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# THE EFFECT OF NON-REMOVABLE DENTURES ON THE CONDITION OF THE PULP AND PERIODONTAL SUPPORT TEETH

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## ABOUT ARTICLE

**Key words:** Metal-ceramic prosthetics, pulp protection, complications at the stage of orthopedic treatment.

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**Abstract:** This article provides information on the various causes of complications at different stages of orthopedic treatment of patients equipped with non-removable prostheses, starting with classical and original studies. This article provides information on the various causes of complications at different stages of orthopedic treatment of patients equipped with non-removable prostheses. Complexes for which medical and orthopedic guarantees are mandatory are described. A set of mandatory medical and orthopedic protective measures aimed at leveling the adverse effects of medical manipulations in the manufacture and use of metal-ceramic prostheses is described. Favorable methods of maintaining pulp viability and the principle of pulp protection with a minimum number of medical and orthopedic measures are highlighted.In metal-ceramic prosthetics, special attention is paid to the principles of maintaining the viability of the pulp and protecting the pulp with minimal polishing of the hard tissues of the tooth.

## INTRODUCTION

The current stage of development of orthopedic dentistry, both scientific and clinical, is characterized by the recognition by many researchers of the dominant role of inflammatory processes against the background of microbial factors in the etiology of periodontal diseases. Over time, inflammation becomes chronic, from slow to very active local or systemic periodontal damage, and the degree of destruction correlates with the amount of plaque and the age of the patient. One of the key points is a violation of the biomechanics of the bone system of the alveolar process against the background of morphological anomalies of the dentition and occlusion. Despite the impressive successes achieved in the development of new principles and methods for prosthetics of various dentition defects and improving their introduction into widespread use, the key problem of clinical periodontology in combination with the pathology of the pulp of dissected teeth has not lost its relevance to the present, and the hard and marginal periodontal tissues of dissected teeth Require further comprehensive studies aimed at optimizing protection. In the process of non-removable prosthetics, the gingival edges of the abutment teeth are subjected to microtrauma. The latter is not only a direct consequence of the effect on the crown of the abutment after the installation and fixation of a non-removable prosthesis, but also a consequence of medical manipulations at the prosthetics stage [2, 8, 9, 16, 21, 26, 27]. The manufacture of non-removable dentures requires a number of clinical and technical measures, one of the fundamental points of which is the preparation of hard tissues of the supporting tooth to ensure the functional effectiveness and durability of all types of dentures, including crowns. The latter determines the position of the edges of the artificial crown and the recession of the gum at the time of removal of the double impression [10, 15, 22, 28, 29, 30]. Discussions about the principle of forming the edge of an artificial crown of solid-cast veneers and its position in relation to the gingival furrow, about the preparation of abutment teeth without ledges on the front teeth or about creating a ledge of a certain shape remain a problem for researchers [2, 8, 13, 17]. It is assumed that the subgingival ledges of the crowns prevent the development of superficial root caries, improve the fixation of fixed prostheses and provide an optimal aesthetic result [3, 17]. On the other hand, many researchers consider it undesirable for the edge of the prosthesis crown to be located significantly subgingival. This is due to the fact that in such cases, chronic periodontal inflammation occurs with resorption of the interdental septum and the formation of periodontal pockets [2, 9, 15, 24, 25, 27], as well as pathological changes in the periodontal tissue complex [3, 29]. The widespread introduction of all-ceramic artificial crowns and bridges into orthopedic practice has created new problems. The main ones are inflammatory processes on the gingival edge of the abutment, gum recession, thermal trauma of the pulp, periodontal overload and morphofunctional changes in periodontal tissues. These adverse effects of non-removable prostheses on the periodontal ligament and pulp have been noted by many researchers [5, 10, 13]. Of

great importance is the correct formation of the metal-ceramic edge of the crown, its position, thickness and morphology, which means the presence or absence of an anterior ledge, its shape, width and perimeter. The thickness and length of the edge of the crown inserted into the gingival groove should correspond to the physiological parameters of the latter, which, as is known, are not the same for different teeth, as well as for the same tooth, depending on the surface [10, 22, 23]. The authors, who studied morphological changes in the periapical tissues of the teeth, note the presence of inflammation of varying intensity at the gingival margin due to the uneven fit of the artificial crown to the gingival margin [2, 26, 27, 28]. There are advantages and disadvantages of where the edge of the ceramic-metal crown is located - at or below the gingival edge. Thus, the location of the crown edge in the gingival fissure provides the greatest aesthetic effect, but is undesirable from the point of view of the physiology of the marginal periodontal ligament, since it can cause chronic inflammation with resorption of the interdental septum and the formation of periodontal pockets [26]. Against the background of intact periodontal and periodontitis tissues, the opinion about the absence of a pronounced inflammatory process in the area of abutment teeth with a subgingival marginal ledge for fixing the basic prosthesis is ambiguous, and clinical recommendations are quite contradictory [13, 16, 22, 25]. The preparation of a tooth with a ledge located in the gingival fissure to achieve a greater aesthetic effect is very traumatic for the marginal zone of the periodontal ligament. The supradingival position of the ledge violates aesthetics and often leads to the development of carious processes [28]. It was believed that the edges of the crown should be removed from the gum level by 1.5-2 mm in order to prevent the development of inflammation in marginal periodontal tissues, both in intact and affected periodontal tissues. In many cases, it is possible to place the edge of the crown above the gingival edge. This happens in cases where the abutment tooth has a sufficient clinical crown height to ensure reliable fixation of the non-removable prosthesis, or when the maxillary part of the tooth is not visible when smiling. At the same time, the location of the edge of the artificial crown above the gum is contraindicated if the tooth was previously covered with a crown and its edge fell below the gum. It is believed that it is advisable not to bring the edge of the crown to the gum level if the depth of the gingival furrow is less than 0.5 mm [25, 26, 28, 33]. The exception to this rule is interventions on the front teeth. However, if the edge of the artificial crown is located above the gingival edge, aesthetics is impaired, especially when fixed on the front teeth. To improve the appearance of the patient, it was proposed to restore the upper gingival margin with metal-ceramic crowns with composite material [30, 44]. According to other researchers, the edge of the artificial crown should be at the same level with the gingival margin, without sinking into the gingival groove. They believed that such an arrangement of the crown edge is the most atraumatic for marginal periodontal tissues [10, 13, 23]. It was noted that when the edge of

the crown is located at the gum level, with or without the formation of a ledge, the periodontal ligament in most cases does not undergo significant changes. If the edge of the artificial crown is located below the gingival edge, the presence of a ledge is necessary. This is due to the fact that in the absence of a ledge, tartar is intensively deposited on the protruding edge of the artificial crown, which causes inflammation of the marginal periodontal tissues. The occurrence of inflammation of the marginal periodontal ligament is associated not only with injury to the epithelium during the formation of the tooth surface. It is also caused by the formation of uneven contours along the edges of artificial ceramic metal crowns. In particular, the formation of a high equator on the contact surface of an artificial crown covering adjacent teeth increases the interdental gap, thereby violating aesthetics and injuring the interdental papillae [10, 31, 34]. According to many researchers, gum recession during the preparation of hard tooth tissues and the removal of a double impression occupies an important place among the factors that negatively affect the gingival margin. Improper preparation of abutment teeth leads to excessive excision of hard tissues and excessive narrowing of the proximal wall, which leads to damage to the pulp and poor fixation of the finished prosthesis. The tactics of depulpation of all abutment teeth is not justified when using metal-ceramic prostheses [1, 4]. Frequent complications when using ceramic-metal prostheses are lysis and necrotic destruction of hard dentine tissues and the cement layer of a tooth prepared for an artificial crown, as well as demineralization of the prosthesis. These processes often develop not only in the area of the crown edge caused by the destruction of the fixing material, but also in the degenerate tooth [6, 20, 28]. After 24 months, only 68.18 ± 4.96% of patients with a durable crown in the case, our study suggests that tooth tissue gives reason to reject tooth debridement as a way to protect against the damaging effects of odontopreparation. Tooth debridement performed immediately before and long before prosthetics reduces the effectiveness of orthopedic treatment, as it causes inflammatory complications of periodontal ligaments in 15.51 ± 2.65% of patients and increases the fragility of hard tooth tissues in 9.09 ± 2.10% of cases [4, 5]. A fracture of the crown is a characteristic complication when using depulpated teeth as abutments of solid, non-removable dentures [6, 19], and researchers [2, 10, 23] agree with this opinion. The same frequency of complications is observed both in patients whose teeth were depalped long before prosthetics, and in those who depalped their teeth immediately before prosthetics. The changes occurring in this case are the result of overheating and dehydration of tooth tissues during pre-prosthetic treatment and subsequent microbial invasion through open dentine tubules with the possibility of pulp damage and hemorrhage. The results of experimental studies on dogs confirm that the scraping of large layers of hard tooth tissues leads to significant morphological damage. Circulatory disorders in the pulp and periodontal ligament manifest themselves from day 1 and are expressed by hyperemia, thrombosis and

perivascular hemorrhages. Circulatory disorders last 3-5 days, after which vascular disorders decrease and disappear by day 15. Changes in the bone tissue of the jaw manifest themselves as a limited circulatory disorder for 3-5 days without pronounced inflammatory disorders. The proliferation of cellular elements and the proliferation of connective tissue in the bone marrow cavity leads to a narrowing of the bone marrow cavity [1, 4, 5,]. The clinical results of dental prosthetics in patients with fully molded dentures in orthopedic clinics confirm the need to protect the prepared tooth tissues. Neglect of measures to protect the polished tooth tissues can lead to acute inflammatory phenomena in the area of the patient's abutment teeth, which makes a good result of prosthetics very problematic [3, 6]. Therefore, the set of measures mandatory for patients undergoing orthopedic treatment with cast dentures includes dental odontopreparation taking into account the characteristics of the teeth and special measures to protect tooth tissues. Special measures to protect tooth tissues serve to form a kind of bandage on the newly formed wound surface. In most cases, temporary crowns are used on average for 10-15 days between cleaning the tooth surface and fixing the complete prosthesis. The results of experimental, clinical and cytochemical studies confirm the advantages of maintaining the viability of teeth used as abutments in whole-cast prosthetics. An important condition in this case is the protection of tooth tissues with a temporary crown during the period between the formation of the tooth and the fixation of the prosthesis. When fixing temporary crowns made of autogenic hard plastic, it is recommended to cover the prepared tissues with 30% silver nitrate or fluorinated varnish [6, 7]. On the other hand, it is believed that the use of such bactericidal concentrations of 30% silver nitrate solution as an application agent is aesthetically and morphologically unacceptable, since it causes darkening of the tooth surface and destructive changes in the nerve endings of the dentine tubules, which leads to subsequent necrotic pulp caries. Studies [11, 12, 14] have shown that for a more effective antimicrobial effect, it is desirable to initially treat teeth with a 3% solution of hydrogen peroxide after preparation for solid cast structures. Then the tooth surface can be treated once or twice with 0.05% chlorhexidine solution or 1% silver nitrate solution to prolong the antiseptic effect, and during the manufacture of a permanent tooth, the tooth surface can additionally be sealed with a temporary crown. In connection with the expansion of the lumen of the dentine tubules, remineralization, especially deep fluoridation, is recommended [12]. For this purpose, "Fluorax" formulations containing fluoride, copper and magnesium ions, as well as a suspension of highly dispersed calcium hydroxide in distilled water are used [19]. Scanning electron microscopy confirmed that the Fluorax varnish forms a smooth, dense and homogeneous protective layer on the surface of hard tooth tissues [18]. In recent years, other methods of protection have been used as an alternative to pulp removal to preserve the viability of the pulp. One of these methods is the direct coating of the pulp with calcium hydroxide, which plays a

special role as an effective material for protecting the pulp. Direct coating of traumatically damaged pulp, as well as pulpotomy, has a treatment success rate of 61-96% when using calcium hydroxide or liner bond adhesive. It was found that calcium enters the dentine bridge from the bloodstream. Experiments on rats to study the ultrastructure of pulp lesions after direct coating of the pulp with calcium-betaglycerophosphate showed that this drug is a source of calcium and phosphate by hydrolysis with alkaline phosphotase, and osteodentin is formed first, and then tubular dentin is rapidly formed. It has been shown that this is being achieved. At the same time, given the numerous results of using calcium hydroxide adhesive systems for direct coating of pulp, the results obtained in animal studies cannot be fully extrapolated to clinical practice, since the presence of acidic components in such materials in some cases may be a contraindication for their use to maintain pulp viability. It was concluded that the results obtained in animal studies cannot be fully extrapolated to clinical practice. In this regard, the search for new materials for coating the pulp continues. To date, it has been established that hydrophilic primers penetrate into healthy dentin and form a durable hydrolyzed or resin-impregnated dentin layer, preventing the development of post-treatment hypersensitivity and micro-leaks from the surface of resin-hydrolyzed dentin. Such adhesive primers and bonding systems increase the density of the underlying remaining dentin layer while maintaining biocompatibility with the pulp.

## CONCLUSION

Currently, the possibility of widespread clinical use of these adhesive systems as an alternative material to calcium hydroxide is being considered.

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