International Journal of Community Medicine and Public Health
Bedawi MA et al. Int J Community Med Public Health. 2026 Feb;13(2):969-975
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20260007

Review Article

Long-term maintenance protocols for overdenture attachments

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Received: 16 December 2025
Accepted: 30 December 2025

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ABSTRACT

Overdentures provide better stability, retention, and patient comfort compared to conventional complete dentures, representing a significant advancement in removable prosthodontics. Their effectiveness is strongly influenced by the type of support, whether tooth-supported or implant-supported, as well as the chosen attachment system, including ball-bar-clip locators, telescopic mechanisms, and magnetic mechanisms. Mandibular implant overdentures in particular demonstrate high clinical predictability and remain the standard of care for patients with severe ridge resorption. This review evaluates the performance of overdentures by examining implant survival, mechanical and biological complication patterns, functional outcomes, and patient satisfaction. According to available data, implant overdentures greatly improve oral health-related quality of life while increasing bite force and masticatory efficiency. Long-term success requires taking into account attachment-specific maintenance requirements, such as the wear of bar components or the periodic replacement of nylon inserts in locator systems. To achieve similar results, maxillary overdentures may need extra implants or changes to the palatal design. The review also covers emerging trends influencing overdenture therapy in the future, clinical implications, and maintenance procedures. Clinicians can choose the best attachment systems to predict maintenance needs and enhance long-term treatment outcomes for edentulous patients by having a thorough understanding of these factors.

Keywords: Overdentures, Implant-supported overdentures, Prosthodontics, Patient satisfaction

INTRODUCTION

Elderly people are always experiencing various dental problems, most importantly edentulism, which is a debilitating and irreversible condition.[1] Treatment of edentulism involves conventional removable complete dentures or implant-supported fixed or removable overdentures for a completely edentulous patient. Conventional complete dentures have been linked to negative effects on chewing and speaking due to various factors, such as poor retention, stability, and support.[2] On the other hand, implant overdentures provide excellent support for fixed and removable prostheses and adequately restore the esthetics of the patients, which increases functional efficiency compared with conventional removable complete and partial denture prostheses.[2]

'Overdenture' refers to removable dental prostheses that cover and rest on one or more remaining natural teeth, the roots of natural teeth, and/or dental implants.[3] Other nomenclature for this includes overlay dentures or

overlay prostheses.[3] Various overdenture designs have been developed, such as the tooth-supported overdenture and the implant-supported overdenture.[4,5] An overdenture is recommended for patients who have only a few retainable teeth left in an arch. It is also advantageous for individuals with malrelated ridges, those requiring a single denture, or patients with challenging oral conditions, such as unfavorable tongue position, high muscle attachments, or a deep palatal vault, that compromise prosthesis retention and stability.[6,7] Oral prophylaxis, systemic complications, and inadequate inter-arch distance are contraindications for overdenture use.

Various overdenture attachment systems have been developed, which can be categorized into four main categories: ball or stud, bar and clip, magnet type, and telescopic attachments.[8,9] They can also be classified into non-splinted attachments (ball, magnet, locator, and double crown attachment) and splinted attachments (bar and clip attachment).[10,11] Attachment systems are formed of two parts: a retainer composed of a metal housing (the female or matrix) and a corresponding fitting component (the male or patrix), with one part incorporated into the underside of the prosthesis and the other attached to the implant.[9]

Each overdenture attachment system provides different retention, which is largely influenced by maintenance protocols. Improper maintenance of overdenture attachment systems can lead to various complications, including matrix loosening, detachment of the matrix, fracture of the denture, need for relining and rebasing, and fracture of components such as bar fracture and crown fracture.[12] There has been considerable development in attachments for implant overdentures.[13] However, there is a need for updated information regarding implant overdenture attachments. Furthermore, a universal, validated, and applicable long-term maintenance protocol for overdenture attachments is lacking. This review aims to discuss overdentures: their types and effectiveness, as well as types of overdenture attachment systems. It also seeks to explore current literature for maintenance protocols for overdenture attachment systems.

LITERATURE SEARCH

A comprehensive literature search was conducted in Medline (via PubMed), Scopus, and Web of Science databases up to November 29, 2025. Medical Subject Headings (MeSH) and relevant free-text keywords were used to identify synonyms. Boolean operators (AND', OR') were applied to combine search terms in alignment with guidance from the Cochrane handbook for systematic reviews of interventions. Key search terms included: "Overdenture" AND "Overdenture Attachments" AND "Maintenance". Summaries and duplicates of the found studies were exported and removed by EndNoteX8. Any study that discusses long-term maintenance protocols for overdenture attachments and is published in peer-reviewed journals was included. All languages are included. Full-text articles, case series, and abstracts with related topics are included. Case reports, comments, and letters were excluded.

DISCUSSION

Conventional dentures versus overdentures

For edentulous patients, conventional complete dentures have long been the standard prosthetic option; however, in contemporary prosthodontic practice, their shortcomings are becoming more apparent. Continuous residual ridge resorption, which is especially noticeable in the mandible, eventually results in decreased stability, loss of support, and impaired functional performance.[14] Conventional dentures lack periodontal ligament feedback, which reduces proprioception and makes mastication less effective and frequently uncomfortable.[15] The psychological impact of dentures that move during social interactions, difficulty with hard or fibrous foods, and speech instability are all common complaints from patients.[16] Because overdentures preserve remaining roots or incorporate dental implants, they offer improved support, stability, and proprioception, making them a biologically superior substitute.[17] In tooth-supported overdentures, root preservation significantly increases chewing comfort and efficiency by slowing down alveolar ridge resorption and enhancing tactile sensation.[18] Overdentures supported by implants, especially in the mandible, significantly increase stability and retention.[19] Research consistently demonstrates that patients who switch from traditional dentures to implant overdentures report higher levels of satisfaction, overall better masticatory performance, and increased confidence during function.[20,21] Because of its consistent functional advantage over traditional dentures, the mandibular one- or two-implant overdenture has even been suggested as the minimal standard of care for numerous edentulous patients.[22]

Overdenture classification

Based on support

Overdentures that are supported by teeth take advantage of the biological benefit of keeping natural roots. Periodontal mechanoreceptors maintain alveolar bone through functional loading and preserve neural feedback.[23] These overdentures lessen denture movement and more evenly distribute occlusal forces. Root-supported overdentures can last for many years and greatly improve long-term prosthesis function when proper oral hygiene is practiced.[24] By directly interacting with osseointegrated implants, implant-supported overdentures eliminate the need for residual ridge anatomy. When proper oral hygiene and recall programs are followed, mandibular overdenture implant survival rates often exceed 90-95% over a period of ten to fifteen

years.[25,26] Additionally, implant support reduces denture movement, which enhances speech and allows patients to eat a greater variety of foods.[27] The number distribution and attachment system of implants all affect load transfer and resistance to functional displacement, and these factors are correlated with the degree of stability.[28]

location of the arch

Because of the anatomical complexity of the maxilla, maxillary overdentures require careful prosthetic planning.[29] The maxillary bone provides less retention and is softer than the mandible. Due to this decreased bone density, more implants, typically four or more, depending on the shape of the arch, are needed to provide adequate stability.[30] Unless enough implants are positioned to offer complete retention without soft-tissue support, palatal coverage might still be required.[11,31] Reduced palatal coverage improves patient comfort, but this result depends on biomechanical viability.[32] In contrast, the anterior mandible's advantageous anatomy and denser bone quality make mandibular overdentures extremely predictable.[33] One of the prosthetic procedures in contemporary dentistry with the strongest evidence is the two-implant mandibular overdenture.[34] Following implant overdenture placement, patients who had trouble with unstable mandibular dentures usually report immediate functional improvement, improved chewing efficiency, and a notable improvement in oral health-related quality of life

Type of attachments

Ball attachments are popular because they are easy to use and dependable. Because of their resilience, they permit some rotational freedom, which lessens the transmission of stress to implants and safeguards the bone surrounding them.[35] They are appropriate for a variety of clinical situations, affordable, and simple to maintain. By splinting several implants together, improving load distribution, and minimizing micromovement, bar-clip attachments stabilize multiple implants.[36] Due to their superior retention and long-term durability, they are suitable for patients with high functional demands. However, because plaque buildup around bar structures can raise the risk of peri-implantitis, they require more prosthetic space and excellent hygiene. Locator attachments feature low-profile height, dual retention (internal and external), and interchangeable nylon inserts with varying retention levels.[37] Their strong retention, ease of insertion for senior patients, and comparatively low maintenance burden are the reasons for their popularity. They are frequently used in both maxillary and mandibular overdentures and are perfect in situations with limited inter-arch space. The primary and secondary crowns' frictional retention is the basis for telescopic attachments.[38] They offer superior force distribution, long-term stability, and simple hygienic removal.[39] However, their widespread use is limited by the complexity of fabrication and increased costs. Magnet attachments make insertion and removal simple, which is especially useful for patients with poor dexterity. Their main drawbacks are that they have less retentive force than mechanical attachments and that if improperly sealed, they may corrode.[40]

Splinted attachments versus non-splinted attachments

By distributing functional loads among multiple implants, splinted attachments, such as bar systems, offer collective support. This may shield implants from excessive bending forces and lessen the concentration of stress.[41] Splinted designs are particularly helpful for patients with low bone density or poorly aligned implants. However, they are more demanding for both patients and clinicians and necessitate careful oral hygiene practices. Implants can operate autonomously with non-splinted attachments such as ball attachments or locators. They make hygiene simpler, take up less prosthetic space, and require less upkeep. Although non-splinted designs may have slightly higher rates of attachment wear, clinical studies typically show comparable implant survival rates between splinted and non-splinted systems. Both systems perform well in terms of overall patient-centered outcomes, although non-splinted systems are frequently chosen due to their ease of use.[42]

Assessment of overdenture performance

Biological, mechanical, functional, and patient-reported results are used to assess the performance of overdentures. Implant-supported overdentures consistently perform better than conventional complete dentures, especially in the mandible, where denture instability is prevalent.[43] For mandibular overdentures, the majority of long-term clinical studies report implant survival rates of 90-95% over 5-10 years, whereas maxillary overdentures frequently require more implants due to lower bone density in order to achieve comparable success rates.[44] Among the most commonly reported problems are mechanical complications. Despite being popular due to their ease of use and low-profile locator attachments frequently need to have their nylon inserts changed regularly because wear reduces retention. Although bar-clip systems are more technique-sensitive, they typically offer greater long-term stability.[36] Magnetic attachments reduce lateral stress and are simple for older patients, but they are prone to corrosion and typically provide less retention. Due to easier access to hygiene, biological complications like peri-implant mucositis or peri-implantitis are less common with overdentures than with fixed implant restorations, though poor oral hygiene can still lead to soft-tissue inflammation.[45] An additional indicator of overdenture success is functional outcomes. Users of overdentures see notable increases in bite force and masticatory efficiency, which are frequently two to three times higher than with traditional dentures. This improves chewing ability and nutritional intake. Bar overdentures typically provide the most stability, particularly in patients with severely resorbed ridges.

Prosthesis stability is strongly correlated with attachment type.[46] Measures of quality of life and patient satisfaction strongly favor overdentures over traditional dentures. Users often report feeling more at ease speaking more clearly, feeling more confident, and being more at ease in social situations. Because lower complete dentures are frequently unstable, mandibular implant overdentures usually demonstrate the biggest improvement.[47] Because minimizing palatal extension frequently improves comfort and taste perception, maxillary overdentures can differ based on whether palatal coverage is reduced. Lastly, cost-effectiveness analyses show that overdentures are more cost-effective for many patients despite their higher initial cost due to their long-term performance, decreased need for denture adhesives, and lower rate of recurrent sore spots.[48] Computer-aided design (CAD) and computer-aided manufacturing (CAM) milling and 3D printing are two examples of emerging digital workflows that are improving prosthesis fit and cutting down on clinical adjustment time, both of which have a positive long-term impact.[49]

Maintenance protocols for overdentures

Overdentures require routine maintenance, and in order to achieve long-term maintenance, a correct biomechanical design and a healthy oral environment should be established. Patients treated with overdentures require professional hygiene care, adjustments, and treatment of complications.[50] They should receive regular biological maintenance to control inflammation and prevent peri-implant disease.[50] Regular mechanical maintenance also should be provided that may involve repair and replacement of implant abutments and superstructure components.[50] Maintenance consists of a triad formed by the patient, prosthodontist/implantologist, and dental technician.

Prior to implant and overdenture therapy, it is critical to educate and assess patients as a first step for ensuring long-term maintenance.[50] Patients should be instructed that the treatment is not finished once the implants and prosthesis are placed and that ongoing maintenance is required. Furthermore, preparation for overdenture should include hygiene techniques, sterile instrumentation, and antimicrobials, as well as using more refined dental materials and new framework designs.[51]

Following the procedure, care of implants and overdentures should be gentle and clean, as tissues are usually tender after implant placement,[50] which makes it harder to maintain adequate hygiene and debridement. It should be noted that the presence of sutures is associated with plaque formation, leading to food retention, increasing the risk of poor healing or infection.[50] Additionally, patients should be advised to use chlorhexidine gluconate given its substantivity and ability to destroy oral bacteria. Chlorhexidine gluconate may be applied as a mouth rinse or locally using cotton swabs or tufted brushes, based on the patient's specific needs. Twice-a-day rinsing with antimicrobial agents, such as chlorhexidine, has been recommended.[52]

Home hygiene procedures during healing periods are critical for successful long-term maintenance of overdentures. These procedures should be practical and non-invasive to avoid disturbing the healing tissues. Home hygiene instructions should include that gentle debridement will only be adequate while tissues are healing, and that the use of a soft toothbrush could be advantageous.[50] Following healing, patients should follow a new hygienic procedure.[53,54]

Physical and chemical cleaning methods

Various physical and chemical cleaning methods have been proposed to remove bacterial plaque, calcified plaque, and the destruction of the glycoprotein, mucoprotein, and extracellular mucopolysaccharide components of dental plaque that break the plaque components on denture surfaces.[52] Mechanical devices for daily self-administered bacterial plaque removal include soft toothbrushes, nylon-coated interproximal brushes, powered toothbrushes, and dental floss to facilitate cleaning in less accessible areas.[52] Chemical cleaning methods have shown higher effectiveness, which made them a more preferable option. However, they have been linked to deleterious effects, such as bleaching the acrylic resin, metal corrosion, and transient or permanent destruction of soft liners.[52] Chemical cleansers often contain antimicrobial agents, such as alkaline peroxides, alkaline hypochlorite, and enzymes, which are intended to kill microorganisms in plaque. They also involve disinfectant substances, such as chlorhexidine, povidone-iodine and benzoyl peroxide.[52]

Currently, brushing is the most preferred and widely used method for cleaning the prosthesis and removing dental plaque, food residue, and coloration. Inadequate, wrong brush and cleaning can lead to severe wear on the acrylic parts of the prosthesis. Toothbrushes with medium synthetic bristles, long, rounded, and of small diameter, or dedicated denture brushes are the most effective tools for cleaning the prosthesis, whereas hard-bristled toothbrushes should not be used.[52]

Maintenance of overdenture attachments

It has been reported that cleaning solutions can increase hardness and surface roughness of prostheses following oral rehabilitation.[55] This may be attributed to the loss of soluble components, such as polymers, acrylics, and metals, which can result in void formation, corrosion, material breakdown, and discoloration.[56,57] Multiple studies have evaluated the impact of cleaning solutions on the maintenance and retention of the overdenture attachments, given their key role in improving overdenture durability.[58,59] Commercially available chemical denture cleaners use various active agents, such as peroxides, hypochlorite, acids, and enzymes.[56]

A previous study evaluated the impact of cleaning solutions (Corega and Protefix) and tap water on the retention of locator overdenture attachments.[58] The study reported a reduced retention of the overdenture attachments with all cleaning solutions and for all time intervals, with higher loss of retention in the sodium hypochlorite (NaOCl) solution group, followed by the group subjected to tap water.[58] The loss of retention caused by the tap water can be attributed to the metal ions, such as calcium and magnesium, and chlorine, as well as the pH values of the water. However, a recent study by Monteiro et al reported that tap water was associated with the lowest loss of retention in overdenture attachments.[55] This may be explained by the difference in the ion constitution of the water used in this study, classified as soft water (0-60 mL/$CaCO_3$). Derafshi et al evaluated the impact of denture cleansing solutions on the retention of O-ring attachments.[59] They found that NaOCl was associated with a greater decrease in O-ring retention compared with effervescent cleansers. Hence, NaOCl is not recommended as a cleansing solution for patients who use overdentures with O-rings.

Clinical implications

Overdentures require regular maintenance to prevent complications and achieve long-term survival. The process of maintenance starts before the procedure and continues until the patient returns home. It is a lifelong process, involving professional hygiene care, adjustments, and treatment of complications. Prior to overdenture therapy, patients should be educated that ongoing maintenance is required, and preparation should include hygiene techniques, sterile instrumentation, and antimicrobials. Post-care of implants and overdentures should be gentle and clean, as tissues are usually tender after implant placement. Home maintenance protocols could be carried out using physical methods, chemical methods, or both. Brushing is the current preferred method for overdentures and attachments cleansing. Chemical cleansers that contain antimicrobial agents and disinfectant substances can also play a role in overdenture maintenance protocols. Patients should brush their prostheses after brushing and cleaning the attachments. Although various denture cleaning solutions are widely used, evidence consistently shows that many, such as sodium hypochlorite, can reduce the retention and potentially damage overdenture attachment components, making careful selection of cleansing agents essential for long-term prosthesis performance.

CONCLUSION

Long-term maintenance of overdenture attachments is critical to improve overdenture retention and prevent complications. Maintenance of overdenture attachments should involve pre-therapy care, post-therapy care, and home oral hygiene protocols. A combination of physical and chemical cleansing methods should be implemented as well. Future studies should focus on developing a universal, easily applicable, comprehensive, and long-term maintenance protocol for overdenture attachments.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Bedawi MA, Bediwi MA, Alanazi FF, Alzahrani HA, Alebdi AA, Alnofal AM. Long-term maintenance protocols for overdenture attachments. Int J Community Med Public Health 2026;13:969-75.