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Стаття надійшла до редакції 11.12.2023;
затверджена до публікації 11.03.2024



UDC 616.314.25/.26-001.4-08

<https://doi.org/10.26641/2307-0404.2024.2.307778>

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DENTAL REHABILITATION OF A PATIENT WITH A DECREASE IN BITE HEIGHT DUE TO PATHOLOGICAL ABRASION OF HARD TOOTH TISSUES (clinical case)

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Цитування: *Медичні перспективи.* 2024. Т. 29, № 2. С. 245-253

Cited: *Medicni perspektivi.* 2024;29(2): 245-253

Key words: *pathological abrasion, occlusal height, masticatory muscles, temporomandibular joint, myorelaxing splint*

Ключові слова: *патологічне стирання, оклюзійна висота, жувальні м'язи, скронево-нижньощелепний суглоб, міорелаксуючий сплінт*

Abstract. *Dental rehabilitation of a patient with a decrease in bite height due to pathological abrasion of hard tooth tissues (clinical case). Sokolovska V.M., Tsvetkova N.V., Davydenko V.Y., Pysarenko O.A., Tarashevskaya Y.E. At the present stage of diagnostics and treatment of dental diseases, morphofunctional disorders of the dento-maxillary system associated with a decrease in the height of occlusion are becoming more common. In the scientific literature, this pathological condition is described under the name "occlusion" that decreases. The reasons that cause it include partial or complete loss of teeth, irrational prosthetics and untimely restoration of dentition defects, doctors' mistakes in the restructuring of the masticatory apparatus, and a generalized form of pathological abrasion of hard tooth tissues. The purpose of the study – demonstration of a clinical case of pathological abrasion of hard tissues of teeth with a decrease*

in bite height, complicated by defects in the dentition. Patient S., 47 years old, applied for orthopedic help with complaints of anatomical deformity, significant abrasion of teeth on the upper and lower jaws, increased sensitivity to various types of irritants, partial absence of teeth, impaired masticatory function, periodic clicking in the temporomandibular joint, aesthetic and phonetic defects. Based on the data obtained, we established the following diagnosis: generalized form of pathological abrasion of hard tooth tissues, subcompensated form of reduced bite height, complicated by defects in the dentition of the upper jaw – class I according to the Kenedy classification, lower jaw – class III according to the Kenedy classification. The loss of chewing efficiency according to Agapov was 68%. Patient S. was recommended a two-stage orthopedic treatment, which involves preliminary separation of the bite with the help of individual vinyl mouth guards which have an increasing thickness of 2, 4 and 6 mm, made for the lower jaw. The planned treatment period with each of the muscle relaxant splints will be 2 months. Subsequently, 15, 14, 13, 12, 11, 21, 22, 23, 24 will be restored with one-piece metal crowns with ceramic cladding, and the final defects in the lateral areas will be restored with a clasp prosthesis with a locking system of fixation. The included defect of the lateral part of the lower jaw is planned to be restored with a metal-ceramic bridge-like prosthesis with a support on 47, 45, 44, and the worn-out hard tooth tissues will be completely restored with photopolymer material. In patients with a reduction in bite height of more than 2 mm, it is advisable to carry out treatment in two stages. At the first stage, we normalize the occlusal height and rebuild the function of the masticatory muscles. At the second stage, we provide rational prosthetics. Orthopedic rehabilitation with myorelaxing splints of increasing thickness makes it possible to correctly rebuild myostatic reflexes and prevent functional disorders in the TMJ. Any case of complex treatment of patients with a decrease in bite height due to pathological abrasion of the hard tooth tissues deserves the attention of both scientists and dentists in practical health care.

Реферат. Стоматологічна реабілітація пацієнтки зі зниженням висоти прикусу внаслідок патологічного стирання твердих тканин зубів (клінічний випадок). Соколовська В.М., Цветкова Н.В., Давиденко В.Ю., Писаренко О.А., Тарашевська Ю.Є. На сучасному етапі діагностики та лікування стоматологічних захворювань все частіше зустрічаються морфофункціональні порушення зубощелепної системи, що пов'язані зі зниженням висоти оклюзії. У науковій літературі цей патологічний стан описують під назвою «прикус, що знижується». До причин, що його викликають, слід віднести часткову або повну втрату зубів, нераціональне протезування і невчасне відновлення дефектів зубних рядів, помилки лікарів у перебудові жувального апарату, генералізовану форму патологічного стирання твердих тканин зубів. Описано клінічний випадок патологічного стирання твердих тканин зубів зі зниженням висоти прикусу, ускладненого дефектами зубних рядів. За ортопедичною допомогою звернулася пацієнтка С., 47 р., зі скаргами на порушення анатомічної форми, значне стирання зубів на верхній та нижній щелепах, підвищену чутливість до різних видів подразників, часткову відсутність зубів, порушення функції жування, періодичне клацання у скронево-нижньощелепному суглобі, естетичний та фонетичний дефекти. На підставі отриманих даних нами було встановлено такий діагноз: генералізована форма патологічного стирання твердих тканин зубів, субкомпенсована форма зниження висоти прикусу, ускладнені дефектами зубних рядів верхньої щелепи – I клас за класифікацією Кеннеді, нижньої щелепи – III клас за класифікацією Кеннеді. Втрата жувальної ефективності за Агаповим – 68%. Пацієнтці С. рекомендовано двохетапне ортопедичне лікування, яке передбачає попереднє роз'єднання прикусу за допомогою індивідуальних вінілових кап, які мають наростаючу товщину 2, 4 та 6 мм, виготовлених на нижню щелепу. Запланований термін лікування кожним із міорелаксуючих сплінтів буде становити 2 місяці. У подальшому 15, 14, 13, 12, 11, 21, 22, 23, 24 будуть відновлені суцільнолитими металевими коронками з керамічним облицюванням, а кінцеві дефекти в бокових ділянках – бюгельним протезом із замковою системою фіксації. Включений дефект бокової ділянки нижньої щелепи плануємо відновити металокерамічним мостоподібним протезом з опорою на 47, 45, 44, а стерті тверді тканини зубів тотально реставрувати фотополімерним матеріалом. У пацієнтів зі зменшенням висоти прикусу більше ніж 2 мм лікування доцільно проводити у два етапи. На першому етапі нормалізуємо оклюзійну висоту і відновлюємо функцію жувальних м'язів. На другому етапі виконуємо раціональне протезування. Ортопедична реабілітація міорелаксуючими шинами збільшення товщини дозволяє правильно відновити міостатичні рефлекси та запобігти функціональним порушенням СНЩС. Будь-який випадок комплексного лікування пацієнтів зі зниженням висоти прикусу внаслідок патологічної стертості твердих тканин зуба заслуговує на увагу як науковців, так і стоматологів практичної охорони здоров'я.

At the present stage of diagnostics and treatment of dental diseases, morphofunctional disorders of the dento-maxillary system associated with a decrease in the height of occlusion are becoming more common. In the scientific literature, this pathological condition is described under the name "occlusion that decreases" [1, 2]. The reasons that cause it include partial or complete loss of teeth, irrational prosthetics and untimely restoration of dentition defects, doctors' mistakes in the restructuring of the masticatory

apparatus, and a generalized form of pathological abrasion of hard tooth tissues [3, 4].

Pathological abrasion of hard tooth tissues is a progressive process of enamel and dentin loss, which is accompanied by changes in aesthetic, morphological and functional character in dental and surrounding dental tissues, masticatory muscles, and temporomandibular joint (TMJ) [5, 6]. According to our researches in 2022-2023, this pathological condition was found in 67 examined servicemen [7].

The clinical picture of the pathology worsens in cases where the generalized form of hard tissue abrasion is complicated by dentition defects and masticatory muscle parafunction. When the integrity of the tooth row is disturbed, the number of pairs of opposing teeth that maintain the height of the occlusion decreases [8, 9]. As a result, the remaining teeth take on an increased chewing load, which sharply accelerates the abrasion of their hard tissues and causes functional overload of the periodontium [10]. At the same time, patients complain of difficulty in chewing food, rapid fatigue of the chewing muscles, noise and congestion in the ears, impaired salivation. The neuromuscular apparatus and TMJ are involved in pathological symptoms [11].

In order to study the nature of occlusal relationships in patients with reduced intraalveolar height due to pathological abrasion, an occlusogram is used, and in the presence of dentition defects, electromyographic studies, 3D diagnostics, and intraoral scanning are used [12, 13].

In the treatment of a slight decrease in interalveolar height (up to 2 mm), it is most often restored at one time. The choice of structures depends on the condition of the teeth and periodontal tissues, the type of occlusion [14].

If the bite height is reduced by more than 2 mm, it is advisable to carry out treatment in several stages. At the first stage, it is necessary to normalize the interalveolar height and restructure the function of the masticatory muscles. At the second stage, orthopedic treatment is completed with rational dental prosthetics. The two-stage treatment is aimed at preventing complications of dental intervention [15].

Timely implementation of therapeutic and preventive measures aimed at the formation of the appropriate level of the dento-maxillary system remains one of the urgent problems of prosthetic dentistry [16].

The purpose of the study – demonstration of a clinical case of pathological abrasion of hard tooth tissues with a decrease in bite height, complicated by defects in the dentition.

MATERIALS AND METHODS OF RESEARCH

The object of the study is a 47-year-old patient S. with a generalised form of pathological abrasion of hard tooth tissues, subcompensated reduction in occlusion height and dentition defects. The patient underwent clinical and additional examination methods. An anamnesis morbi was collected in the clinic and an objective examination of the patient was performed. To make the final diagnosis, additional examination methods were used: 3-D diagnostics, Schiller-Pisarev test, occlusogram.

According to the results of the examination, the commission considers that the materials of the

scientific work comply with the Rules for Humane Treatment of Patients in accordance with the requirements of the Tokyo Declaration of the World Medical Association, international recommendations of the Helsinki Declaration of Human Rights, the Council of Europe Convention on Human Rights and Biomedicine, the Laws of Ukraine, orders of the Ministry of Health of Ukraine, requirements of the Ethical Code of Physicians of Ukraine and can be published in open print (Excerpt from the minutes of the meeting of the Commission on Ethical Issues and Biomedical Ethics of the Institution of higher education "Poltava State Medical University" No. 224 dated 22.02.2024. The patient gave her informed voluntary consent for diagnosis, treatment, surgery and anaesthesia (primary record form No. 003-6/0), and also agreed to use the study data for further publication in the article.

RESULTS AND DISCUSSION.

Patient S., 47 years old, applied for orthopedic help with complaints of anatomical deformity, significant wear of teeth on the upper and lower jaws, increased sensitivity to various types of irritants, partial absence of teeth, impaired masticatory function, periodic clicking in the temporomandibular joint, aesthetic and phonetic defects.

From the anamnesis of the disease, it became known that the teeth were removed due to complications of the carious process over the past six years. Increased abrasion of hard tooth tissues has been noted for the past four years. It is the first time that a dentist-orthopedic doctor is asked for help.

An objective examination of patient S. revealed a decrease in the interalveolar height, the height of the lower third of the face was shortened, the nasolabial and chin folds were sharply pronounced, and chronic skin changes were observed in the angles of the mouth due to constant irritation and increased salivation.

Opening the mouth in full, there is a non-linear closure of the upper and lower jaws. In the state of physiological rest, the width of the gap between the upper and lower teeth reaches 8 mm in the vertical plane.

Examination of the oral cavity revealed a shortening of the crowns length of all teeth by different amounts, their surfaces are uneven and have sharp edges. There is hyperesthesia of the teeth during probing and reaction to temperature stimuli, their percussion is painless.

The plane of abrasion is horizontal, the nature of the closure of the dentition has signs of a straight bite.

Palpation of the front edge of the masticatory muscles reveals their tension. In a 3-D examination of the TMJ, a distal movement of the joint head is

observed, its palpation is painless, and sometimes a click can be noted.

On examination, the oral mucosa is pale pink in colour, without traumatic injuries and neoplasms. The Schiller-Pisarev test was negative.

In order to study the nature of the occlusal relationship, we performed an occlusogram. Based on the impressions obtained from patient S., we made horse-shoe-shaped strips of basic wax with a thickness of 2 mm, which were placed on the teeth of the lower jaw

and asked the patient to close the teeth in the position of central occlusion.

The impressions that we received on the plate were reproduced in the dental formula with the following notations, where:

"-" – no occlusal contact

"!" – supracontacts, overloading of teeth are determined on the occlusogram in the form of contact holes. The occlusogram data are shown in Table.

Occlusiographic examination results

	-	-	-	-	!	+	+	+	+	!	+	-	-	-	
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
	-	-	-	-	!	+	+	+	+	!	!	+	-	-	

Patient S. has a mixed type of occlusogram, which is characterized by the presence of "+", "-", "!" signs in different parts of the jaws.

Based on the data obtained, we established the following diagnosis: a generalized form of pathological abrasion of hard tooth tissues, a subcompensated form of reduced bite height, complicated by defects in the dentition of the upper jaw – class I according to the Kennedy classification, lower jaw – class III according to the Kennedy classification. Loss of chewing efficiency according to Agapov – 68%.

The planned period of treatment with each of the myorelaxing splints will be 2 months. Subsequently, 15, 14, 13, 12, 11, 21, 22, 23, 24 will be restored with one-piece metal crowns with ceramic lining, and the final

defects in the lateral areas will be restored with a clasp prosthesis with a locking fixation system [17, 18].

We plan to restore the included defect of the lateral part of the lower jaw with a metal-ceramic bridge-like prosthesis with support on 47, 45, 44, and completely restore the abraded hard tissues of the teeth with a photopolymer material.

Before orthopedic rehabilitation, the patient underwent therapeutic preparation of the oral cavity for prosthetics.

At the first clinical visit, based on the occlusogram, we selectively grinded the sharp edges of all the abraded teeth and took full anatomical impressions and determined the central occlusion using wax templates (Fig. 1, 2).

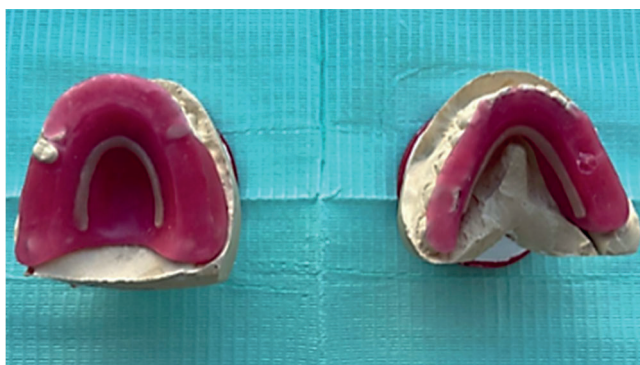


Fig. 1. Wax templates for determining central occlusion

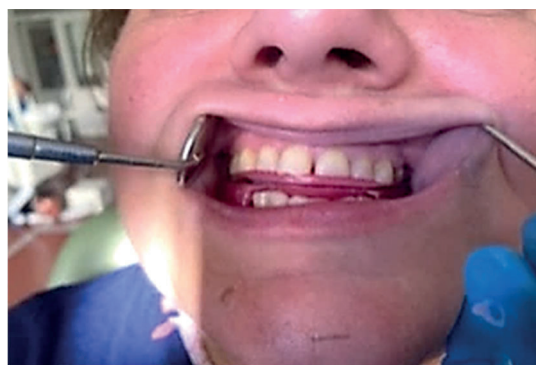


Fig. 2. Determination of the interalveolar height and fixation of the jaws in the central occlusion position

The control models were studied in an articulator, taking into account the optimal height of bite separation (Fig. 3).

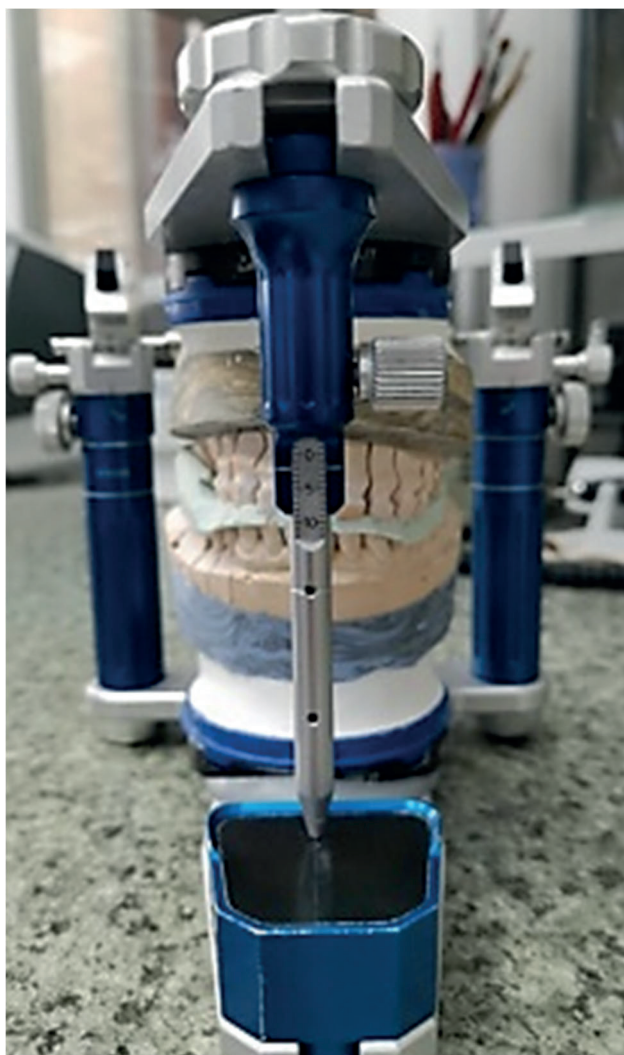


Fig. 3. Models of jaw in the articulator

The treatment was started with a 2 mm thick individually made myorelaxing splint. For this purpose, we used vinyl plates manufactured by Bredent (Germany), pressed using a vacuum molder.

The fitted removable vinyl mouthguard is left in the oral cavity for 2 months, i.e. for the period of adaptation to new conditions and functional restructuring of the dento-maxillary system. The patient was warned about the possibility of pain in the TMJ and appeared for control examinations every two weeks. The absence of unpleasant subjective sensations allowed us to continue treatment.

Next, according to the plan, a myorelaxing splint with a thickness of 4 mm was made for a treatment period of 2 months and a control examination once every two weeks. The absence of complaints during

the use of this design confirms the correctness of the chosen treatment.

The next clinical stage consists in the manufacture of an individual vinyl splint with a thickness of 6 mm. We suggest the patient to reduce the number of control examinations to once a month due to the absence of complaints when using the muscle myorelaxing splint. As an illustration, a photo of patient S. taken at the stages of treatment with individual mouth guards (Fig. 4).

Thus, the clinical and laboratory stages of orthopedic rehabilitation with myorelaxing splints of increasing thickness differ in the duration of the treatment period, but make it possible to properly restructure myostatic reflexes and prevent dysfunctional disorders in the TMJ. The removable nature of the structures prevents the development of complications, associated with stagnant processes in the area of marginal periodontium, which is often observed with the use of non-removable disconnection devices.

The next clinical stage, which allows us to fully imitate the aesthetic appearance of future prostheses and is important at the treatment stage, is mock-up. To create it, we took impressions of the upper and lower jaws with an intraoral scanner and sent the digital model to the laboratory, where we model the future smile over patient's own teeth using the Exocad program (Fig. 5). The ready jaw models are printed on a 3D printer.



Fig. 4. Myorelaxing splint in the oral cavity

The silicone mass is transferred to the finished model of the teeth, after which cavities identical to the shape of the teeth on the model are formed in the impression. We fill the silicone mold with TempSpan composite material and transfer it to the patient's

natural teeth in the oral cavity. Thanks to the model transfer method, we can clearly see which layer of tissue needs to be removed when preparing the teeth. This method allows us to avoid unwanted preparation and preserve as much tooth tissue as possible. We scan the already prepared stumps and send them to the laboratory. We transfer the primary model to the new

scans. The result we get serves as a template for the manufacture of future permanent structures. We print the models of both jaws and at this stage they have the final look. After that, we take an impression of the models with Spidex silicone mass, fill the resulting mold with TempSpan material, put it into the oral cavity and wait for the composite to harden (Fig. 6).

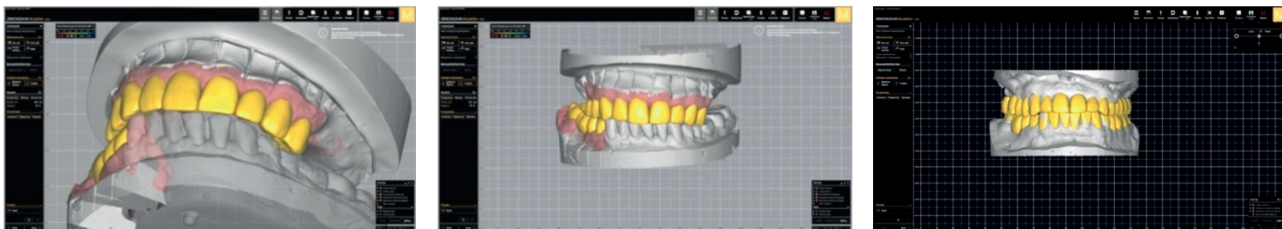


Fig. 5. Mock-up modelling in Exocad software

The finished structure will serve the patient as a temporary prosthesis. We recommend that the patient use the temporary prosthesis for three weeks for maximum adaptation. During this time, the permanent orthopedic structures are being manufactured.

The next stage involved checking and correcting the frames of the one-piece bridge-like prostheses for the upper and lower jaws, made of Premium Co-Cr-alloy for ceramic alloy, manufactured by Bego, Germany. Finally, we determine the shades of tooth color coating according to the Vita scale – A2 (Fig. 7).

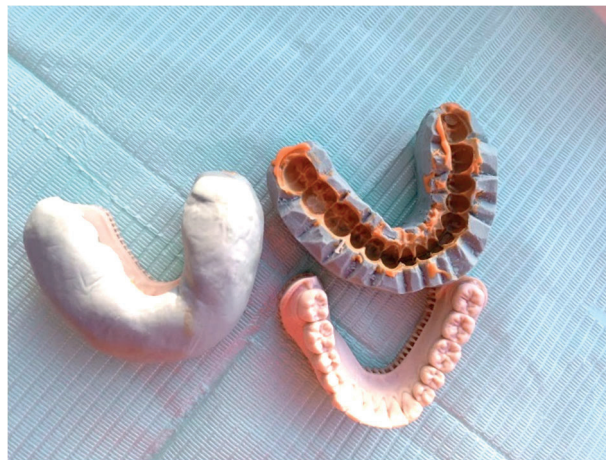
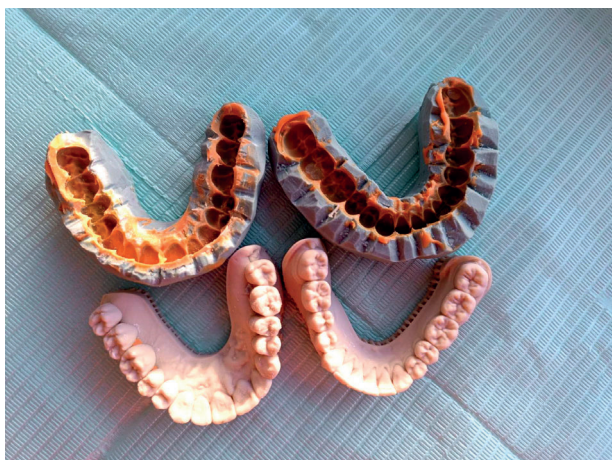


Fig. 6. Making a mock-up using silicone keys

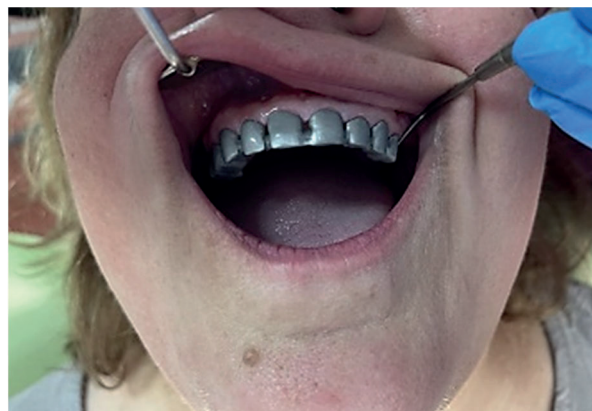


Fig. 7. Fitting one-piece frameworks in the oral cavity

We consider the stage of fitting of one-piece frames lined with ceramics to be mandatory, as it allows us to check the density of interocclusal contacts, the harmony of the vestibular arch, the naturalness of the smile lines and aesthetic ap-

pearance in general. We used DuceramKiss ceramic mass, produced by DeguDent (Germany), for the cladding of the frames. The verified structures were sent to the dental laboratory for glazing (Fig. 8).



Fig. 8. Verification of metal-ceramic restorations before glazing

Subsequently, we took full functional impressions with Speedex silicone mass for the manufacture of a clasp prosthesis with a locking system of fixation. At

the last clinical stage, we corrected the clasp prosthesis and fixed it in the oral cavity together with one-piece metal-ceramic bridge prostheses (Fig. 9).



Fig. 9. Patient's appearance with fixed orthopaedic restorations

Upon completion of prosthetics, a total restoration of the teeth of the lower jaw was carried out to restore their anatomical shape, which was disturbed due to pathological abrasion of hard tissues. The restoration was performed with Filtek Ultimate material, made in Germany (Fig. 10).

Therefore, analyzing and discussing the results obtained by us in a complex case of a patient with a reduced bite height, it should be noted that the complex approach we applied, taking into account

the existing recommendations, convincingly demonstrates the effectiveness of the treatment and diagnostic tactics chosen by us and generally correlates with similar data from other scientists [3, 17, 11, 15].

Based on the data of V.M. Dvornik's research, we proposed a two-stage orthopedic treatment that involves preliminary occlusion separation using individual vinyl mouth guards with increasing thickness of 2, 4 and 6 mm, made for the lower jaw [3, 17].



Fig. 10. The final stage of the patient's treatment and general appearance after the restoration of the lower jaw teeth

In turn, V.S. Onishchenko, V.I. Bida, and O.M. Ovcharenko [11] recommend using mouth guards for a period of three to six months to restore interalveolar height. During this time, the reflexes of the masticatory system are restructured, which further requires rational prosthetics. Therefore, in order to restore the original relationship of the lower jaw to the upper jaw, its physiologically correct position, which changed with a decrease in the height of the occlusion and the loss of the chewing group of teeth, we made a relaxing splint for the patient, the use of which allows you to relax the muscles, fix the lower jaw in the correct position and create the correct ratio of all components of the TMJ.

It should be noted that the technique of all stages of diagnosis and treatment applied by us, detailed in the article, with their photo illustration, has an effective scientific and practical value for clinicians. In turn, the accumulation and analysis of such data will expand the understanding of specialists of this problem and contribute to the improvement of the treatment of patients with similar pathology. We hope for due attention of scientists to these issues by applying a complex approach to their solution, which is reflected in the clinical case presented by us.

CONCLUSIONS

1. In patients with a reduction in bite height of more than 2 mm, it is advisable to carry out treatment in two stages. At the first stage, we normalize the occlusal height and rebuild the function of the masticatory muscles. At the second stage, we provide rational prosthetics.

2. Orthopedic rehabilitation with myorelaxing splints of increasing thickness makes it possible to correctly rebuild myostatic reflexes and prevent functional disorders in the TMJ.

3. Any case of complex treatment of patients with a decrease in bite height due to pathological abrasion of the hard tooth tissues deserves the attention of both scientists and dentists in practical health care.

Contributors:

Sokolovska V.M. – data curation, research;

Tsvetkova N.V. – data curation, research;

Davydenko V.Y. – software;

Pysarenko O.A. – visualization;

Tarashevskaya Y.E. – methodology.

Funding. This research received no external funding.

Conflict of interests. The authors declare no conflict of interest.

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Стаття надійшла до редакції 22.03.2024;
затверджена до публікації 23.04.2024

