

## **Magnets, Ball Attachments and Custom Fabricated Attachments for Tooth Supported Over denture in Partially Edentulous Arches- A Case Series**

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### **Abstract**

Tooth supported overdentures is a simple and cost-efficient modality which helps in preservation of bone. This approach entirely complies with DeVan's maxim that "Perpetual preservation of what is left is more important than the exact replacement of what is lost. Preserved tooth structure beneath the denture base prevents alveolar ridge resorption, enhances proprioceptive feedback, aesthetics and psychological benefits. In this case series, partially edentulous maxillary and mandibular arches were prosthodontically restored using ball attachments, magnetic attachments, and custom-made coping.

**Keywords-** Attachment denture, Over denture, Partially edentulous, Proprioception, Rehabilitation.

### **Introduction**

An important concept in preventive prosthodontics is the tooth-supported overdenture. In tooth supported overdenture, the teeth are maintained as part of the residual ridge as it provides psychological benefit to the patients which is one of its most significant advantage. When compared to implant-supported overdentures, tooth supported overdenture is a simple and affordable treatment<sup>(1,2)</sup>.

The presence of periodontal ligaments in tooth supported overdenture plays a vital role in shock absorption, maintenance of proprioception, functional stimulus for bone preservation, and improves retention, stability, support and masticatory efficiency of patient<sup>(3)</sup>. In this case series, partially edentulous arches in the maxilla and mandible are Prosthodontically restored using ball attachments, magnetic attachments, and telescopic coping.

### **Case Report 1**

A 49-year-old female reported with the chief complaint of difficulty in chewing food due to missing teeth in the upper and lower arch for the past 5 years due to caries and periodontitis. Intraoral examination showed partially edentulous maxillary arch and mandibular arch with erythematous

mucosa in palate due to denture induced stomatitis as patient had maxillary removable partial denture since 5 years (Fig 1a). No mobility and periapical pathology with good bone support was revealed in the clinical and radiographical investigations. The patient was instructed to stop using maxillary RPD (Removable partial denture), and was given antifungal tablet fluconazole 100 mg OD (Once daily) for 3 days, as well as a multivitamin tablet and topical clotrimazole. After complete healing of lesion, maxillary conventional RPD and mandibular overdenture using ball attachments in 35,45(Fédération Dentaire Internationale)with metal coping on 44 was planned for this patient.

Intentional root canal treatment of 35,44 and 45 was done followed by tooth preparation using tapered round end diamond point, 2-3 mm of the coronal height of teeth was maintained with chamfer finish line supragingivally (Fig 1c). Post space for EDS (essential dental system)Fig 2c) was prepared in 35 and 45, leaving 4mm of gutta percha apically. Thereafter, the ball attachments were sealed with dual cure resin cement (Fylla Connect, Mother's dental). Excess cement was removed, cured and final radiograph was taken.

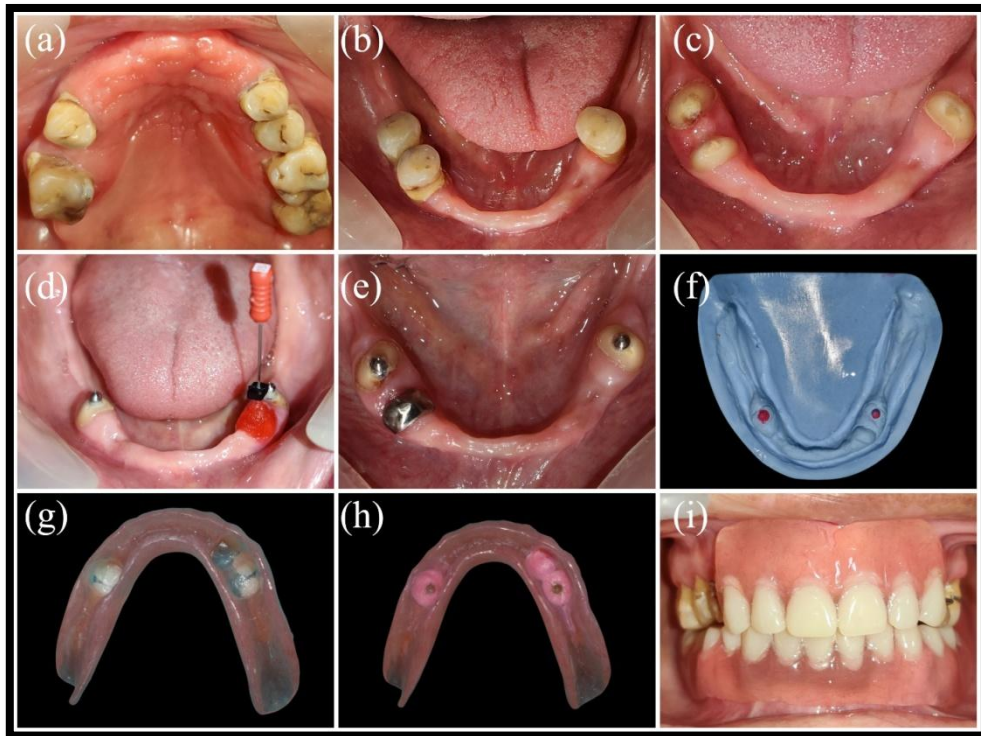
Custom post and dome shaped coping were prepared on 44 with the help of an endodontic file with pattern resin(Pattern resin, GC Corp) (Fig 1d). It was then sprued and finally casted in co-cr base metal alloy. The coping was further evaluated for fit in the patients' mouth and cemented using GIC(GC Gold label; GC Corporation, Japan) (Fig 1e).

An irreversible hydrocolloid (Zelgan, Dentsply) was used to make primary impressions of the maxillary and mandibular arch. The impressions were poured and custom trays were fabricated with autopolymerizing acrylic resin. Border moulding of mandibular arch was done using green stick compound and a polyvinyl siloxane light body impression material (Addition silicone, GC Flexceed) was used to make the final impression. Plaster beading was done, and final cast was poured using type IIIgypsum product (Fig 1f).

Maxillomandibular relation was recorded. The established records were transferred to a semi-adjustable articulator and teeth arrangement followed by try-in was done. The processing was done in heat cure acrylic resin (DPI Heat cure, Mumbai) in conventional manner followed by finishing and polishing.

During mandibular denture insertion, the area of premolars was marked using the polyvinyl siloxane light body impression material (Addition silicone, GC Flexceed) and relieved using carbide burs to incorporate the female component of ball attachment which is nylon caps(Fig 1g). Pick-up impression was made using autopolymerizing acrylic resin (Trevalon; Dentsply

International) (Fig 1h). Excess resin was trimmed, finished, and polished. Following this, denture insertion was done (Fig 1i). Post-operative instructions regarding denture maintenance and oral hygiene were given to the patient and follow up was scheduled after every three months.



**Figure 1. (a) Intraoral maxillary view with erythematous mucosa, (b) Intraoral mandibular view, (c) Tooth Preparation, (d) Cementation of ball attachments and resin pattern preparation for coping on 44, (e) Cementation of coping,(f) Final cast, (g) Prepared recess for nylon cap,(h) Attachment of nylon cap, (i) Post rehabilitative view**

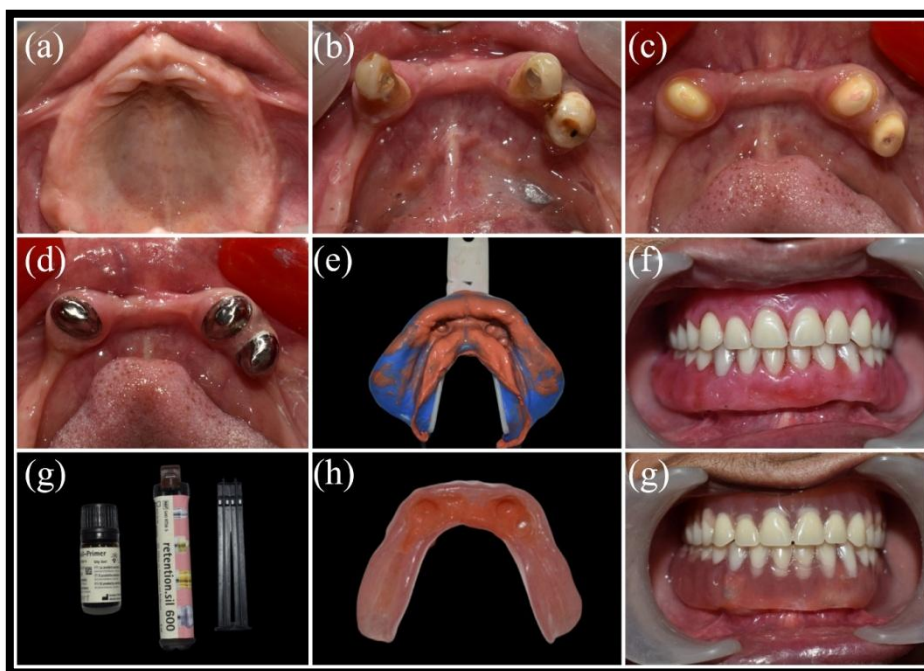
## Case 2

A 51-year-old female reported with the chief complaint of difficulty in chewing food due to missing teeth. Intraoral examination revealed completely edentulous maxillary arch and partially edentulous mandibular arch with presence of 33, 43 and 44 (Fig 2 a,b). Radiographic examination revealed root canal treated 33,43 and 44 with good bone support. Due to economical reasons, complete denture in maxillary arch opposing mandibular overdenture using custom made copings in 33,43 and 44 was planned for this patient.

Tooth preparation of 33,43 and 44 was done with tapered round end diamond point to 2-3mm above the crest of the ridge (Fig 2 c). Impression of the prepared teeth was made in polyvinyl siloxane impression material (addition silicone, GC Flexceed). Wax pattern for the copings were prepared on

the cast and after casting, finishing and polishing final metal copings were obtained. Metal copings were cemented with the help of GIC (GC Gold label; GC Corporation, Japan) (Fig 2 d).

Thereafter, conventional primary impression, border molding, maxillomandibular jaw relation and try-in was done followed by curing, finishing and polishing of denture as shown in case 1 (Fig 2 e, f). Recess was created on the intaglio surface of mandibular denture to accommodate the copings. Multiseal primer was applied in the created recess and after drying of primer, retention sil (Bredent medical GmbH and Co. KG) was filled in the recess and denture was placed on the copings. After 3 minutes, denture was removed and excess retention sil was trimmed using putty cutter (Fig 2 h). Following this, denture insertion was done (Fig 2i). Post-operative instructions were given to the patient and a regular follow up was arranged.



**Figure 2. (a, b) Intraoral maxillary and mandibular view, (c) Decoronation done till 2mm supragingival, (d) Cementation of metal copings (e) Final Impression, (f) Try-in, (g) Retention sil, (h) Pick up of retention sil, (i) Post rehabilitative view**

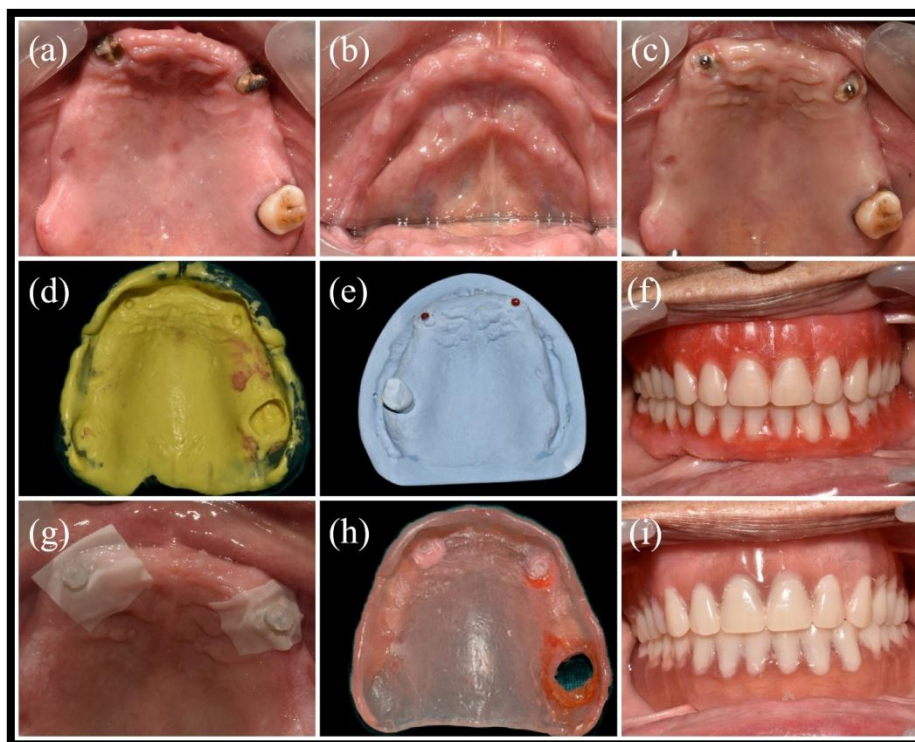
### Case 3

A 55-year-old female reported with the chief complaint of difficulty in chewing food and poor esthetics due to missing teeth. Intraoral examination revealed completely edentulous mandibular arch and partially edentulous maxillary arch with presence of mutilated 13, 23 and intact 27 (Fig 3 a,b). Radiographic examination revealed root canal treated 13 and 23 with good bone support. Cusil maxillary denture with ball attachment in 13 and 23 with conventional complete mandibular denture

was planned for this patient.

Tooth preparation of 13 and 23 was done and chamfer finish line was given supragingivally. Post space for EDS system (Fig 2c) was prepared in 13 and 23 leaving 4mm of gutta percha apically. Thereafter, the ball attachments were sealed with dual cure resin cement (Fig 3 c). The conventional steps of complete denture were completed as shown in case 1 (Fig 3 d,e,f).

During maxillary denture insertion, recess was prepared in canine regions to accommodate female component of ball attachment. Pick-up impression of ball attachment was made using autopolymerizing acrylic resin (Fig 3 h). Clearance of 3-4 mm was created around 27. The silicone tray adhesive was applied and silicone-based long term soft liners (MOLLOSIL chairside soft relining) were placed intraorally around 27 (Fig 3 h). The denture was inserted in the patient's mouth and held in position until the material sets. Excess material was trimmed, finished, and polished. Following this, denture insertion was done (Fig 3 i). Instructions regarding maintenance of oral and denture hygiene were given and the patient was recalled scheduled 8- 12 month for replacing the soft liner.

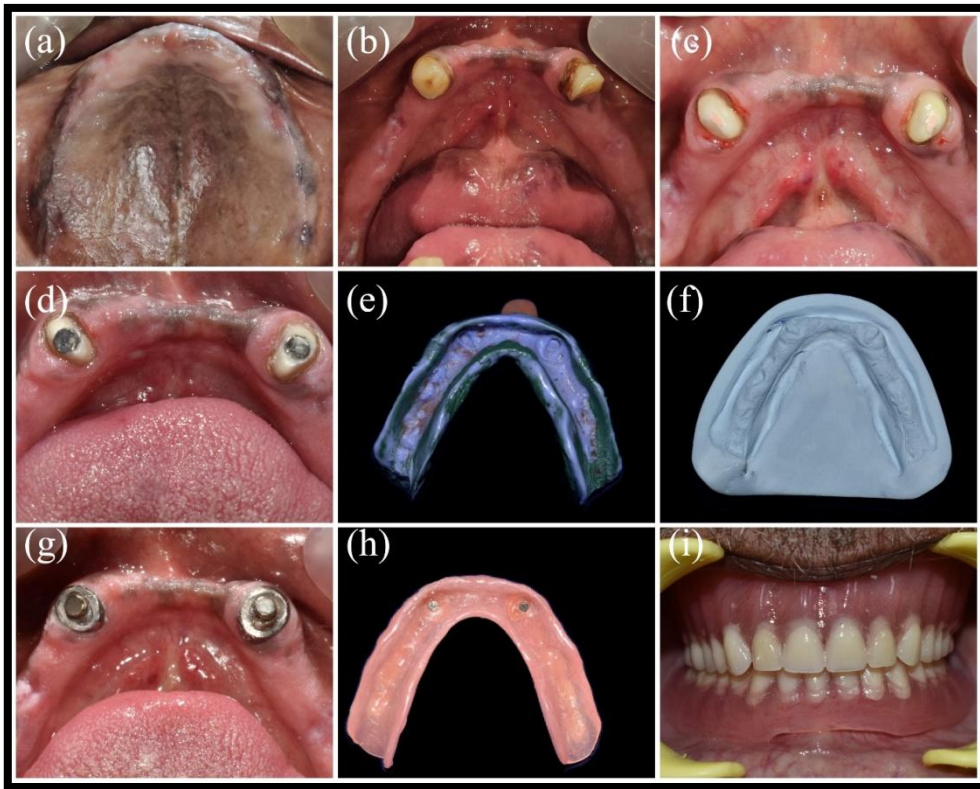


**Figure 3. (a, b) Intraoral maxillary and mandibular view, (c) Cementation of metal copings, (d) Final Impression, (e) Master cast, (f) Try-in,(g) Placement of female component on ball attachments (h) Pick up of female component and application of mollosil in cusil denture area(i) Post rehabilitative view.**



#### Case 4

A 69-year-old male reported with the chief complaint of difficulty in chewing due to missing teeth. Intraoral examination revealed completely edentulous maxillary arch and partially edentulous mandibular arch with presence of 33 and 43 (Fig 4 a,b). Radiographic examination revealed good bone support in 33 and 43. Intentional root canal treatment was done in 33 and 43. Conventional complete maxillary denture and mandibular overdenture using magnets was planned for this patient.



**Figure 4. (a, b) Intraoral maxillary and mandibular view, (c) Tooth Preparation, (d) Cementation of magnets, (e) Final Impression, (f) Master cast, (g) Cemented metal copings on prepared teeth, (h) Pick up of opposite component of magnet (i) Post rehabilitative view.**

Tooth preparation of 33 and 43 was done and chamfer finish line was given supragingivally (Fig 4 c). Post space for 1.5\*3 mm magnet (cobalt-samarium, Ambica Corporation, New Delhi, India) was prepared in 33 and 43. The magnets were sealed in that space with dual cure resin cement (Fig 4 d) followed by primary impression, secondary impression and master cast fabrication. Base metal alloy copings were fabricated on 33 and 43 and cemented with the help of GIC (Fig 4 g). After that, conventional steps of complete denture were completed as shown in case 1.

During mandibular denture insertion, recess was prepared in canine regions to accommodate

opposite components of magnet. Pick-up impression was made using autopolymerizing acrylic resin (Fig 4 h). Excess material was trimmed, finished, and polished. Following this, denture insertion was done (Fig 4 i). Post-operative instructions were given to the patient and follow up was arranged after every three months.

## Discussion

A step towards preventive prosthodontics is the fabrication of tooth-supported over dentures. The ability to adapt to denture prosthesis is impaired by residual ridge resorption and diminished dexterity with increasing age. Saving the natural teeth is the simplest approach to avoid denture problems. For biomechanical and psychological benefits, healthy teeth with compromised periodontal status can be modified and retained. This preventive approach can be achieved by means of overdentures<sup>(4)</sup>.

Depending upon the interarch distance available various types of attachments can be used in overdenture treatment. In case 1 and 3 ball attachments were used for overdenture as the abutment teeth were non vital, evenly distributed, periodontally sound and interarch space present was 12 mm. According to Scherer MD et al., it states that retentive forces of ball attachment are more compared to other attachment system. Ball attachment shows decreased anteroposterior and vertical movement of the denture<sup>(5)</sup>. In case 3, cusil denture was fabricated as upper left second molar was present. Advantages of cusil denture are preservation of the remaining natural teeth and alveolar bone, preservation of proprioception of periodontium of the retained teeth, psychological benefit because the patient is not rendered completely edentulous, good retention and stability of the denture, avoidance of clasp thus aesthetically pleasing and it is good for patients who are allergic to metal. It is time saving and easily prepared with routine steps as a chairside procedure<sup>(6)</sup>.

In case 2, custom made copings were used as an attachment as the interarch space was 14mm. For custom made copings the abutment tooth should be periodontally sound, evenly distributed in arch for better stress distribution, and with interocclusal space of at least  $\geq 13$  mm for copings, denture base, teeth and freeway space. The height of coping should be minimum 4 mm with taper of 6 degrees to determine path of insertion and amount of retention<sup>(7)</sup>.

In case 4, magnets of (1.5\*3mm) were used as a mode of attachment as the interarch space was 10mm and patient has impaired manual dexterity due to aging. Magnets are easy to clean, self-locating and easy to seat and they can automatically reseat following displacement. Magnets are particularly useful in individuals with poor manual dexterity. They are usually flat and can slide and rotate during function; this allows some denture movement and potentially reduces the transmission

of detrimental lateral stresses to the abutment teeth<sup>(8,9)</sup>.

## Conclusion

In this case series four cases were presented, where the treatment plan was mainly decided by the amount of interarch space available. It can be observed that post operative good aesthetics was achieved in all the cases. During follow-up, all the patients reported with good satisfaction, improved appearance and function with no discomfort.

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