванадцятипалої кишки за умов незнімного протезування. Клінічна та експериментальна патологія. 2017; XVI, 1(59):123-7.
12. Соколовська ВМ, Цветкова НВ. Прояви непереносимості стоматологічних матеріалів у порожнині рота (клінічний випадок). Український стоматологічний альманах. 2022; (4):48-51.
13. Hoseini M, Bocher P, Shahryari A, Azari F, Szpunar JA, Vali H. On the importance of crystallographic texture in the biocompatibility of titanium based substrate. J Biomed Mater Res A. 2014; 102(10):3631-8. doi: 10.1002/jbm.a.35028.

References

1. Akberly LB. Vlyyanye zubnykh protezov na homeostaz polosty rta. Visnyk stomatolohiyi. 2020; 35(1):57-61. (Russian).

2. Babenya AA. Osobennosty proyavlenyya stomatolohycheskoy patolohyy u lyts s zabolovanyamy zheludochno-kyshechnoho trakta (obzor lyteratury). *Innovatsiyi v stomatolohiyi*. 2015; (1):72-5. (Russian).
3. Bida VI, Huryn PO, V'yunyts'kyy VI. Vplyv pH rotovoyi ridyny na adaptatsiyu patsiyentiv do riznykh vydiv znimnykh proteziv. *Sovremennaya stomatolohyya*. 2012; (4):122-5. (Ukrainian).
4. Hel'sins'ka deklaratsiya Vsesvitn'oyi medychnoyi asotsiatsiyi "Etychni pryntsypy medychnykh doslidzhen' za uchastyu lyudyny u yakosti ob'yekta doslidzhen'ya". *Elektronnyy resursj. – Rezhym dostupu do resursu: http://zakon4.rada.gov.ua/laws/show/990_005*. (Ukrainian).
5. Hotsko YUM. Indeksna otsinka stanu parodonta v nosiyiv metalokeramichnykh proteziv. *Suchasna stomatolohiya*. 2020; 1(100):22-5. doi: 10.33295/1992-576X-2020-1-22. (Ukrainian).
6. Hryzodub DV. Analiz chastoty somatychnykh uskladnen' u patsiyentiv z neperenosymisty konstruktivnykh stomatolohichnykh materialiv, yaki korystuyut'sya neznimnyimi mostopodobnyimi protezami. *Problemy bezpererвної osvity i nauky*. 2019; 1(33):64-7. (Ukrainian).
7. Dvornyk VM, Marchenko AV, Ponomarenko VO, Kovalenko VV, Lytovchenko IYU, Teslenko OI, Yerys LB. Patohenetichna profilaktyka proteznykh stomatyv u osib iz vnutrishnimy khvorobamy. *Svit medytsyny ta biolohiyi*. 2022; (1):48-53. (Ukrainian).
8. Zolotukhina OL, Romanova YUH. Patohenetichni aspekty rozvytku zakhvoryuvan' tkanyn parodonta na tli patolohiyi shlunka (ohlyad literatury). *Visnyk problem biolohiyi i medytsyny*. 2018; (2):23–5. (Ukrainian).
9. Manashchuk NV. Rozpovsyudzhennist' ta klinichnyy perebih zakhvoryuvan' parodonta na tli khronichnykh kolitiv. *Visnyk problem biolohiyi i medytsyny*. 2014; 2(1):239-41. (Ukrainian).
10. Nikonov AYU, Omel'chenko OA, Koval'chuk YUA, Serhiyenko MO. Doslidzhennya slyzovoyi obolonky yasen pry vidnovlenni defektiv zubnykh ryadiv shtampovano-payanymy konstruktivnyimi z nerzhaviyuchoyi stali. *Medytsyna s'ohodni i zavtra*. 2015; 68(3):30-4. (Ukrainian).
11. Roshchuk OI. Efektyvnist' kompleksnoyi profilaktyky vtraty zubiv u khvorykh na vyrzkovu khvorobu dvanadtsyatypaloyi kyshky za umov neznimnoho protezuvannya. *Klinichna ta eksperymental'na patolohiya*. 2017; XVI, 1(59):123-7. (Ukrainian).
12. Sokolovs'ka VM, Tsvetkova NV. Proyavy neperenosymosti stomatolohichnykh materialiv u porozhnyni rota (klinichnyy vypadok). *Ukrayins'kyy stomatolohichnyy al'manakh*. 2022; (4):48-51. (Ukrainian).
13. Hoseini M, Bocher P, Shahryari A, Azari F, Szpunar JA, Vali H. On the importance of crystallographic texture in the biocompatibility of titanium based substrate. *J Biomed Mater Res A*. 2014; 102(10):3631-8. doi: 10.1002/jbm.a.35028.

**Стаття надійшла
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Summary

The article presents the results of scientific research on the negative impact of fixed denture structures on the tissues of the oral cavity and gastrointestinal tract in patients with chronic gastritis.

The relevance of the work lies in the fact that orthopedic treatment not only eliminates aesthetic defects, restores the impaired function of the dentoalveolar system, but also has a significant preventive value for the prevention of gastrointestinal diseases.

The aim of our research was to study the effect of fixed dentures made of different structural materials on the tissues of the oral cavity and gastrointestinal tract in chronic gastritis.

Objects and methods of the study. We examined patients of the gastroenterological department who were inpatients with chronic gastritis and used fixed dentures.

The examination took into account complaints of burning sensation, itching, redness of the gingival mucosa, gingival swelling, increased salivation or dryness in the oral cavity, heightened perception of acidity and the presence of microcurrents in the oral cavity; type of denture and visually determined the material from which it is made; compliance of the denture with clinical and technological requirements, the period of its use, diagnosis of the underlying disease for which the patient is undergoing inpatient treatment.

Study results and conclusions. According to the results of the study, it was found that out of 86 patients examined, 44 patients (51.16%) of both groups used soldered bridges, 42 (48.84%) - full-cast bridges. Pathological manifestations of the negative effects of soldered dentures in the oral cavity and gastrointestinal tract were detected in 41 of 44 patients, which is 47.7% of the total number of patients examined. Out of 42 patients (48.84%) in both groups, 11 (12.8%) had full-cast bridges.

Soldered bridges cause 35% more complications in the oral cavity and digestive system than full-cast dentures. Negative manifestations and exacerbation of somatic pathology when using fixed dentures are observed 3 times more often in patients with hyperacid gastritis.

Key words: fixed dentures, oral cavity, gastrointestinal tract, burning.

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ВПЛИВ НЕЗНІМНИХ КОНСТРУКЦІЙ ЗУБНИХ ПРОТЕЗІВ НА ТКАНИНИ ПОРОЖНИНИ РОТА І ПЕРЕБІГ ЗАХВОРЮВАНЬ ШЛУНКОВО-КИШКОВОГО ТРАКТУ

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Резюме

У статті представлено результати наукових досліджень щодо негативного впливу незнімних конструкцій зубних протезів на тканини порожнини рота і шлунково-кишкового тракту в пацієнтів, які хворіють на хронічний гастрит.

Актуальність роботи полягає в тому, що ортопедичне лікування не тільки усуває естетичні недоліки, відновлює порушену функцію зубощелепної системи, а й має суттєве профілактичне значення для запобігання захворюванням шлунково-кишкового тракту.

Мета дослідження – вивчити вплив незнімних зубних протезів, виготовлених із різних конструкційних матеріалів, на тканини порожнини рота і шлунково-кишкового тракту при хронічних гастритах.

Об'єкти і методи дослідження. Було обстежено пацієнтів гастроентерологічного відділення, які перебували на стаціонарному лікуванні з хронічними гастритами й користувалися незнімними конструкціями зубних протезів.

На обстеженні враховували: скарги на печію, свербіж, почервоніння слизової оболонки ясен, набряк ясен, посилення слиновиділення або сухість у порожнині рота, посилене відчуття кислого, появу мікрострумів у порожнині рота; вид протеза, візуально визначали матеріал, із якого він виготовлений; відповідність протеза клініко-технологічним вимогам, термін користування ним; діагноз основної хвороби, з якою пацієнт перебуває на стаціонарному лікуванні.

Результати дослідження і висновки. За результатами досліджень встановлено, що з 86 оглянутих 44 пацієнти (51,16%) обох груп користувалися паяними мостоподібними протезами, 42 (48,84%) – суцільнолитими мостоподібними протезами. Патологічні прояви негативного впливу паяних протезів у порожнині рота і в шлунково-кишковому тракті виявили в 41 із 44 пацієнтів, що складає 47,7% загальної кількості обстежених. Із 42 пацієнтів (48,84%) обох груп, які користувалися суцільнолитими мостоподібними протезами, – у 11 (12,8%).

Паяні мостоподібні протези на 35% більше спричиняють ускладнення з боку ротової порожнини й органів травлення, ніж суцільнолиті протези.

У 3 рази частіше негативні прояви й загострення соматичної патології при користуванні незнімними конструкціями зубних протезів спостерігаються в пацієнтів, хворих на гіперацидний гастрит.

Ключові слова: незнімні зубні протези, порожнина рота, шлунково-кишковий тракт, печія.