Protet Stomatol, 2026; 76(2): 182-191
DOI: 10.5114/ps/224211


# Implant-retained mandibular overdentures with Locator attachments – a report of two clinical cases

## Protezy żuchwowe mocowane na implantach z elementami Locator – opis dwóch przypadków klinicznych

***Amel Labidi[1,3], Ilhem Ben Othmen[2,3], Emna Abid[1,3], Ines Saadellaoui[1,3], Sana Bekri[1,3], Lamia Mansour[1,3]***

[1] **Department of Prosthodontics, Laboratory for Biological, Clinical and Dento-Facial Approach, University of Monastir, Tunisia**
Head: Professor *Lamia Mansour*

[2] **Department of Fixed Prosthodontics, Research Laboratory of Occlusodontics and Ceramics, University of Monastir, Tunisia**
Head: Professor *Belhassen Harzallah*

[3] **Department of Prosthodontics, Faculty of Dental Medicine, University of Monastir, Avicenna Avenue, 5019 Monastir, Tunisia**
Head: Professor *Mohamed Salah Khalfi*

KEY WORDS:
prosthetic rehabilitation, implant-retained overdentures, mandibular edentulism, Locator attachments, implant angulation, interocclusal space

HASŁA INDEKSOWE:
rehabilitacja protetyczna, protezy na implantach, bezzębie żuchwy, zaczepy Locator, kątowanie implantów, przestrzeń międzyzwarciowa

*Summary*

*An implant-retained complete lower denture is widely recognized as the gold standard for rehabilitating the edentulous mandible. Its simplicity, minimal invasiveness, predictability, efficacy, and cost-effectiveness make it an attractive treatment option. The most commonly used retention systems for overdentures include bars and axial attachment systems. Clinicians must carefully evaluate the advantages and limitations of each system to determine the most appropriate choice based on the clinical context. This work presents two clinical cases of edentulous patients rehabilitated with implant-supported overdentures retained by Locator attachments. In the first case, Locators were selected due to implant axis divergence, necessitating a retention system that compensates*

*Streszczenie*

*Całkowita proteza dolna oparta na implantach jest powszechnie uznawana za złoty standard w rehabilitacji bezzębnej żuchwy. Jej prostota, minimalna inwazyjność, przewidywalność, skuteczność i opłacalność czynią ją atrakcyjną opcją leczenia. Najczęściej stosowanymi systemami retencyjnymi dla protez overdenture są belki i systemy mocowania osiowego. Lekarze muszą dokładnie ocenić zalety i ograniczenia każdego systemu, aby dokonać najodpowiedniejszego wyboru w kontekście klinicznym. Niniejsza praca przedstawia dwa przypadki kliniczne pacjentów bezzębnych, u których wykonano rehabilitację z zastosowaniem protez overdenture opartymi na implantach, mocowanymi za pomocą łączników Locator. W pierwszym przypadku łączniki Locator wybrano ze względu na rozbieżność osi implantu,*

*for angulation discrepancies while ensuring optimal prosthetic stability. In the second case, Locator attachments were selected due to limited interocclusal space, requiring a low-profile retention system to maintain functionality and aesthetics. These cases highlight the importance of individualized treatment planning based on anatomical and biomechanical considerations. The Locator system offers advantages including self-alignment during insertion, a compact design, and the ability to accommodate implant angulations of up to 40 degrees. Compared to ball attachments, Locators exhibit greater durability and maintain retention force over time, making them a superior choice in cases of implant divergence or restricted interocclusal space.*

*co wymagało systemu retencyjnego kompensującego różnice kątowe, zapewniając jednocześnie optymalną stabilizację. W drugim przypadku łączniki Locator wybrano ze względu na ograniczoną przestrzeń międzyokluzyjną, wymagającą niskoprofilowego systemu retencyjnego w celu zachowania funkcjonalności i estetyki. Przypadki te podkreślają wagę indywidualnego planowania leczenia, opartego na uwarunkowaniach anatomicznych i biomechanicznych. System Locator oferuje takie zalety, jak łatwość podczas wprowadzania, kompaktowa konstrukcja oraz możliwość dostosowania implantów do kątów nachylenia do 40 stopni. W porównaniu z zaczepami kulkowymi, Locatory charakteryzują się większą trwałością i utrzymują siłę retencji przez długi czas, co czyni je lepszym wyborem w przypadku rozbieżności implantów lub ograniczonej przestrzeni międzyzwarciowej.*

## Introduction

With the increasing life expectancy, there has been a rise in the number of patients presenting with complete unilateral or bilateral edentulism. Retention and stability issues remain the primary complaints among patients wearing mandibular complete dentures. Depending on the clinical situation and the financial constraints of the patients, various therapeutic approaches can be considered to enhance prosthetic retention and stability.[1,2] According to the consensus established at McGill University in 2002, implant-supported complete overdentures (ISODs) are regarded as the standard of care for mandibular complete prosthetic rehabilitation.[3] They should be the first-line treatment for patients with total mandibular edentulism.

A wide range of supra-implant attachment systems is available to clinicians, with axial attachments being the most commonly used due to their ease of handling and manipulation.[4] Despite the existence of several axial attachment systems on the market, they share common limitations. They are contraindicated in cases of reduced prosthetic space due to the risk of prosthesis fracture and over-contouring. Moreover, they do not tolerate implant axis divergence, leading to premature wear of the female components. The LOCATOR® axial attachment system was developed to overcome these issues and has been widely applied in clinical practice.[5,6]

The aim of this article was to provide an in-depth review of the various indications for the LOCATOR® attachment system and to describe, step by step, the clinical workflow for its implementation through a case study.

*Clinical case 1*

A 61-year-old female patient in good general health, presented for prosthetic rehabilitation. Intra-oral examination revealed total mandibular edentulism with advanced ridge resorption due to long-term tooth loss. A conventional mandibular complete denture was fabricated following standard protocols (Fig. 1). However, during follow-up visits,

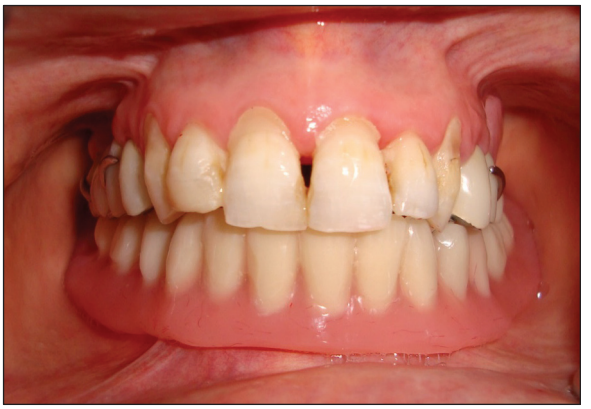

***Fig. 1. The patient treated with conventional mandibular complete denture.***

with a radiographic guide derived from the duplicated complete denture in transparent resin, confirmed sufficient ridge width for safe implant placement without anatomical interference (Fig. 2). Two *Easy Implant* fixtures (Ø 3.75 mm, length 10 mm) were selected. Using a surgical guide, the implants were placed, followed by a four-month healing period for osseointegration. A postoperative panoramic radiograph confirmed successful osseointegration but revealed a 16° inclination of the right implant relative to the vertical axis, while the left implant remained perfectly vertical

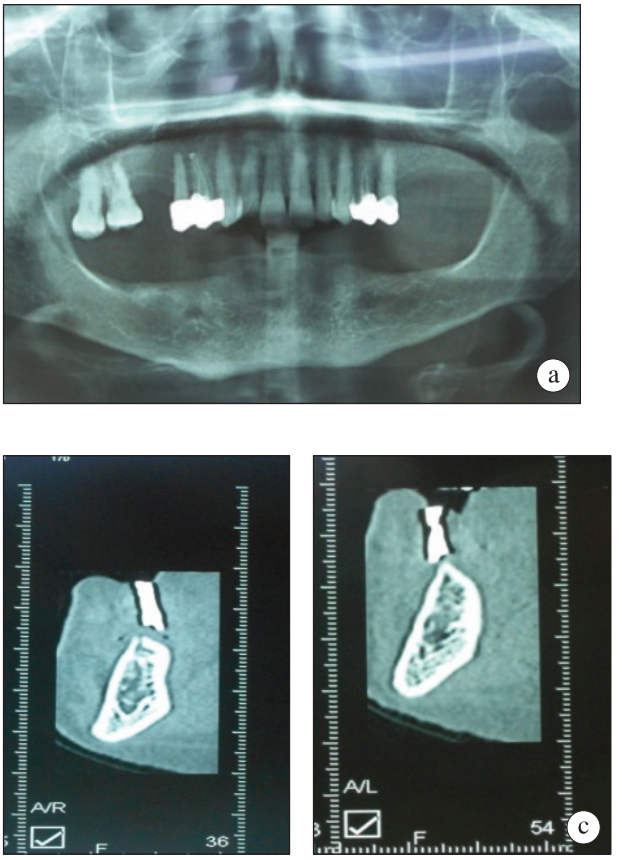


***Fig. 2. Pre-operative radiographs; a – pre-operative orthopantomograph, b – radiographic guide, c – CBCT, oblique coronal reconstruction.***

the patient reported insufficient retention and dynamic instability. Despite multiple occlusal adjustments, the patient remained dissatisfied, prompting consideration of an implant-retained overdenture using a supra-implant attachment system. A panoramic radiograph demonstrated adequate symphyseal bone volume for implant placement. CBCT, performed

(Fig. 3). Due to this angulation discrepancy, the LOCATOR® attachment system was chosen for its ability to compensate for non-parallel implant positioning. Given the stability of the existing complete denture, a direct technique was used to integrate the female LOCATOR® components. The appropriate abutment height was determined by measuring the distance from

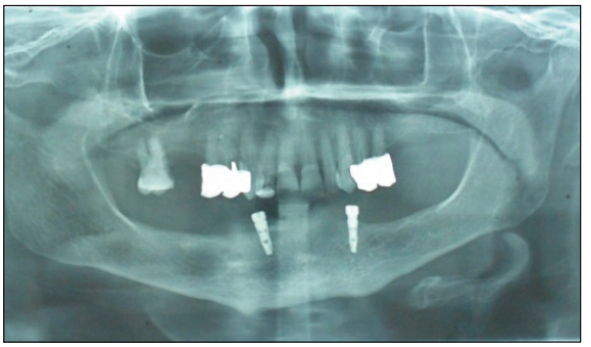

*Fig. 3. Postoperative orthopantomography.*

movement without gingival impingement. The male LOCATOR® attachments were inserted, and the inner surface of the denture was relieved accordingly. Auto-polymerizing resin was applied to these relief areas, and the prosthesis was seated under occlusal pressure to ensure proper adaptation. After polymerization, the prosthesis was removed, the positioning of the male components was verified, the excess resin was trimmed, and the intaglio surface was

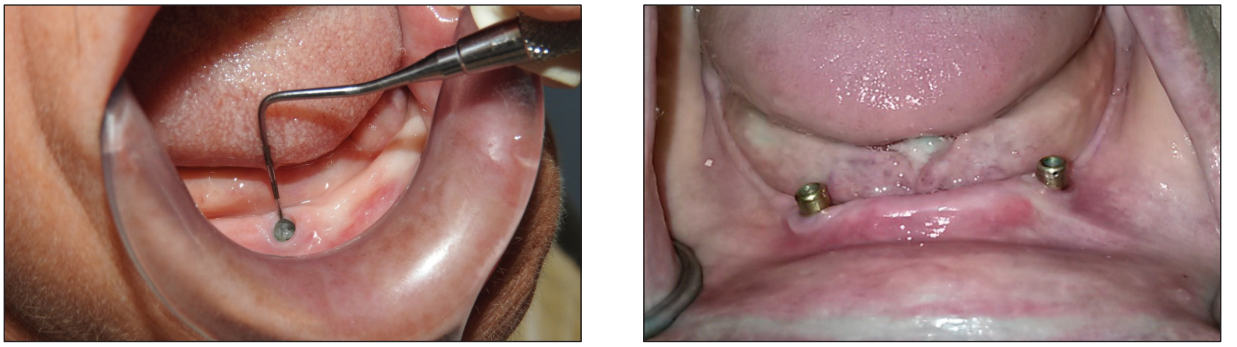

*Fig. 4. Choosing the appropriate height of the Locator abutment according to the gingival height above the implant.*

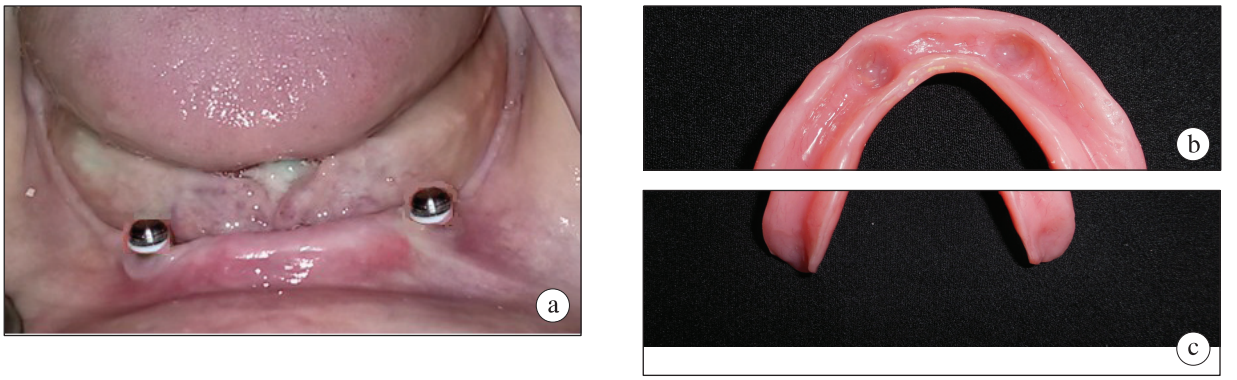


*Fig. 5. Integration of the Locator components within the prosthesis; a – placement of the male part of the Locator, b – control of the resin elimination of the prosthesis intaglio, c – the male part of Locator is within the intaglio of the prosthesis and the black insert is replaced by the blue insert.*

the gingival margin to the implant collar with a periodontal probe, selecting 3 mm abutments to extend 1.5 mm beyond the gingival margin (Fig. 4). Healing screws were removed, and LOCATOR® abutments were placed and torqued to 25 Ncm. Plastic spacers were positioned around the abutments to isolate the peri-implant region, ensuring optimal prosthetic

polished. The black processing inserts in the male LOCATOR® attachments were replaced with definitive retention inserts using the dedicated LOCATOR® tool. The patient was then instructed on proper insertion and removal of the prosthesis, and a follow-up appointment was scheduled to assess fit, retention and any necessary adjustments.

*Clinical Case 2*

A 52-year-old female patient with a history of gastric issues, presented with concerns regarding instability in her mandibular prosthesis, which significantly affected her quality of life. The proposed treatment plan involved creating a new mandibular prosthesis and placing two implants in the symphyseal region,

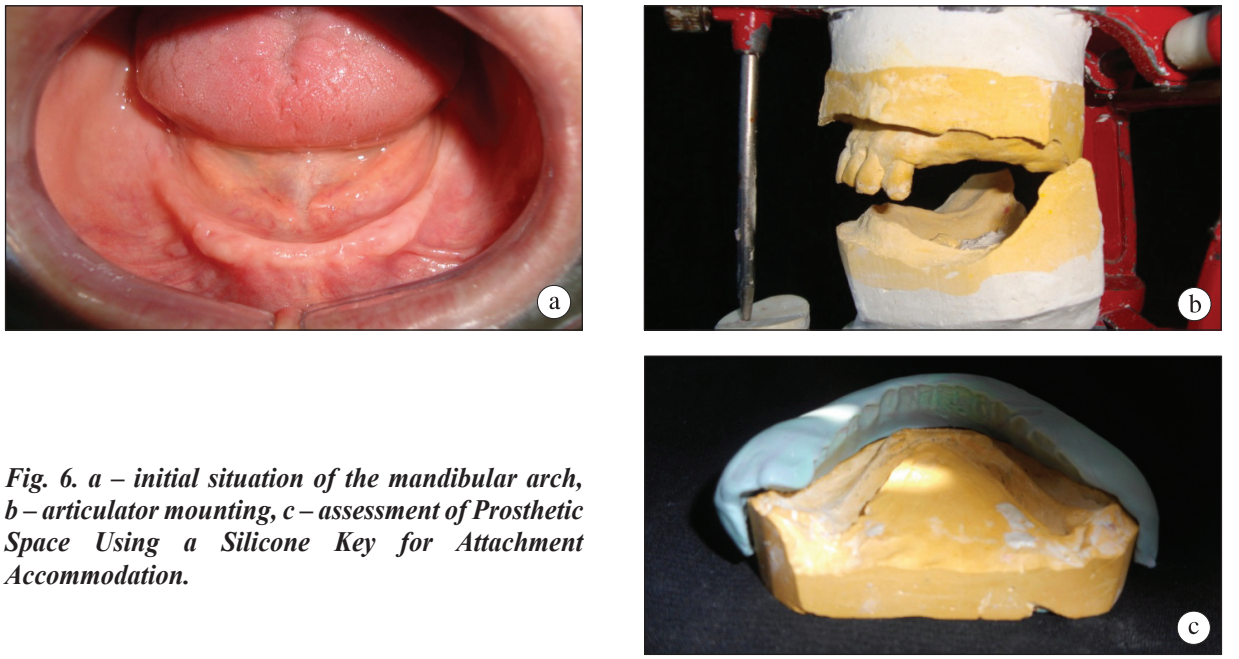


***Fig. 6. a – initial situation of the mandibular arch, b – articulator mounting, c – assessment of Prosthetic Space Using a Silicone Key for Attachment Accommodation.***

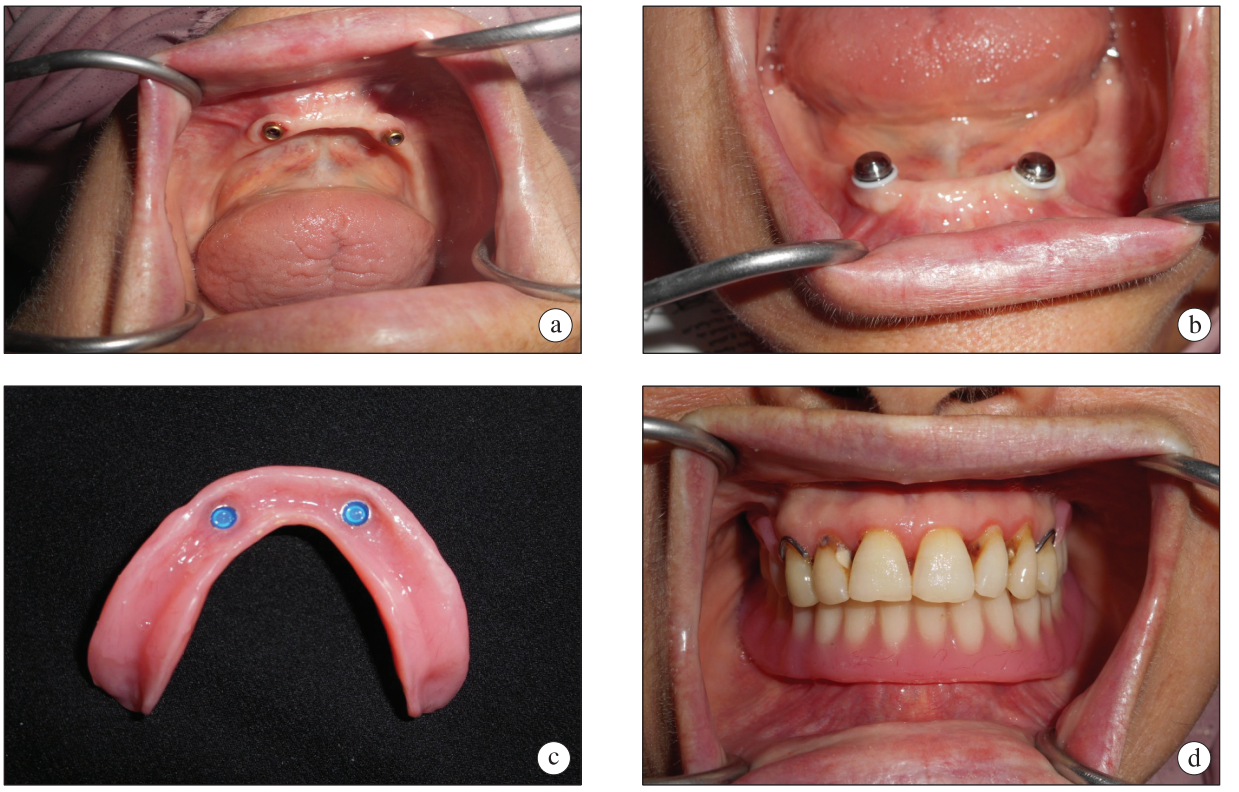


***Fig. 7. a – placement of abutment, b – placement of male component, c – male component in denture, d – final result.***

utilizing attachments to enhance retention. The radiographic evaluation confirmed the feasibility of the treatment. An assessment of the mounted diagnostic casts on an articulator indicated a reduced prosthetic space, leading to the selection of the LOCATOR® attachment system as the optimal choice for maximizing retention while accommodating the limited vertical dimension (Fig. 6). After successful implant osseointegration, 2 mm LOCATOR® abutments were chosen. Once the abutments were secured, the female LOCATOR® components were installed. A corresponding relief space was created in the inner surface of the new prosthesis, followed by the direct integration of the female attachments using auto-polymerizing resin to ensure optimal adaptation and stability (Fig. 7).

## Discussion

Total edentulism is a debilitating condition characterized by complete loss of teeth, leading to severe dysfunction of the dentomaxillary system. While previously considered an inevitable consequence of aging, it is now recognized as a pathological state often accompanied by systemic comorbidities.[7,8] The condition remains prevalent among the elderly, significantly impacting their quality of life.[9] Following tooth extraction, alveolar bone resorption occurs at a rapid rate within the first three years, subsequently slowing but never ceasing entirely. The average mandibular ridge resorption rate is approximately 0.2 mm per year.[10]

In severe cases, extensive resorption complicates the fabrication of a well-fitting complete denture, resulting in compromised stability, support and retention. These issues lead to patient discomfort and reduced masticatory efficiency.[10,11]

Indeed, mandibular conventional complete dentures pose greater functional challenges than their maxillary counterparts due to anatomical and physiological factors. These include a thinner mucosal covering over the residual ridge, a reduced surface area for denture support, and dynamic movements of the tongue, floor of the mouth and the mandible. Such limitations often necessitate the use of dental implants and attachment systems to enhance prosthetic stability and function.[12-14]

Implant-retained complete dentures have become the standard treatment for mandibular edentulism, significantly improving patient-reported outcomes. Studies have demonstrated superior stability, masticatory efficiency, and quality of life in patients receiving implant-retained complete dentures compared to those with conventional dentures.[10,15]

Removable implant-supported overdentures offer several advantages over fixed implant-supported overdentures, including improved aesthetics, better access to improve oral hygiene, lower financial burden and a reduced number of required implants. They can also enhance phonetics and provide adequate lip support by compensating for lost soft and hard tissues through the denture base. This modality is particularly beneficial for patients with significant loss of alveolar bone and soft tissue, where both dental and tissue replacements are necessary.[16]

Various supra-implant attachment systems have been developed to optimize the retention of mandibular complete dentures. The choice of attachment system depends on multiple factors, including degree of retention required, jaw morphology, anatomical constraints, mucosal ridge conditions, bone height, inter-arch space and the patient's adherence to follow-up appointments.[4,6,17]

Minimum space requirements for different attachment systems vary, including bar, telescopic, ball and locator attachments requiring specific interocclusal dimensions

for proper function. Implant angulation also influences the choice of attachment, with ball attachments tolerating implant divergences of up to 10° and locator attachments compensating for angulations of up to 40°. Parallelism of implants is crucial for telescopic attachments, whereas bar attachments can accommodate non-parallel implants using angulated abutments.[4,6,17]

Ball and bar attachments have been used since the 1960s. Ball attachments are simple and cost-effective but require periodic replacement of O-rings due to gradual loss of retention. Bar attachments provide greater stability but involve increased technique sensitivity and cost. Additionally, bar systems are associated with mucosal hyperplasia, hygiene challenges, and the need for periodic activation of the retention clip.[18-20]

The LOCATOR® attachment system was developed to address the limitations of traditional ball and bar designs. Its low-profile design minimizes interocclusal space requirements, with the total height of the abutment and attachment measuring only 2.5 mm on internally connected implants, saving 1.68 mm to 3.05 mm of vertical space in comparison with alternative systems. This feature makes LOCATOR® an optimal solution for cases where vertical space constraints would otherwise limit treatment options.[4,21]

Additionally, its self-aligning feature facilitates proper seating while minimizing premature wear caused by implant mispositioning, and its design enables the restoration of implants with divergence angles of up to 40°, as documented in the technical specifications by Zest Anchors.

A systematic review comparing ball and locator attachments in implant-supported overdentures reported that locator attachments were associated with fewer complications such as reduced retention loss, fewer maintenance visits and decreased incidence of soft tissue issues.[4]

*In vitro* studies reinforce these findings. *Sajjy Upinder* et al. demonstrated that locator attachments offered superior retention and wear resistance under cyclic loading.[22] Similarly, *Tae-Yun Kang* found that locator systems had the highest initial retention among commonly used attachments.[23] In contrast, *Tejomaya Shastry* et al. observed that ball/O-ring and bar attachments exhibited higher retentive forces than locator attachments in specific test conditions.[24]

Component wear, particularly of the nylon insert, was found to be directly proportional to insertion/removal cycles. *Kamran*'s *in vitro* study also highlighted the impact of implant angulation: as angulation increased from 5° to 20°, the nylon component in ball attachments wore more rapidly. Additionally, the study compared the retention of locator and Clix ball abutments under both parallel and divergent conditions, concluding that locator attachments maintained higher retention overall, although divergence reduced retention in both systems.[25-27]

Another *in vitro* study evaluated the biomechanical behavior of locator and ball attachments under vertical loading (0°) on implants inclined at 20°. While both systems showed similar stress distribution patterns, locator attachments induced lower stress levels in cortical and cancellous bone as well as in the implant body. The highest stress concentration was noted at the neck of the ball abutment. These results suggest that implant inclination redistributes stress toward the supporting bone and implant structure, alleviating strain on the resilient cap. Differences in stress magnitude between the two systems became more pronounced with increasing load angles and implant inclinations, highlighting the superior biomechanical performance of the locator system under angulated conditions.[17]

In terms of implant strain, locator attachments have demonstrated lower strain values compared to bar/clip systems. To further reduce stress on implants, maximizing denture base extension is recommended. Despite these advantages, implant-supported overdentures still require regular follow-up due to potential prosthetic failures, attachment loosening and peri-implant complications. The choice of attachment significantly influences the type and severity of these clinical issues.[19,28]

## Conclusion

Implant-retained overdentures offer a functional and aesthetic solution for mandibular edentulism, significantly improving patient satisfaction and their quality of life. The selection of an appropriate attachment system is critical to ensuring long-term success. While ball and bar attachments remain viable options, the LOCATOR® system provides superior advantages in terms of retention, angulation compensation and prosthetic space optimization. Future research should focus on refining attachment designs to enhance the longevity and stability of implant-retained overdentures.

## References


1. *Müller F:* Interventions for edentate elders - what is the evidence? Gerodontology 2014; 31(Suppl 1): 44-51. doi: 10.1111/ger.12083
2. *Limpuangthip N, Somkotra T, Arksornnukit M:* Impacts of denture retention and stability on oral health-related quality of life, general health, and happiness in elderly Thais. Curr Gerontol Geriatr Res 2019; 2019(1): 3830267. doi: 10.1155/2019/3830267
3. *Feine JS, Carlsson GE, Awad MA,* et al.: The McGill consensus statement on overdentures: mandibular two-implant overdentures as first-choice standard of care for edentulous patients. Int J Oral Maxillofac Implants 2002; 17(4): 601-602.
4. *Patel S, Vaishnav K:* Comparative evaluation of various implant overdenture attachment systems in terms of survival rate, tissue response, and patient satisfaction: a systematic review and meta-analysis. Cureus 2025; 17(5): e83838.
5. *Aboelez MA, Elezz MGA, Abdraboh AE, Elsyad MA:* Angled ball and locator attachments for immediately loaded inclined implants used to retain maxillary overdentures: a crossover study of patient satisfaction and oral health-related quality of life. Clin Implant Dent Relat Res 2022; 24(3): 391-400.
6. *Prasad S, Faverani LP, Santiago JF Jr,* et al.: Attachment systems for mandibular implant-supported overdentures: a systematic review and meta-analysis of randomized controlled trials. J Prosthet Dent 2024; 132(2): 354-368.
7. *Iacob S, Chisnoiu RM, Zaharia A,* et al.: Correlation between type of edentulism, age, socioeconomic status, and general health. J Clin Med 2025; 14(11): 3924. doi: 10.3390/jcm14113924
8. *Tung HJ, Ford R:* Incident edentulism and number of comorbidities among middle-aged and older Americans. Gerodontology 2023; 40(4): 484-490. doi: 10.1111/ger.12675
9. *Cano-Gutiérrez C, Borda MG, Reyes-Ortiz CA,* et al.: Edentulism and dental prostheses in the elderly: impact on quality of life measured with EuroQol – visual analogue scale (EQ-VAS). Acta Odontol Latinoam 2015; 28(2): 149-155.
10. *Sharka R, Abed H, Hector M:* Oral health-related quality of life and satisfaction of edentulous patients using conventional complete dentures and implant-retained overdentures: an umbrella systematic review. Gerodontology 2019; 36(3): 195-204.
11. *Ravi R, Chaudhary N, Dahiya D:* Complete denture fabrication and management of severely resorbed ridges. EAS J Humanit Cult

Stud 2021; 3(4): 163-167.
12. *Sun X, Meng L, Chen Y,* et al.: Efficacy and risk factors of traditional denture restoration versus biofunctional complete denture restoration system. Am J Transl Res 2023; 15(7): 4755-4762.
13. *Sardar C, Mistry G, Randhawa NK, Puppala P, Chitnis A, Sachdev SS:* An update on attachment systems for mandibular implant overdentures: a review. Bioinformation 2024; 20(11): 1623-1628. doi: 10.6026/9732063002001623
14. *Jain P, Rathee M:* Stability in mandibular denture. StatPearls 2025 Available from: https://www.ncbi.nlm.nih.gov/books/NBK549861/
15. *Sagheb K, Wentaschek S, Bjelopavlovic M,* et al.: Evaluation of masticatory efficiency and oral health-related quality of life in implant-retained overdenture with different numbers of implants in the edentulous mandible: a one-year follow-up prospective study. Int J Implant Dent 2024; 10(1): 12.
16. *Pasciuta M, Grossmann Y, Finger IM:* A prosthetic solution to restoring the edentulous mandible with limited interarch space using an implant-tissue-supported overdenture: a clinical report. J Prosthet Dent 2005; 93(2): 116-120. doi: 10.1016/j.prosdent.2004.09.024
17. *Bhattacharjee B, Saneja R, Singh A,* et al.: Peri-implant stress distribution assessment of various attachment systems for overdentures by finite-element analysis: a systematic review. J Oral Biol Craniofac Res 2022; 12(6): 802-808.
18. *Chaware SH, Thakkar ST:* A systematic review and meta-analysis of the attachments used in implant-supported overdentures. J Indian Prosthodont Soc 2020; 20(3): 255-268. doi: 10.4103/jips.jips_368_19
19. *Thomason JM, Kelly SA, Bendkowski A, Ellis JS:* Two implant retained overdentures – a review of the literature supporting the McGill and York consensus statements. J Dent 2023; 133: 104324.
20. *Cakarer S, Can T, Yaltirik M, Keskin C:* Complications associated with the ball, bar and locator attachments for implant-supported overdentures. Med Oral Patol Oral Cir Bucal 2011; 16(7): e953-e959.
21. *Gupta N, Bansal R, Shukla NK:* The effect of ball versus locator attachment system on the performance of implant-supported overdenture: a systematic review. J Oral Biol Craniofac Res 2023; 13(1): 44-55. doi: 10.1016/j.jobcr.2022.11.001
22. *Upinder S, Saluja BS, Gupta G, Kaur B, Singh G:* Comparison of changes in retentive force and wear pattern of two stud attachments for implant overdentures: an in vitro study. Indian J Dent Sci 2019; 11: 65-70.
23. *Kang TY, Kim JH, Kim KM, Kwon JS:* In vitro effects of cyclic dislodgement on retentive properties of various titanium-based dental implant overdenture attachment systems. Materials (Basel) 2019; 12: 3770.
24. *Shastry T, Anupama NM, Shetty S, Nalinakshamma M:* An in vitro comparative study to evaluate the retention of different attachment systems used in implant-retained overdentures. J Indian Prosthodont Soc 2016; 16(2): 159-166. doi: 10.4103/0972-4052.176520
25. *Orujov K, Roth D, Karl M, Grobecker-Karl T:* Retentive behavior of locator versus ball attachments on parallel versus non-parallel implants. Appl Sci 2024; 14(2): 914. doi: 10.3390/app14020914
26. *Sultana N, Bartlett DW, Suleiman M:* Retention of implant-supported overdentures at different implant angulations: comparing locator and ball attachments. Clin Oral Implants Res 2017; 28(11): 1406-1410. doi: 10.1111/clr.13003
27. *Al-Ghafli SA, Michalakis KX, Hirayama H, Kang K:* The in vitro effect of different implant angulations and cyclic dislodgement on the retentive properties of an overdenture attachment system. J Prosthet Dent 2009;

102(3): 140-147. doi: 10.1016/S0022-3913(09)60134-7

28. *Yoo JS, Kwon KR, Noh K, Lee H, Paek J:* Stress analysis of mandibular implant overdenture with locator and bar/clip attachment: comparative study with differences in the denture base length. J Adv Prosthodont 2017; 9(3): 143-151. doi: 10.4047/jap.2017.9.3.143

Zaakceptowano do druku: 5.06.2026 r.

Adres autorów: Department of Fixed Prosthodontics, Research Laboratory of Occlusodontics and Ceramics, University of Monastir, Avenue Avicenne, 5019 Monastir, Tunisia.