IJIMM, Volume 2, Issue 5, 2024 ISSN: 2995-5319
http://medicaljournals.eu/index.php/IJIMM/issue/view/3

INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Post-Treatment Condition of Parodont Tissue in Patients Prosthetic With Metal-Ceramic and Zirconium Prostheses

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Abstract: To increase the efficiency of prosthetics, the use of metal, metal-ceramic and zircon dentures was determined. The issues of modern methods of dental prosthetics are highlighted. The analysis of the most common errors and complications in prosthetics with the use of fixed structures has been carried out. The assessment of the physical and technical properties of cermet structures remains poorly studied. To exclude ceramic chips, antagonizing dentures are not brought to contact, which can lead to deformation. Thus, the question of the influence of fixed prostheses on the clinical and morphological state in the absence of periodontal tissues remains unstudied.

According to certain data, pronounced morpho-functional changes are observed in the periodontal microvessels with an increase in functional loads. It should be borne in mind that the problems associated with obtaining reliable information on the condition of the tissues surrounding the tooth (periodontium, periodontium, marginal gum) arise already at the initial stage. The diagnostic methods used are rather approximate and in many cases do not reflect the actual picture of the state of the periodontal tissues. In this regard, the study of the state of galvanosis of the oral cavity with fixed prosthetics made of various metals becomes urgent and requires further research in this direction, which will improve the quality of dental care and prevent premature removal of orthopedic structures. The available research in this direction is not numerous and is of a fragmentary nature. Therefore, the identification of the cause-and-effect circumstances that contribute to the occurrence and cause of diseases of oral mucosa when using various types of prostheses (metal crowns, ceramics, zirconium) with the use of histological, electron microscopic and histochemical research methods, will allow developing more effective methods of their treatment and prevention [2.4.6.8.10.12.14.16.18].

Aim of the study

Is comparative assessment of morphological and functional changes in periodontal tissues when using metal, metal-ceramic and zircon dentures to improve the efficiency of prosthetics.

Materials and methods. Oral cavity sanitation, dental plaque removal, and oral hygiene training were carried out. Diagnostic observations of the periodontal condition were carried out in the area of abutment teeth before and after fixation of bridges and crowns, as well as within 1, 3, 6, 12 months after prosthetics. Clinical methods included questioning, casual examination, and armed eye examination (stomatoscopy) of the oral cavity. Stomatoscopy was performed using an ophthalmic operating microscope at a magnification of 30 times. The bone tissue around the abutment tooth was examined using X-ray machines. The pictures were taken according to Yusupov. Computed tomography was performed to assess the bone structure of the upper and lower jaw. To determine the endurance of the periodontal tissue to vertical load, gnatodynamometry was performed using electronic gnatodynamometers. Electroodontometry was performed selectively, and only those teeth that were included in the abutment teeth for bridges and according to indications. The used bridges (cermets, zirconium, metal crowns) create conditions for the development of increased functional load on the periodontal tissues of the supporting teeth.

Gastrointestinal tract sampling was performed before complex treatment in patients with defects in dentition and hard dental tissues and after prosthetics , not earlier than after 30 days , as well as in healthy individuals. To do this, at the dental appointment, the patient was asked to rinse the oral cavity with 3 small volumes of plain water and think about lemon to stimulate salivation. Sterile penicillin

vials with a volume of 10 ml were used as test tubes, which patients filled with their gastric cancer up to 1 / 3-1 / 2 of the total volume. Then glass vials with the test material were frozen in a freezer and stored at minus 20 ° C for no more than one month. Thereafter, undiluted samples were thawed very quickly by heat treatment in a water bath at 37 ° C to prevent fibrinogen precipitation. In the comparison group (control group), studies of 24 teeth with intact periodontium in the upper and lower jaws were carried out on the basis of basic and paraclinical research methods (percussion, the state of the gingival margin using a bulbous probe), X-ray - overview and sighting images, electrodontometry - to determine condition of the pulp and periodontal. In the main observation group of patients, in addition to determining the type of design features of bridges, all abutment teeth were examined in the same sequence as in the comparison group [1.3.5.7.9.11.13.15.17].

The clinical condition of the marginal periodontium was assessed visually and using an operating microscope, the Schiller-Pisarev test and the papillary-marginal alveolar index (PMA) indexes, where hyperemia, edema, bleeding and vascular pattern were determined.

The clinical picture with partial adentia largely depends on the number of lost teeth, dystopia, type of bite, functional usefulness, the state of hard tissues not only of abutment teeth, but also of the complex of tissues surrounding the tooth. The appearance of a defect after tooth extraction disrupts its continuity, morphological and functional disorders occur. Shortened periods of wearing fixed bridges resulted in supercontact, while in others the teeth were turned off from the act of chewing. The marginal gum, where the connection with the tooth occurs, is often interpreted as a gingival pocket, a gingival gap, a physiological pocket, a gingival groove. When measuring the gingival gap, the groove depth reached 2-3 mm on average. With bridge prosthetics, when odontopreparation was performed and the gums were injured (periodontal pathology), the depth of the gingival groove in 50% of cases reached 3 mm. These data related to the indicators of the marginal gingiva of the abutment teeth around the defect during repeated prosthetics of patients. The condition of the periodontal gap served as a basis for assessing the marginal periodontium in persons wearing fixed prostheses, both during re-prosthetics and in future orthopedic interventions. We studied the magnitude of the electrochemical potentials in connection with the finding in the oral cavity of prostheses of various design features, as well as the materials from which they were made: solid, cermets, zircon. The pattern of mitosis, as a rule, is observed in the cells of the basal layer, as well as in the adjacent lower rows of cells of the spiny layer. The electron diffraction pattern of a transmission microscope shows detachment of cells of the granular layer with penetration of microorganisms into the intercellular space. Destructive changes are also observed in the deep zones of the spiny layers of the epithelium. It should be noted a slowdown in the differentiation of epithelial cells and a sharp decrease in the mitotic activity of the combined zone. In the prickly layers, there is a rupture of dysmosamic connections between epithelial cells [18.19].

With the introduction of metals (mainly stainless steel) into the practice of orthopedic treatment, the reactions to these materials were explained by the appearance of galvanic phenomena in the oral cavity. As a rule, the diagnosis was formulated as "galvanosis", "electrogalvanosis". Since there were no sufficiently sensitive research methods to prove the presence of metal corrosion in an aggressive environment. Significant disorders with partial edentulousness occur in the tissues of the periodontal complex, since it is the integrity of the dentition of the jaws that ensures the usefulness of chewing as one of the most important functions of the body. Dissection of hard dental tissues without observing the established rules leads to morpho-functional changes in dental pulp tissues. In the monograph of Professor Irsaliev Kh.I. (2001) widely described and illustrated electronograms of the surface of prepared teeth.

Results and discussion. Such materials used for dentures do not meet either the aesthetic or functional requirements of modern dentistry. This state of the problem dictated the search for the most adequate structures built into the oral cavity, devoid of the above disadvantages. Currently, the most satisfying clinical and functional requirements and aesthetic parameters are dentures made of cermet, zirconium. Undoubtedly, the positive results of orthopedic structures made of cermets and zirconium are largely indifferent for the organs and tissues of the oral cavity. However, there are also negative influences on

the marginal periodontium associated with the advancement of the edges of the crowns into the periodontal pocket, causing morphological changes. The present study is devoted to the study of the marginal periodontium when using fixed bridges, cermets, zirconium and chromium-cobolt alloy). However, problems arise in the first approximation and are associated with an objective assessment of the true picture of the state of the tissues surrounding the tooth. The currently used diagnostic methods are quite subjective: there are no standard measurement techniques, developed protocols, and the available data are contradictory. Thus, the existing methods for assessing the state of the marginal gingiva of the periodontal abutment teeth do not give a true picture of its functional changes in microcirculation at the stages of prosthetics with secondary adentia.

In our opinion, special attention should be paid to determining the state of the marginal periodontium of abutment teeth in modern types of prosthetics (cermets, zirconium), adaptation processes at the level of microcirculation, which was the topic of the study [17.19]. We have examined by clinical, functional and morphological methods the tissues of the marginal periodontium of abutment teeth in patients using metal-ceramic and zircon bridges. In the dynamics of observations before fixation of the bridge with LDF of the supporting teeth, a positive dynamics of microcirculation indices was determined. The level of capillary blood flow (M) increased by 28% and approached the initial level before treatment, vasomotor vascular activity (KV) increased by 32%. After fixation of the bridge in the dynamics of observations of the marginal gingiva of the supporting teeth, the level of capillary blood flow tended to further increase: the vasomotor activity of microvessels (KV) decreased by 10%, which is lower than the initial level. 1 month after fixation of the bridge, the level of capillary blood flow tended to progress and corresponded to normal values. The obtained indicators remained in the dynamics of observations up to 6 months and in more distant periods of observation. According to the results of our research, orthopedic treatment of a partial dentition defect with metal-ceramic structures is important for determining the state of microcirculation of the supporting tissues of the teeth. The data obtained from the study of laser-Doppler flowmetry (LDF) at the stages of orthopedic treatment up to the fixation of a fixed bridge and in the long-term observation period show that this objective assessment of the functional state of the microcirculation system in the periodontal tissues of the marginal gingiva of the abutment teeth is relevant for predicting near and long-term results prosthetics of partial dentition defects.

As a rule, the content of FN O- α is not determined, or is at a low level in the blood serum of healthy people, whereas with the development of a pathological process, its amount increases several times. Thus, synthesis FN O- α in patients with the group to prosthetic averaged 12.3 ± 0.32 pg / ml, and these values were in the control group 9 , 4 ± 0.39 pg / ml, which is 1 , 3 times more ($P < 0.001$). It was also found that a significant increase in the level of IL-10 in the main observation group before orthodontic treatment was 1.2 times (10.6 ± 0.32 pg / ml versus 8.5 ± 0.38 pg / ml) ($P < 0.001$).

The obtained data with cytokine status of the oral cavity before the prosthetics point to the weakening of the local immune defense GPRS, connectivity with the need for the orthopedic intervention.

After the imposition of dentures, the 1st dental examination was carried out the next day, at the stage of denture correction. Treatment of inflammatory changes in the mucous membrane was carried out both at the reception and at home using preparations containing antiseptic, anesthetic, regenerating components in accordance with the "Protocol for the management of patients with partial absence of teeth (partial secondary adentia)".

The study of the dynamics of the above mentioned mediators of inflammation recorded a decrease in the expression with 30 days after fixation of the fixed bridge, but these data did not reach the values before the start of treatment and did not undergo significant fluctuations in the future, that is, remained within the specified concentrations.

Thus, in group I of patients with metal-ceramic prosthetics after 1 month, the level of IL-1 β decreased to 16.4 ± 0.74 pg / ml ($P < 0.0\ 01$), IL-6 to 28.7 ± 0.72 pg / ml ($P < 0.0\ 01$) , TNF- α - 24.5 ± 1.03 pg / ml ($P < 0.001$) , IL-10 - 15.3 ± 0.65 pg / ml ($P < 0.001$).

It is important to note that in the II group of patients with zirconium prosthetics, the level of IL-1β after a month of prosthetic implantation retained a tendency to decrease by 30% compared to the values after 7 days. Thus, the content of IL-1β after 30 days is 13.6 ± 0.46pg / ml (P < 0.001).

Concentration of FN O- α was significantly decreased on Day 30 to 14.8 ± 0.36 pg / ml, but did not reach the initial values (starting - 12.3 ± 0,32pg / ml (P < 0.05). The rating of content via 1 month established a slight decrease in the expression of IL-6 to 24.5 ± 1.03pg / ml (P < 0.0 01). A decline after 1 month was observed in the level of IL-10, which averaged 12.5 ± 0.68 pg / ml (P < 0.001).

These indicators indicate a decrease in the inflammatory response of the oral cavity, albeit slow, but stabilization of the local immune mood of the oral cavity.

The revealed significant increase in the concentration of pro-inflammatory cytokines IL-6 and TNF-α after 7 days and 1 month in both groups indicates a significant decrease in anti-infectious resistance in the oral cavity, which is a consequence of an imbalance between the normal flora and the body's immune response at the local level.

Conclusions. Diagnostics and treatment of an increased level of galvanic currents should involve the removal of metal structures of various inclusions and the conduct of pathogenetic therapy of periodontal tissues before re-prosthetics, with the replacement of basic dental materials with ceramics or zirconium. The activation of the inflammatory process in the periodontal tissues was established, manifested by an increase in the concentration of pro- and anti-inflammatory cytokines already on the 7th day after fixation of the prosthetic structure.It was revealed that with zirconium prosthetics, the positive dynamics of indices of local immunity links in gastric cancer in patients of this group. On examination, no foci of inflammation caused by the prostheses were observed, which indicates a satisfactory regeneration of the tissues of the prosthetic bed, and in the patients' opinion, they were completely adapted to the denture.

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