

A "Clasp-less" Smile: Aesthetic and Functional Rehabilitation of Mandibular Distal Extension Using Semi-Precision Attachments-A Case Report

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Abstract

Managing a mandibular distal extension case opposing a completely edentulous maxilla requires careful control of rotational forces to protect remaining teeth. Traditional clasp-retained removable dentures often face patient resistance due to poor aesthetics. Semi-precision attachments eliminate visible clasps and serve as stress-breakers to protect the health of remaining abutments. This case report details the treatment of a 65-year-old female presenting with an edentulous maxilla and a mandibular Kennedy Class I modification 2 arch.

Prosthetic rehabilitation consisted of a maxillary complete denture opposing a tooth-supported fixed partial denture featuring extracoronal attachments linked to a mandibular cast partial denture framework. A digital workflow incorporating extraoral scanning and specialized design software was utilized to avoid traditional casting distortions and ensure precise component parallelism. Follow-up examinations over six months revealed outstanding mucosal tolerance, a stable snap-fit, and highly satisfied patient feedback regarding aesthetics and chewing efficiency. The clinical

combination of semi-precision attachments and digital design techniques yields a highly accurate, reproducible, and non-surgical treatment alternative for complex edentulous rehabilitations.

Keywords: Complete denture, Computer-aided design, Distal extension, Extraoral scanning, Restorative dentistry.

Introduction

Partial edentulism, particularly in distal extension situations (Kennedy Class I and II), poses significant biomechanical challenges due to the lack of posterior abutment support. While implant-supported prostheses are often considered the gold standard, they may be contraindicated due to insufficient bone volume, medical conditions, or financial constraints ¹.

Conventional removable partial dentures (RPDs) utilizing metal clasps are a common alternative, but they often face poor patient acceptance due to visible metal displays and inadequate retention during function. Semi-precision attachments offer a superior alternative by providing a mechanical "link" between a fixed restoration and a removable framework. These custom-fabricated components eliminate unsightly clasps, enhance esthetic integration, and provide stress-breaking features that protect the health of the remaining abutment teeth ².

This case report details the prosthetic rehabilitation of a partially edentulous mandibular arch using an extra coronal attachment³ retained bilateral cast partial denture, strategically designed to provide optimal function and esthetics while opposing a conventional maxillary complete denture.

Case Presentation

A 65-year-old female presented to the Department of Prosthodontics complaining of impaired masticatory function. The patient had undergone multiple extractions

of maxillary mobile teeth two month prior, resulting in his current difficulty chewing.

On clinical examination patient had two-month-old OPG [fig-1] before extraction which shows compromised maxillary teeth and ill-fitting fixed partial denture of 31,32,33,41,42,43,44. Later this ill-fitting FPD is planned for removal then after removal mandible show Kennedy class-1 with modification 2 and maxillary completely edentulism [fig-2] as patient reported to department after extraction of maxillary teeth.



Figure 1: Pre-op OPG



Figure 2: Maxillary arch—post extraction



Figure 3: Tentative jaw relation

After the required periodontal treatment and primary analysis of the diagnostic casts, treatment was planned, which consisted of a tooth-supported fixed prosthesis from lower right canine to left premolar and semi-precision attachments distal to the abutments with a cast partial removable denture in the mandibular arch and a conventional complete denture in the maxillary arch.

Diagnostic casts were utilized to fabricate record bases using self-cure acrylic resin (DPI Dental Products, Mumbai, India), followed by the construction of modeling wax occlusal rims (Hindustan Dental Products, Hyderabad, India). These were employed to record the patient's vertical dimension and a tentative centric relation, which were subsequently transferred to an articulator[fig-3]. Tooth preparation was modified atraumatic with supragingival margins irt 32,33,35,42,43. Following this, impression was made using irreversible hydrocolloid material (Septodont Plastalgin Healthcare India Pvt. Ltd) for the mandibular arch. Border molding and wash impressions were done using low fusing impression compound (DPI Pinnacle Tracing Sticks, DPI Dental Products, Mumbai, India) and zinc oxide eugenol impression paste (DPI Impression paste, DPI Dental Products, Mumbai, India) for the maxillary arch[fig-4,5].



Figure 4: maxillary impression



Figure 5: Mandibular impression

Wax patterns for the metal copings were made on the master cast, incorporating prefabricated castable OT Cap (Rhein 83 Inc, USA) attachments distal to the abutments[fig-6]. These extracoronaral attachments provide elastic retention and function as stress-breakers to dissipate occlusal forces.

Figure 6: wax patterns incorporating castable OT cap



Fig 6.1: occlusal view



Fig 6.2: side view

In this configuration, the male component (patnix) was integrated into the fixed partial denture wax pattern,

while the female component (matrix) was housed within the removable cast partial denture.

Following the casting of the FPD metal copings, they were evaluated intraorally to ensure precise marginal adaptation and fit [fig-7]. Subsequently, a pick-up impression was recorded with the copings in situ using a polyvinyl siloxane elastomeric material [fig-8] (Photosil, DPI Dental Products, Mumbai, India). Once the porcelain was fused to the copings, the assembly was returned to the master cast. A survey analysis was performed to ensure the parallelism of the attachment components and to confirm a definitive path of insertion for the mandibular cast partial denture. An extraoral scanning procedure was performed [fig-9] to digitize the mandibular cast and attachment components. The scanned data were imported into dental CAD CAM software, where the cast partial denture framework was digitally designed and fabricated ensuring optimal fit, path of insertion, and precise integration with the semi-precision attachments.



Figure 7: Metal trial is done



Figure 8: Pickup

Record bases were constructed on the maxillary and mandibular master casts to facilitate the registration of a definitive jaw relation. Following articulation, the prosthetic teeth were arranged, and a clinical wax trial [fig-10] was conducted to verify occlusion, phonetics, and esthetics. The maxillary complete denture and mandibular cast partial denture were then processed. To ensure long-term serviceability, the retentive O-rings were secured within the mandibular base using metal housings [fig-11], allowing for easy replacement should wear occur.

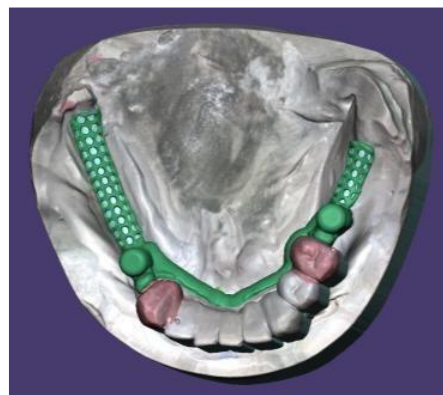


Figure 9: Extraoral scanning for CPD



Figure 10: clinical wax try-in

During the cementation of the FPD, the cast partial denture was coupled to the fixed component extra-orally to ensure a synchronized path of insertion. After applying a thin layer of petroleum jelly to the attachments for ease of separation, the assembly was secured using glass ionomer cement [fig-12]. Following cementation, both the maxillary complete denture and the mandibular cast partial denture were definitively inserted [fig-13].



Figure 11: processed lower denture with retentive O-ring with metal housings



Figure 12: Cementation of FPD with CPD insertion

The patient was recalled at one week, one month, and six months to monitor the adaptation and functional performance of the prosthesis. At each visit, the abutment health and mucosal response were evaluated. The patient reported significant improvement in masticatory efficiency and was highly satisfied with the "clasp-less" esthetics. At the six-month recall, the retentive O-rings showed no signs of significant wear, and the prosthesis maintained a stable, definitive "snap-fit".

Figure 13: post-op



Figure 13.1: Frontal



Figure 13.2: Right lateral view



Figure 13.3: Left lateral view

Discussion

Rehabilitating Kennedy Class I and II situations is clinically demanding because the prosthesis is supported by two different tissues with varying displacement rates: the rigid abutment teeth and the resilient alveolar mucosa⁴. While dental implants are often considered the gold standard, they may be contraindicated due to systemic health issues or anatomical limitations⁵. Conventional CPDs provide a functional solution, but their metallic clasps are frequently rejected by patients due to poor esthetics⁶. To address this, semi-precision attachments offer a "clasp-less" appearance while functioning as stress breakers that distribute functional loads more favourably^{7,8}.

However, the fabrication of attachment-retained dentures is highly technique-sensitive. Success depends on the precise alignment of the matrix and patrix components along a common path of insertion. Traditional manual waxing of attachments can be problematic, often resulting in a loss of friction and compromised retention over time. The use of prefabricated castable attachments,

such as the Rhein 83 OT Cap, allows for direct integration into the coping's wax pattern. This ensures a more accurate casting process and provides predictable, long-term mechanical retention ⁹.

A key highlight of this case was the incorporation of a digital workflow using extraoral scanning and CAD-based framework design. Following the clinical and laboratory stages of wax pattern fabrication and metal framework trial, the mandibular cast and attachment components were digitized using an extraoral scanner. This digital acquisition of data allowed for precise visualization and manipulation of the prosthetic design within specialized dental CAD software ¹⁰.

The use of extraoral scanning offers several advantages over conventional techniques ¹¹. Firstly, it ensures high accuracy in capturing fine details of the cast and attachment components, reducing the risk of distortion associated with traditional impression materials and manual duplication processes. Secondly, digital models can be stored, retrieved, and modified easily, enhancing workflow efficiency and reproducibility ¹². The combination of semi-precision attachments with digital design techniques represents a synergistic approach in modern prosthodontics. While attachments enhance the biomechanical and esthetic aspects of the prosthesis, digital technology ensures precision and reproducibility in its fabrication. This integrated approach ultimately leads to improved clinical outcomes and higher levels of patient satisfaction.

Conclusion

Semi-precision attachments provide a superior, non-surgical alternative to conventional dentures, offering excellent esthetics and functional stability through their stress-breaking design. The integration of CAD/CAM technology further enhances this modality by ensuring high-precision framework fit and predictable retention.

When combined with regular maintenance of the retentive inserts, this "hybrid" approach significantly improves masticatory efficiency and patient quality of life.

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