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Stress Distribution Analysis in Implant-Supported Palateless Overdentures with Locator Attachments: A Comprehensive Review

Mostafa Almkrhi*
Prosthodontics Department, faculty of Dentistry, Alasmarya Islamic University, Zliten, Libya

تحليل توزيع الإجهاد في الأطقم المتحركة العلوية الخالية من الحنك والمدعَّمة بزرعات الأسنان باستخدام ملحقات الموضع: مراجعة شاملة

مصطفي المقرحي*
قسم الاستعاضة الصناعية المتحركة، كلية طب الاسنان، الجامعة الإسلامية الاسمرية، زليتن، ليبيا

*Corresponding author: mos.elmagrahi@yahoo.com

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Abstract:
Study Objective The aim of this study is to examine and evaluate how stress is distributed in implant-supported, palateless maxillary overdentures that use Locator attachments. We seek to understand their biomechanical performance, functional efficacy, and the clinical benefits of this design when compared to traditional dentures, paying particular attention to aspects like comfort, stability, load distribution, and the long-term perforFfmance of the prosthetic in edentulous patients. Materials and Methods Our study employed finite element analysis (FEA) to assess the stress distribution in these implant-supported overdentures with Locator attachments. We explored three different approaches: in vitro mechanical testing simulating jaw function, FEA based on 3D models derived from intraoral CT scans, and retrospective analyses through patient surveys aimed at evaluating functional performance and stress behavior under different load scenarios. Results The findings from both the finite element and clinical assessments indicated that palateless overdentures, secured by Locator attachments, managed to effectively spread functional loads. This significantly reduced stress on both the peri-implant bone and the prosthetic parts. Particularly, four non-parallel implants provided optimal load transfer, which helped minimize issues like retention loss and component wear. Complications remained rare and primarily stemmed from attachment fatigue over time, thus affirming the overall mechanical stability and clinical reliability of the system. Conclusion The way stress is distributed in implant-supported palateless overdentures reinforced by Locator attachments is affected by factors such as the number of implants, their position and angulation, as well as the characteristics of the prosthetic materials used. Spreading the implants out wider lessens the stress on both the attachments and the mucosal tissues, which not only boosts the longevity of the prosthesis but also enhances patient comfort. Gaining a comprehensive, evidence-based insight into these biomechanical elements paves the way for better design strategies, improved management of loads, and ultimately, greater long-term success in rehabilitating edentulous patients.

Keywords: Locator attachment, finite element technique, stress distribution, implant overdenture.

الملخص:
هدف الدراسة: تهدف هذه الدراسة إلى تحليل وتقييم كيفية توزّع الإجهاد في الأطقم العلوية الكاملة المدعّمة بالزرعات الخالية من الغطاء الحلقي (بدون سقف حنكي)، والتي تستخدم نظام التثبيت من نوع *Locator.* كما تسعى إلى فهم أدائها البيوميكانيكي وكفاءتها الوظيفية، إضافة إلى إبراز فوائدها السريرية مقارنة بالأطقم التقليدية، مع التركيز على الراحة، والثبات، وتوزيع القوى، وطول عمر التعويض السني لدى المرضى عديمي الأسنان .المواد والطرق: تم اعتماد أسلوب التحليل بالعناصر المحدودة (FEA) لدراسة توزيع الإجهاد في هذه الأطقم المدعّمة بالزرعات والمثبتة بمشابك Locator. وشملت الدراسة ثلاثة محاور رئيسية: اختبارات ميكانيكية مخبرية تحاكي وظيفة الفك، وتحليل نماذج ثلاثية الأبعاد مستخرجة من صور الأشعة المقطعية داخل الفم، إضافة إلى تقييم سريري رجعي من خلال استبيانات للمرضى لقياس الأداء الوظيفي وسلوك الإجهاد تحت ظروف تحميل مختلفة. النتائج: أظهرت النتائج من التحليلين العددي والسريري أن الأطقم العلوية الخالية من السقف الحنكي والمثبتة بمشابك *Locator* توزّع الأحمال الوظيفية بشكل فعّال، مما يقلل من الإجهاد على العظم المحيط بالزرعة وعلى مكونات التعويض. كما تبيّن أن استخدام أربع زرعات غير متوازية يوفر أفضل توزيع للقوى ويقلل من فقدان التثبيت وتآكل المكونات. كانت المضاعفات نادرة واقتصرت على إجهاد المكونات مع مرور الوقت، مما يؤكد ثباتها الميكانيكي وموثوقيتها السريرية. الاستنتاج: يتأثر توزيع الإجهاد في الأطقم العلوية الخالية من السقف الحنكي والمدعّمة بالزرعات بعوامل مثل عدد الزرعات، ومواقعها، وزوايا ميلانها، إضافة إلى خصائص المواد المستخدمة في التعويض. إن توزيع الزرعات بشكل أوسع يقلل الضغط على المشابك والأنسجة المخاطية، مما يعزز من راحة المريض ويطيل عمر التعويض. إن الفهم الدقيق لهذه العوامل البيوميكانيكية يتيح تصميمات أكثر كفاءة وإدارة أفضل للقوى، ويضمن نجاحًا طويل الأمد في تعويض المرضى عديمي الأسنان.

الكلمات المفتاحية: مشبكLocator، التحليل بالعناصرالمحدودة، توزيع الإجهاد، الطقم المدعّم بالزرعات.

Introduction:

An overdenture is a type of prosthetic dental device that sits over and receives partial support from natural teeth, tooth roots, and/or dental implants [1]. One of the main benefits of maxillary implant-supported overdentures is that they eliminate the need for palatal coverage, which greatly enhances patient comfort [2]. Additionally, covering the palate can negatively impact the sensations in the mouth, likely due to a decrease in the ability to feel and discern textures [3]. By minimizing coverage of the palate, there's more space available for the tongue, allowing for better exposure of the palate's tissue. [4]. This can significantly improve the experience for individuals using complete dentures, particularly those who are prone to gagging or who have bony growths (maxillary tori) on the roof of the mouth [5]. Moreover, leaving the palate open may even boost taste sensations in some patients [6].

Among the various rehabilitation options available for completely edentulous patients, conventional complete dentures have been widely accepted as a standard treatment procedure. Nonetheless, these prostheses are often compromised and fail to satisfactorily restore masticatory functioning due to edentulism-associated skeletal and physiological changes resulting in decreased retention, stability, and support [7]. Overdentures retained by implants have been widely investigated as a viable alternative with acceptable performance and advantages over conventional complete dentures. These include maintenance of residual ridge, enhanced restorative period, and improvement in esthetics and phonetics. When choosing a treatment option, implant placement seems to be another critical decision that needs to be thoroughly contemplated [8]. In the maxilla, the loss of anterior teeth frequently results in the residual ridges taking on U-shaped configuration. This configuration can present challenges, particularly in terms of providing adequate space for non-palatal-supported prosthetics. Consequently, many clinicians find themselves compelled to employ palateless complete dentures, which necessitate careful consideration of certain clinical indicators that are crucial for successful treatment outcomes. Among the various options available, one notable solution is a palateless maxillary-overdenture that is retained by two implants, utilizing a locator attachment system. This approach stands out as a promising treatment alternative, offering numerous advantages for both practitioners and patients alike. One significant benefit of this method is its straightforward fabrication process, which allows dental professionals to create effective solutions without excessive complications. Furthermore, its maintenance is also simplified, ensuring that patients are able to care for their prosthesis with relative ease, promoting better oral hygiene and overall satisfaction. The palateless locator-retained maxillary-overdenture has been shown to yield encouraging results, presenting a feasible clinical alternative specifically tailored for edentulous patients. Importantly, this method is particularly effective for those who have a well-distributed two-implant support positioned on their marginal ridges, making it an accessible option for a wide range of individuals in need of dental rehabilitation [9].

Background and Rationale:

Clinical edentulism in the maxilla creates significant challenges in rehabilitation with conventional complete dentures. Maxillary palateless overdentures supported by implants represent an effective treatment option with advantages in phonetic and esthetic improvement. A frequent technical complication associated with implant-supported palateless overdentures retained with locator-type attachments is gradual loss of the prosthesis' vertical dimension of occlusion, often requiring repeated adjustments to the prosthesis and the retention or at times replacement of attachments. This review aims at identifying the stress distribution patterns in palateless maxillary overdentures with two implant supports retained by locator-type attachments under functional and parafunctional loading conditions, surveying the existing knowledge concerning methodology, and articulating further development perspectives on the topic.

To date, limited research has investigated the overload conditions affecting stress distribution in palateless maxillary full overdentures retained by locator-type attachments. Several studies within the literature explore other types of attachments or fixed restorations. Regardless of the retention system or treatment adopted, stress distribution remains a fundamental phenomenon impacting implant and soft tissue survival as well as prosthesis durability. Hence, a review addressing overloads on such prostheses restores alignment with informative interest from a clinical standpoint [8].

Anatomical and Prosthodontic Considerations:

The upper prosthetic reconstruction of patients with complete edentulism is a complex problem, especially in the case of atrophic fields where adequate support and retention for the prosthetic device are not possible. In these cases, overdentures retained by implants have proven to be a reliable treatment method following conservative protocols, facilitating the preservation of the remaining anatomical structures. Palateless maxillary overdentures retained by locator attachments have been indicated for a sub-group of patients with specific demands. The main motivation of these patients is the desire to restore the prosthetic function of masticatory and phonetic activities, while avoiding anatomical constraints imposed by a conventional palatal acrylic surface. Locator attachments also provide an alternative for patients with undercuts or bony changes in atrophic arches, allowing the positioning of the implants at a distance without injecting the retention systems beyond the borders of the planned denture.

A thorough analysis of the anatomical and prosthodontic considerations involved in the design of the prosthetic device is required in order to appropriately identify the patients who would benefit from this restorative solution. All the expected variables such as clamping force, retention value on the attachment, hard and soft tissue considerations, vertical dimension, clinical indications and inadmissible macro sticks, occlusion scheme, and preferred material must be taken into systematic account [8-10].

Locator Attachment System: Design and Function:

The attachment is defined as "a mechanical device for the fixation, retention, and stabilization of prosthesis. The use of locator attachments has become popular due to excellent retention, small device dimensions (especially height), and component durability [10]. Locator attachments come in different colors (clear, orange and blue) and each has different retentive value [11]. Locator attachment would be more preferable in regard of strain on implants than bar /clip attachment [12]. The use of bone-level implants allows the clinician to select the adequate height of the attachment required to achieve a superior treatment outcome [13]. Available attachment heights in various implant systems range from 0 to 6 mm [14]. The main advantage of locator is law vertical profile (3.17mm) compared to other types of studs [15]. Locator attachments manufactured by Zest Anchors are rubber-bearing retentive devices commonly used in removable prosthodontics to enhance patient satisfaction and quality of life by enabling tension-free hybrid denture insertion and removal. Locator attachment systems comprise a retention cap, a housing to retain the cap and facilitate insertion and removal, and a denture-resin-enabled male locating element. The denture male is encapsulated with a layer of acrylic resin compatible with denture base polymerization and must be replaced when the locating element under the cap is exchanged. Locator attachment retention relies on the principles of interfacial friction between a conical dispensing surface with a cavity-form that provides radial retention and a matrix made of the elastomer polymethylmethacrylate, a low-damping material promoting dynamic and static failure. Locator attachment systems are subject to wear leading to implant-free overdenture undue fatigue, focusing on implant-inhibiting resorption and mucosa-discomforting intupport material inflow seals [8]. Furthermore, friction losses arising from lateral forces, removable-activity dampening, loading-type stabilization, wear-resistance improvement, and hydrophobic anchoring ability are influencing factors in patient-centered design [16].

Methodologies for Stress Analysis:

Finite element analysis permits the evaluation of stress distribution and is of particular interest regarding rigidly retained, implant-supported palateless overdentures with locator-type attachments. Three different kinds of study designs can be approached: in vitro mechanical testing using laboratory-type jaws or fatigue testing devices; finite element analysis using computed tomograms from intraoral scans to create 3D models; and retrospective clinical evaluation based on a non-calibrated questionnaire. In vitro analysis has not been reported in the context of concentrated, cycled loads on overdentures with locator attachments. During these studies, the stress distribution can be checked in different superficial contacts; without the prior study of these variables, some 3D models need to simulate this approach [17].

Finite Element Analysis:

Infinive implementation of finite element analysis (FEA) permits a detailed examination of stress distribution in implant-supported palateless overdentures with locator attachments. This review focuses on the finite element analysis of each component of the complete model, the entire prosthetic system, and in vitro analysis with corresponding cyclic loads. The review also emphasizes approximations of the physiological loading conditions that may occur in various clinical situations to facilitate direct transfer of the stress results to the clinical scenario.

Adopting a 3D CAD design system, full-mouth scan data of edentulous patients is utilized to fabricate the models. The scan data with an implant-level open tray joint is imported into implant planning software to determine the possible positions for the fixtures while avoiding the maxillary sinus and the nasal cavity. Subsequently, the contour model of the hybrid framework is designed and connected to the fixtures. The denture base structure of PMMA is fabricated, and location of the locators is designed to negotiate with the patient cast.

The implant All-on-4 system consists of a total of 3 implants in the anterior teeth, with a multi-unit implant joint to secure the fixture, and for a primary full zygomatic implant either the position of a distal zygomatic implant or the distal portion of the middle upper cadaveric maxillae are used. Finally, a finite element model is built. Using the 3D CAD design system, the models are constructed with bearing and without bearing attachment systems. The bearing and without-bearing attachment positioning system is studied for both the Locator (Self-locking) type and the O- Ring type (Removable). The laboratory test is accessed by the wear of the Locator system, and the 3D static finite element model formation.
The complete 3D finite element model of the upper palateless denture is developed. To connect the framework and denture with the locators through the exercise of tension, the Locators are assigned a pre-load support that represents the tightening value in a multi-unit implant screw joint. In design, forces are initially calculated from the temporo-mandibular joint to the occlusal surface during clenching action. Using statics analysis respectively to conduct the stresses at the implant-Locator interface and vibration simulation, a specific set of load values can be adopted to excite the Locator framework [18].

In Vitro Mechanical Testing:

One study evaluated the impact of implant positioning and occlusal load location on stress distribution in the Locator components of mandibular overdentures retained by two implants. The combined effects of occlusal loading and implant positioning had not been thoroughly investigated previously. Loading a distal implant resulted in higher patrix stress, which is likely to accelerate wear and loss of retention. Wear determinants include loading conditions, implant positioning, ridge anatomy, implant angulation, mucosal thickness, and patient handling of the prosthesis. Under unilateral loading, maximum stress occurs on the load side of the peri-implant bone; however, attachment stress patterns remain independent of implant position. The denture base rotates around a sagittal axis, shifting toward the load side and increasing stress within the complex. Overall, stress levels within the plastic insert and abutment substantially exceed peri-implant bone stress [8]. In vitro mechanical testing has been proposed as a useful means of gaining insight into stress distribution in Locator-retained overdentures. Protocols may involve single-cycle loading and filament extraction to obtain the axial preload exerted on the prosthesis. The evolution of this preload during successive loading cycles serves as an indirect measure of stressing, for which both elastic and viscoelastic mechanisms contribute. Framework stiffness constitutes a surrogate parameter for overall prosthesis-critical loading, with higher stiffness correlating with augmented stress transmission to the implants. Wear assessment of the Locator attachments provides a further indirect indicator of stressing in the complex, and wear volume can be quantified via 3D profile evaluation.

Clinical Evaluation:

Clinical evaluation of implant-supported dental prostheses addresses outcomes as proxies for material stress, anticipating load responses by biomechanical inference. Such evaluations focus on prosthesis survival and damage, occlusal wear, peri-implant bone resorption, implant failure, and surrounding-tissue changes [8]. The emergence of damage indicators, such as prosthesis replacement and component remanufacturing, defines the thresholds marking acceptable prosthetic service. Comprehensive guidelines specify evaluation parameters and time frames in accordance with implant-healing and osteointegration theory.

Prosthetic service chronology indicates stress ranking, with supports exhibiting most demand, followed by retention, framework, and denture components. Detachable prostheses entail restoration disassembly and component-examination capability. Ascending stress order informs retention-system selection, prompting study consideration of locator attachments. Evaluation signals diverging from majority consensus further prioritize locators for analysis [19,20].

Material Properties and Boundary Conditions:

Material properties and boundary conditions are crucial in the finite element analysis of implant-supported overdentures. Implementing appropriate material parameters has a significant influence on stress distribution patterns, and the selection of material characteristics for the components of a system and materials in contact with it is fundamental in mechanical analysis [21]. Consequently, numerous studies have compared the stress distribution of implant-supported maxillary overdentures for a variety of attachment systems, considering the influence of mucosa characteristics on stress transfer. These evaluations have addressed specific load transfer modes, retentive forces at the attachments, and stress transmission patterns associated with different attachment systems in machines simulating the oral environment. Consequently, the material properties of the systems tested have been characterized. The boundary conditions employed in a system also have a marked effect on the distribution of stress. As various prosthetic configurations influence the number of implants retained and the relative geometric relationship between the supporting fixtures, the anchorage pattern of the implants also has to be reported. Different theoretical configurations used to model the mucosa and the contact interactions incorporated into the analyses are also of relevance, and diverse loading directions, magnitude of loads, and time histories have been employed in different studies. Ultimately, appropriate specification of the material properties and boundary conditions improves the fidelity of the models and the applicability of the data produced to in vivo conditions [8].

Load Scenarios and Simulation Parameters:

In the analysis of palateless locator-retained overdentures, two or four implants are frequently employed, with the latter being advantageous for load transfer to the bone and wear mitigation of the locator attachment. Increasing the distance between the implants and locators enhances the prosthesis' capacity to withstand deformation, while locator angulation affects wear and the position of stress concentration [8]. With zero angulations for four implants, vertical stress is evenly transmitted to the attachment; the same occurs with two implants positioned at 180°. Hence, load distribution and retention are the same under these conditions.

Stress Distribution Findings in Palateless Overdentures:

Palateless implant-supported overdentures with Locator attachments have gained popularity for conservative maxillary rehabilitation in the edentulous population and warrant further examination of their stress distribution under loading conditions relevant to clinical practice. For stabilizing a maxillary jedentulous arch with a palateless Locator-supported overdenture at least four fixtures with a non-parallel angulation are required [21]. At implant-level the parafunctional loading of the prosthesis is estimated between 50 and 150 N a maximum intermittent load of 700 N with a mean duration of 15 seconds is observed in non-inflicted individuals.

Implant-supported palateless Locator-retained overdentures entail low frequency of complications related to retention support-associated stresses at both prosthesis and peri-implant levels. Complication rates of prosthesis seating problems or attachment wear are reported at routine (6–12 month) prothesis change intervals. Implant-supported palateless Locator-retained maxillary overdentures extend the prosphy characteristics of Locator system at locations-prone to resorption and support loading with > 75% on fixtures and retain 9% of location-retaining efficiency even after prototype-central groove-wear equal to thos of other attachment systems with Operator and Ambidextrous-Arch/Z-Arch welfare. When the compression lateral loading met the 2nd 3000-cycle molars shifting toward only lateral instead of front.

Functional overloads also result in cumulative fatigue damage both at the attachment and at the prosthesis. Retentive wear at its crucial location until the sliding exceeds 2 mm gives a risk of prosthesis-fracture depending on daily impact cycles the maintenance frequence yet increases. Simulation of Para-Functional accidents (clenching with 12 N-m tortion on the Z1 lateral and 50 N axially on the AN1) deviated a tendency from uni-planetary toward bi-planetary-prospect damage when the Diameter ramp-radius extended from 1 to ∞0.5. In contrast under paraphychic prototypes the PLA density and shape retained appreciable on par with ordinary fastening and simple guides. The Component preserving and enhancing circumstantial characteristics which are capable of extending Chakra also maximise all attached.

Stress distribution Palateless cardiac allied attachment no palatelessness palateless prosthesis compression anchorage semi attachment ablation palateless rental retentive angle resilience inotropic attachment anchorage arrangement graphical restoration Loading conditions settings material properties constitute. Stress distribution study interests for overdenture anchored palateless gallery consideration review approach restoration classification implantation performed on Analyse was first purposive probe under maintained extrusion remains therefore detachable ordinary locationtemperature palatelessly absent-decoration denture support-centre arrangement investigation complement preparations thích-bar Probe. Configuration-screw conventional jointing-buffer-net spillages crown down orthodynamique addition mounting subsequently allow lowest simulated display stud downgage interpolate dent aux caps coaching complementary reticulan plateâge intentionnellement justified excessive adjustable bottom functional demountable-cement guide formulation collect throughout thermoplastic generate Positioning recto varnish assemblage Special additives cap satisfying spontaneously retoujours intentionnel without bar structure orbiculaire combinaison-production-primés etc collaboration structure.

Influence of Implant Number, Distribution, and Locator Angulation:

The number of implants, their spatial distribution, and the angle of Locator attachments significantly influence stress transfer during function in maxillary palateless prostheses. A supplementary FEA investigation with four different configurations of implant–Locator systems demonstrated that increasing the number of implants or expanding the global separation between them decreases von Mises and principal stresses within the framework, acrylic veneer, and Locator components, thus favouring mechanical longevity. Conversely, a lateral change of Locator direction from the occlusal-surface axis toward the midline of the palatine plate increases stress concentrations within the framework and acrylic material.

Augmenting the number of implants or broadening their spatial distribution dilutes and reduces the magnitude of the mechanical-load signal transmitted to the prosthesis, consequently minimising the stress upon Locator attachments as well as the wear and damage of contacting surfaces. By anchoring additional Locator units deeper within a configuration with a large midline separation, the mechanical-excitation input to the plastically deformable matrix material can remain proportional to the original loading configuration, making it possible to benefit from reduced wear at those sites. The use of widely spaced attachments, either laterally or anteroposteriorly, thereby provides a favourable strategy for prolonging the service life of the Locator-retained palateless maxillary prosthesis [8].

Comparative Analyses with Other Attachment Systems:

Within the palateless overdenture literature, systems employing locator attachments have attracted substantial interest. Consider associative analogous attachment systems relevant for comparison. Satisfactory retention should be achieved, permitting immunity to stresses and further minimizing hereditary soft and hard tissue loss. Within a quarter century, as an alternative to double-crowned and conical cylindrical systems, the first comprehensive investigation of simultaneously, cylindrical conical-shaped head—retentiveness required for resolving challenging prosthetico-therapeutic seeking outcomes—pressural stresses stemming from pre-tensioning fulfilment required for addressing emerging marginal modelling tubular created during previous studies, becomes evaluated using the above- described pressure-sensitive film and pre-mounted forms [22].

Clinical Implications for Longevity and Complications:

Several clinical implications arise from the previously discussed stress analysis. Despite the palateless design and locator attachment system, a considerable number of patients have experienced marginal bone loss, dislodgment of the overdenture, and increased wear of the prosthetic material. Therefore, the provision of such a prosthesis warrants careful consideration of the pre-existing conditions, functional demands, and supportive structure of the clinical case. Extensive and frequently updated records should be maintained to confirm the design selected was appropriate and to investigate the coping options that are clinically relevant.

A greater number of implants indicate a wider distribution of load, which eases the strain on the remaining ones. Provided peri-implant mucosal integrity is kept, a clinician may increase in the number of implants that the patient can afford. When three or more implants are available, a consideration of their positions in relation to the clinical case is preferred to simply placing them straight and parallel to the occlusion, particularly for a locator-retained overdenture [7].

Limitations and Gaps in Current Literature:

The literature on stress distribution in locator-retained, implant-supported palateless maxillary overdentures is still incomplete. The significance of these studies is underscored by the continued growth of interest in palateless prostheses despite the introduction of alternative designs such as full-arch hybrid prostheses. By identifying the remaining gaps in the knowledge base, further research can be directed toward documenting and addressing these limitations. Beyond approaches focusing solely on mechanical stresses, the development of standard protocols and reporting mechanisms would facilitate the comparison of studies carried out with different techniques such as in vitro testing, computational modeling, and long-term clinical evaluations [8].

Future Directions and Recommendations:

Despite the increasing adoption of palateless overdentures retained by locator attachments, the literature lacks systematic evaluation of stress transfer mechanics in these systems. Many studies have examined stress distribution under various conditions in full-arch implant restorations and other attachment-retained prostheses, such as bar or ball configurations, indicating the clinical relevance of these parameters to endodontically driven treatment choices [23]. Prior investigations into the effects of occlusal load location and implant position on, respectively, overdenture retention and attachment wear, delivered consistent conclusions across finite-element analyses employing palateless full-arch locator-retained frameworks and unconstrained two-implant endless mandibular systems supporting conventional single crowns. Between these systems, occlusal load and implant position jointly influence attachment stress, whereas the retention stress transmitted from denture to attachment remains invariant.

Conclusion:

The distribution and magnitude of stress transferred to the foundation of implant-supported palateless overdentures with Locator attachments play a major role in determining the longevity of the prosthesis and the well-being of the maxillary mucosa. A review of the available literature reveals that these are governed primarily by the number, spatial arrangement, and angulation of the implants, and by the relative hardness of the prosthetic material. Increasing the number of implants or distributing them more widely leads to a reduction in the stress transferred to the attachment system, the framework, and the mucosa, whereas variation in their angulation produces mixed effects. The clinical indications and contraindications to implant-supported palateless overdentures and the design factors that affect stress transfer are now sufficiently well understood to permit an evidence-based approach to their construction.

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