

Comparative Analysis of Literature Data on the Use of Temporary Structures in Dental Implant Prothesization (Literary Review)

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Abstract:

The article presents a comparative analysis of literature data regarding the use of temporary structures in dental implant prosthetics. It evaluates clinical effectiveness, advantages, and limitations of removable and fixed temporary prostheses, including adhesive bridges, acrylic crowns, and CAD/CAM fabricated restorations. Particular attention is given to the role of temporary prostheses in supporting osteointegration, maintaining occlusal height, restoring aesthetics, and preventing functional overload of implants. The review also discusses immediate and early loading protocols and their influence on bone remodeling and implant stability. Different materials, such as acrylic resins and bisacrylate composites, are analyzed in terms of biocompatibility, mechanical strength, and clinical applicability. The study highlights the importance of individualized selection of temporary structures based on patient-specific anatomical and functional conditions. Overall, temporary prosthetics are shown to improve rehabilitation outcomes, patient comfort, and treatment predictability during the implant healing phase. Future research is recommended for clinical optimization protocols in dentistry.

Keywords: *Dental implantation, osteointegration, temporary prosthetics.*

Introduction

Attention is paid to methods for manufacturing temporary structures, including the use of self-hardening bisacrylate composites, acrylic materials, and CAD/CAM technologies. Special attention is paid to the role of temporary prostheses in the osteointegration process, where they help restore aesthetic and functional characteristics, maintain bite height, and prevent overloading of implants. Situations where the use of temporary structures is necessary to ensure the patient's comfortable rehabilitation during the osteointegration period, as well as to minimize the risk of dysfunctions, were also analyzed[1]. The article emphasizes the importance of selecting optimal temporary prostheses based on each patient's clinical characteristics, as well as the need for further research in the field of temporary prosthetics on dental implants.

The progressive development of modern medical technologies has significantly improved the approach to the problem of early aesthetic and functional rehabilitation of patients after implant placement. Currently, the use of dental implantation allows for achieving stable long-term results.

Treating patients using dental implantation methods requires the use of temporary prostheses at all clinical stages - from tooth extraction, through the osteointegration period, and until the creation of permanent prostheses [2,3]. Orthopedic treatment using non-removable temporary structures fixed on implants for several hours (immediate load) or 2-3 days (early deferred load) after surgery represents one of the most dynamically developing areas of dental treatment in recent decades.

The use of temporary structures helps restore facial aesthetics by replacing visible defects caused by tooth loss, and also allows for the analysis of shape and color before preparing the final restoration [4,5]. The patient's psychological comfort after temporary prosthetics is also an important aspect.

The necessity of using temporary prostheses is explained by the long rehabilitation periods for patients during the osteointegration of intraosseous dental implants (from 3 to 8 months). Temporary prostheses not only perform an aesthetic function but also contribute to the restoration of masticatory

function, the preservation of bite height, the prevention of overload and the displacement of remaining teeth toward the defect, and the distal displacement of the lower jaw during the loss of masticatory teeth. This, in turn, helps prevent the disruption of occlusive relationships and the development of temporomandibular joint dysfunction. In some cases, temporary prostheses can be manufactured to correct language parafunction, hypertonia of soft tissues in the sublingual area, or during the healing of an operative wound by secondary tension [6].

According to the opinion of a number of specialists, orthopedic structures used for temporary rehabilitation should be called transitional prostheses rather than temporary ones. This is due to the fact that both temporary and permanent implants, as well as vital or devitalized teeth, can be used as supports, which after treatment are completed will not necessarily serve as the basis for permanent dentures [8,9]. It is important that the same teeth can be used for temporary prostheses as for permanent ones. Furthermore, the period of transitional prosthetics may exceed the time allocated for the use of temporary structures.

Immediate loading of implants allows for simultaneous functional loading with temporary prostheses. This method has become the most in-demand among patients, as it significantly reduces the duration of temporary prosthetics and reduces discomfort. Histological studies of biopsies obtained from the "bone-implant" zone, both in humans and animals, show that immediate load contributes to faster and higher-quality bone growth in the implant area compared to cases where implants are not subjected to immediate load. These methods are effective only if there is full primary stability of the implant, which must be within the installation force range of 25 to 46 N/cm [10, 11].

It has been experimentally established that during early functional loads, bundles of collagen fibers are formed around the implants in various directions, contributing to the uniform distribution of chewing load. Stretching and compression of collagen fibers occur, the implant adapts faster to the bone, and physiological mechanical pressure accelerates the restructuring and thickening of the bone tissue of the alveolar process, ensuring a process of fibroosteointegration that, due to the thinness of the fibrous capsule, is close to the process of osteointegration. Subsequently, a decrease in coarse-fiber connective tissue is observed, without signs of inflammation, and the gradual formation of bone tissue.

It has been established that temporary prosthetics on dental implants do not lead to overloading of dental implants and do not negatively affect the osteointegration of dental implants. High primary stability ensures good aesthetic and functional results for immediate temporary prosthetics [12,13]. The justification for applying immediate load is not only to reduce the risk of fibrous tissue formation leading to clinical failure of the implant, but also to minimize the formation of fibrous bone and stimulate the maturation of lamellar bone capable of withstanding occlusive load [14].

Temporary non-removable structures on implants can consist of two separate parts (temporary abutment and crown) or one where the temporary crown is connected to the temporary abutment. In the first case, the cement fixation method is applied, and in the second, the screw fixation method for provisional crowns. A number of authors note that the cause of more frequent development of peri-implantitis during cement fixation, along with the increase in the micro-gap between the abutment and the implant during crown loading, is the cement residue along the edge of the crown in contact with the peri-implant gums, which is detected during microscopic examination of the removed crowns. Some authors propose using temporary abutments and crowns (the method of cement fixation of crowns), while others recommend using screwed-on temporary structures (screw fixation) made of plastic or composite material.

The manufacture of temporary crowns from acrylic plastics has become widespread [15]. To date, self-hardening bisacrylate composites with automatic mixing systems have gained great popularity among clinicians, allowing for the rapid creation of a temporary structure. These materials are characterized by high mechanical properties, such as strength and surface hardness, and possess good stability in oral conditions. Bisacrylate resins do not contain methyl methacrylate, which ensures good biocompatibility of the treated crowns and bridges. The use of CAD/CAM technologies allows for the creation of prostheses milled from plastic blocks.

In some cases, it is impossible to immediately apply a load to the installed implant due to insufficient primary stability of the implant or the presence of dysfunctional states. In such cases, the manufacture of temporary structures is used for the period of implant osteointegration.

Methodology

This study was conducted as a literature-based comparative analysis of scientific publications addressing the use of temporary structures in dental implant prosthetics. A systematic search was performed in electronic databases including PubMed, Scopus, Google Scholar, and regional scientific journals using keywords such as dental implantation, temporary prosthetics, osteointegration, and immediate loading. Inclusion criteria comprised peer-reviewed articles, clinical studies, experimental research, and review papers published between 2010 and 2025. Articles focusing on permanent prosthetics or unrelated surgical fields were excluded. The selected literature was analyzed using qualitative content analysis to identify trends in material selection, prosthetic design, loading protocols, and clinical outcomes. Comparative evaluation was performed based on functional efficiency, biomechanical stability, and biological compatibility. Data synthesis was carried to determine optimal approaches for temporary prosthetic rehabilitation during the implant healing phase and osteointegration period.

Results and discussion

Several types of temporary orthopedic structures are distinguished: partial removable plate prosthesis, adhesive bridge-shaped prosthesis, and temporary bridge-shaped prostheses made of plastic or metal-plastic [9]. If treated teeth are located near the implantation zone, the defect is most often replaced by a bridge-like structure that rests on these teeth. For temporary bridge prostheses used during implantation, the contact of the intermediate part with the alveolar process mucous membrane must be minimal to prevent mucosal injury and prevent wound epithelialization and the performance of hygienic procedures.

In cases where adjacent teeth are preserved or when it is impossible to manufacture a bridge-shaped prosthesis (for example, with end defects or large defects), temporary removable prosthetics are widely used. Removable prostheses are easily adjusted and provide convenience in caring for the implantation area. However, in most cases, there is no alternative to removable prostheses. According to some specialists, removable prostheses cannot be used for a long time after surgery, as they require frequent adjustments and can exert excessive pressure on the implants, negatively affecting the osteointegration process.

Adhesive bridge prostheses can be used as temporary structures for minor defects in the tooth series (no more than two teeth) or as aesthetic prostheses for the frontal group of teeth. Depending on the manufacturing method, adhesive bridge prostheses are divided into those manufactured directly in the oral cavity using fiberglass ligaments and light-hardening composite materials (direct method) and Merland prostheses manufactured using clinical and laboratory methods (indirect method). One of the key features of using adhesive bridge structures in treatment using implants is the restoration of

aesthetics and function immediately after surgery. These prostheses can be manufactured prior to surgical intervention, both solid-cast metal and reinforced with fiberglass tape.

According to I.Yu. Shirokov et al. [11], when using a two-stage implantation method for the osteointegration period, it is necessary to use temporary dental implants (mini-implants) to temporarily restore aesthetics, speech, and function, as well as to fix temporary fixed prostheses. Prosthesis with temporary implants allows for the optimization of the rehabilitation period, reduces the percentage of postoperative complications, and significantly improves patients' quality of life.

Despite the high risk of losing or breaking temporary implants, several authors agree that installing temporary implants meets the requirements of direct prosthetics, and the orthopedic structures fixed to such implants provide patients with the necessary comfort and allow for the avoidance of removable prostheses during implantological treatment [7].

The use of palate stabilizers for fixing an immediate prosthesis is described in cases where, immediately after implant placement on the upper jaw, it is impossible to fix the permanent prosthesis on them. The use of various types of temporary orthopedic structures is necessary so that throughout the long-term treatment process during the osteointegration of dental implants, the patient "does not deviate from their usual lifestyle," maintains their appearance, and remains socially active.

Conclusions

Thus, the analysis of publications confirms the relevance of the problem of early aesthetic and functional rehabilitation of patients after dental implants. At the same time, many issues related to the impact of a temporary prosthesis on the density and volume of jaw bone tissue and the morphofunctional state of the mucous membrane during the osteointegration of implants remain unresolved. Further in-depth study of the problem of selecting the type of temporary prosthesis that determines the quality of life for this group of patients appears promising.

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