



Modern Views on the use of Metal-Ceramic Structures in Dental Prosthetics

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Abstract: In modern dentistry, the construction of cermet is of particular interest. Orthopedic dentists often prefer to depulpate the supporting teeth to avoid complications, despite the fact that many researchers point to the advantages of vital teeth over depulped ones.

Keywords: prosthetics, depulping, cermet.

Among orthopedic dentists, the problem of dental depulping during prosthetics of patients is still relevant. In most cases, pulp removal is performed during prosthetics with metal-ceramic structures, although this is not always justified. According to researchers, 97% of teeth under metal-ceramic structures undergo depulping [4]. This situation in prosthetics of patients with metal-ceramic structures is usually due to the fact that orthopedic dentists are afraid of problems that arise in the process of working with vital teeth. First of all, this is due to the need for anesthesia, the use of protective coatings and the manufacture of dental crowns. Problems may also include increased sensitivity of treated teeth due to the opening of dentine tubules, as a result of which the pulp is exposed to chemical, physical stimuli, bacteria and their waste products, which can lead to its hyperemia and even the development of acute or chronic pulpitis [2, 7, 8, 13]. Prosthetics based on vital teeth has a number of advantages, the main of which is the absence of complications related to the quality of endodontic treatment. The complex structure of the root canal system, the presence of deltas, branches create difficulties in the preparation and obturation process. For successful treatment, it is necessary to use an effective isolation system of the surgical field, expensive endodontic instruments and equipment, as well as X-ray monitoring is mandatory. However, even compliance with all of the above conditions cannot 100% guarantee the absence of complications after endodontic treatment [4, 6, 11, 13]. The data of foreign scientists, based on 20 years of observations of various orthopedic structures on vital and depulped teeth, indicate in favor of preserving the pulp of the tooth when using it as a support [11, 15]. These studies have shown that the probability of failure in cases where support is carried out on depulped teeth is higher than when using vital teeth. According to the data obtained, the greatest number of failures was observed when using depulped teeth as distal supports of bridge prostheses, in prostheses with cantilever segments, as well as in combined prostheses with rigid fixation [11]. Scientists explain the higher percentage of complications compared to vital teeth by damage to the tissues of the apical periodontium and a violation of its cushioning function as a result of endodontic treatment. Therefore, depulped teeth tolerate increased loads worse than vital ones. A number of authors also believe that prosthetics with vital teeth is preferable, and it is necessary to depulpate the supporting teeth only according to indications that can be presented in the form of three groups [7, 10]. The first group includes anomalies of position, development and age characteristics of some groups of teeth.

Anomalies in the position of the teeth suggest supra- or infraposition, vestibular or oral inclination of more than 15°, extra- or intraalveolar position. In this case, if orthodontic treatment is impossible or the patient refuses it for one reason or another, as a result of uneven preparation of different tooth surfaces, an opening of the tooth cavity will inevitably occur, which fully justifies its preliminary depulping. Developmental abnormalities include imperfect dentin and amelogenesis, Fournier's teeth, Getchinson's teeth, and other congenital anomalies. In this case, the crown part of the tooth has an inadequate shape



and dimensions for the manufacture and optimal fixation of structures, which determines the need to strengthen and restore the clinical crown of the tooth using pin structures with preliminary depulcation. In addition, the first group of causes of depulcation can include the young age of the patient and the structural features of some groups of teeth. For example, the lower incisors throughout a person's life have small vestibulo-oral and mesio-distal dimensions, therefore, in the manufacture of a number of structures after odontopreparation, the wall thickness from the medial or distal side will be less than 1 mm, which is an indication for strengthening the tooth using pin structures with pre-depulcation. The second group of indications can include carious and non-carious lesions of the teeth. If, in case of carious destruction, the height of the crown part of the tooth remaining after the removal of necrotic tissues is less than 5 mm or the carious process is localized at the root of the tooth, then there is a need to strengthen with pin structures and restore a full-fledged stump with the help of preliminary depulcation. Complicated caries is an inflammatory process in the pulp of the tooth or in the periapical tissues. In some cases, the patient does not consult a doctor in the acute period, and the inflammation may turn into a chronic stage, or primary chronic inflammation develops against the background of weak reactivity of the body. Such teeth may not bother patients for a long time. But when planning orthopedic treatment, at the diagnostic stage, it is very important to identify such foci using additional examination methods and to carry out endodontic treatment of these teeth before prosthetics. Non-carious lesions include: a fragment of a part of the tooth crown, a deep crack of the tooth crown, traumatic pulpitis that developed during the manufacture of the prosthesis, trauma to the dental alveolar complex, accompanied by detachment of the neurovascular bundle, a wedge-shaped defect, increased tooth abrasion. When a part of the tooth crown is broken off, the fracture line may pass in close proximity to or through the tooth cavity. The latter is an absolute indication for depulcation. If the tooth cavity is not affected, it is necessary to estimate the height of the remaining part of the crown from the point of view of adequate fixation of the future prosthesis and, if it is less than 5 mm, then before prosthetics it is necessary to depulcate the tooth and restore the stump using pin structures. A wedge-shaped defect is a fairly common pathology found in almost all age groups. This can create a problem when prosthetics of teeth with a significant defect of hard tissues in the gingival region, especially when the wedge-shaped defect reaches the middle of the root diameter. After odontopreparation, the stump of such a tooth becomes significantly thinner and becomes less resistant to the horizontal component of the chewing load. Such a clinical situation has an unfavorable long-term prognosis, since the manufactured restoration can eventually lead to complications in the form of a horizontal fracture or a fracture of the crown part. Therefore, before prosthetics of teeth with significant wedge-shaped defects, depulcation with subsequent reinforcement is recommended.

With increased abrasion of the tooth of II and III degrees and a decrease in the height of the lower face, as a rule, the remaining part of the clinical crown has insufficient height and does not allow to produce an adequate non-removable structure without restoring the stump of the tooth with pins, which, naturally, requires removal of the tooth pulp. The third group of indications includes situations where the need for depulcation is due to the design features of prostheses. For example, when preparing lateral incisors or premolars of the upper jaw for structures requiring the creation of a round protrusion 0.8 - 1 mm wide (for example, during restorations without metal), there is a risk of opening or damage to the tooth pulp due to thinning of the dentin wall. There is also a need for depulcation when using the root canal for additional retention of the artificial crown, as well as for prosthetics with capping prostheses with intra- or extra-root fixing clips. In addition to the above, it can be added that during the preparation of vital teeth, the pulp chamber of which has a large size or non-standard position, the horn of the pulp chamber often opens. In such a situation, teeth are usually depulcated already during orthopedic treatment, since it is extremely difficult to predict the occurrence of such a situation at the treatment planning stage. There are a number of conditions that must be observed in order to succeed and avoid complications during prosthetics of vital teeth [3, 7, 10]. Firstly, adequate anesthesia is necessary, since preparation for metal-ceramic structures involves the removal of a significant amount of hard tissue, which can cause unpleasant pain. It is necessary to periodically prepare the tooth tissues with the mandatory use of intensive water cooling (the volume of water supplied should be at least 40-50 ml /min). Adequate water cooling avoids overheating of the pulp, since an increase in temperature in the pulp chamber by more than 6-7 ° C leads



to irreversible changes, since the denaturation of protein molecules occurs at temperatures above 42 °C. When using intensive water cooling, there is naturally a need for a good aspiration system to ensure optimal water quality. the convenience of an orthopedic dentist and the comfort of the patient [5, 10]. A number of requirements are also imposed on the cutting tool. Burs for processing vital teeth for metal-ceramic crowns should have good cutting properties. Otherwise, excessive pressure during cooking can lead to a significant increase in temperature, even with abundant cooling with water. In addition, coarse-grained and medium-grained bores should only be used to remove enamel and surface layers of dentin, and fine-grained abrasives should be used for further grinding of hard tissues. The burs should also be located in the center, otherwise vacuole dystrophy of odontoblasts due to osmotic shock is possible. When preparing vital teeth, it is justified to use marker drills and special techniques that allow you to remove a given thickness of hard tooth tissues. This, on the one hand, ensures good aesthetics of the manufactured structure, on the other, allows maintaining a sufficient thickness of hard tissues, thereby reducing the risk of complications [2, 5, 14]. For successful preparation of vital teeth, it is important to know the safety zones of different groups of teeth in patients, taking into account age characteristics. One of the main factors determining the success of prosthetics is the manufacture of dental crowns and the use of protective coatings. The use of desensitizers and film-forming protective preparations makes it possible to reduce the sensitivity of prepared vital teeth and protect the tooth pulp from the penetration of microorganisms of the oral cavity through open dentine tubules. The coating of prepared vital teeth with special preparations and the manufacture of temporary crowns, according to most authors, is mandatory [6, 8, 12]. Compliance with the above conditions is mandatory. If it is impossible to fulfill any of the conditions, then referral to depulping of the supporting vital teeth is justified.

Materials and methods. Together with the chief dentists of the regions, a survey of orthopedic dentists of the Republic of Uzbekistan was conducted. The survey was conducted among orthopedic dentists taking advanced training courses at the Department of General Dentistry, as well as among orthopedic dentists of all specialties.

During the survey, orthopedic dentists were asked to answer a number of questions about indications for depulping, the causes of the failure of metal-ceramic prostheses and technological aspects of prosthetics (preparation, use of water cooling, marker burs, manufacture of pharmacological structures, coating of teeth with drugs to reduce sensitivity).. The data obtained were processed using the Microsoft Office Excel computer program.

The results and their discussion. First of all, we were interested in information about how many orthopedic dentists produce metal–ceramic structures based on vital teeth without prior referral for depulping of the supporting ones.

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