



Custom Ball Attachments with Orthodontic Separators: A Cost-Effective Alternative Solution for Overdenture Retention

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ABSTRACT:

Tooth-supported overdentures provide a comfortable and cost-effective treatment option, further enhanced by precision attachments for improved stability. We present a novel approach using custom ball attachments and readily available orthodontic separators. This method offers several advantages:

- Cost-effective: Significantly cheaper than prefabricated attachment systems.
- Easily customizable: Ball attachments can be tailored to individual needs.
- Durable and comfortable: Ball attachments provide good retention and act as shock absorbers.
- Simple to use: Separators have pre-set diameters for convenient placement.

This innovative technique presents a compelling alternative for enhancing overdenture retention, particularly for patients seeking a cost-effective and adaptable solution.

Introduction

While the concept of using removable complete dentures is well-established, overdenture treatment offers a significant advancement. For over a century, dentists have successfully leveraged retained teeth, tooth roots, or even implants to improve the performance and comfort of complete dentures [1, 2]. By utilizing these existing structures, overdentures offer several advantages over traditional options.

The presence of a healthy periodontal ligament maintains alveolar ridge morphology, whereas a diseased periodontal ligament, or its absence, is associated with variable but inevitable time-dependent reduction in

residual ridge dimensions [3]. For seniors with few remaining teeth, overdentures anchored to natural roots not only improve denture stability but also slow down bone resorption, making them a highly valuable treatment choice. In most cases, preserving these roots is preferable to extracting them for implants.

Secondly, retained tooth or root abutments can greatly enhance the stability and function of an overdenture. They provide superior retention, support, and even proprioception, the awareness of tooth position, which is often lost with conventional dentures.

While some dental professionals may shy away from attachments due to cost or perceived complexity, their



benefits are undeniable. Attachment-retained dental prostheses can significantly improve aesthetics and comfort for patients, offering a valuable alternative to implant-supported options, which may not be feasible for everyone [4,5].

Case Report

A 66 year-old male presenting with masticatory difficulties due to edentulous spaces (missing teeth) visited the Department of Prosthodontics at Dr.R.Ahmed Dental College and Hospital. Past medical history was non-contributory to prosthodontic treatment. Intraoral examination revealed well-defined maxillary and mandibular alveolar ridges in a Class I ridge relationship. The maxillary arch was partially edentulous with remaining 11,12,16,21,22.The mandibular arch only retained teeth 34 and 44, both supported by good bone volume and long roots on radiographic investigation. Three treatment options were considered for mandibular arch: conventional complete denture, replacing all teeth following extraction of the remaining teeth or implant-supported overdenture or and tooth-supported overdenture, anchored to remaining teeth for mandibular arch. Removal partial denture was planned for maxillary arch.

The patient opted out of implant-supported dentures due to surgery concerns, longer treatment time, and higher costs.A maxillary partial denture and a mandibular overdenture with extracoronar attachments was finally planned..An orthopantomogram (OPG) and diagnostic casts were made.(Fig 1)

After X-rays and diagnostic casts, we created wax rims to determine occlusion. Tentative jaw relation was recorded using phonetics, aesthetics to determine the approximate vertical dimension of occlusion. Interarch space was found to be adequate. On the diagnostic cast, teeth 34 and 44 were mock prepared to check whether it can accommodate custom ball attachments and orthodontic separators (female component).



Fig.1: Diagnostic cast

To prioritize the patient's comfort and minimize surgery, we developed a plan for a mandibular overdenture utilizing unique ball-and-socket attachments.overdenture was planned to be anchored by custom-made ball attachments (like tiny pegs) fitting snugly into orthodontic separators positioned within the denture itself.The treatment plan was presented to the patient and his consent was obtained.



Fig.2a : Post space impression



Fig.2b : Post space impression

Endodontics was performed on both teeth, then they were shaped into domes with 3-4 mm crowns above the gums. Post spaces were prepared, and direct-indirect custom



post-coping patterns were made using green stick compound (Fig 2a and 2b) and pick up impression was made by rubber base material(Photosil Putty Light Body,DPI)(Fig. 3) The impression was poured with die stone (Type IV die stone, Ultrarock, Kalabhai Karson Pvt. Ltd., Mumbai, India). The fabrication of the post-coping patterns was completed in the laboratory.



Fig.3:Pick up impression of posts.



Fig.4: Copings with custom ball attachments

Custom ball attachments made from pattern resin were attached to the copings. Attachment diameter was decided in accordance with the diameter of orthodontic separators (American Orthodontics, North America) to be used. Surveying was done to check for their parallelism. The casting of the patterns were done in Co–Cr alloy using conventional procedures.(Fig.4) The copings with attachments were finished and polished and tried in the patient’s mouth and the radiographs were taken. Following which, they were luted to the abutment teeth using GIC (GC Fuji PLUSTM GC America) luting cement.



Fig.5: Final impression with copings.



Fig.6: processed mandibular denture

A primary impression of the lower arch was made with alginate and a special tray was fabricated on the primary cast after block out. Using conventional techniques, border moulding was done and a secondary impression was made with light body addition silicone (Photosil Putty Light Body,DPI)(Fig. 5). Record rims were made and the jaw relationships were recorded.Teeth arrangement was done and a try-in was accomplished. After a satisfactory try-in, the waxed up denture was processed using heat cure acrylic(Fig.6).



Fig.7:Separators placed over the custom Ball attachments



Fig.8:Separators picked up in denture

Once the denture was made, orthodontic separators were placed over the custom ball attachments (Fig.7). Separating medium was applied over cast copings with attachments. The separators were picked up by adding autopolymerizing acrylic resin in the space maintained by wax block out while maintaining upper and lower dentures in occlusion (Fig.8). The excess self-cure acrylic was trimmed. Re-polishing was done in that region. To improve the adhesion of acrylic resin to elastic separator, cyanoacrylate resin was applied at the acrylic-separator junction. The denture was inserted and post insertion instructions were given regarding insertion and removal, eating and speaking as well as maintenance of the denture (Fig.9). Periodic follow-up was carried out.



Fig.9: Denture insertion

Discussion

Preserving teeth to act as anchors for an overdenture offers a cost-effective and comfortable treatment option. These "tooth-supported" overdentures can be further

enhanced with precision attachments, significantly improving their grip and stability.[6,7] For overdenture support, there's a variety of choices: bar-clip systems for secure anchoring, ball-and-ring attachments for added flexibility, ERA's innovative approach, and magnetic technology for a modern touch.[8,9,10]

Individualized attachment selection is crucial in overdenture therapy. Analyzing study models and radiographs allows the dentist to assess factors like bone quantity, remaining teeth location, and desired retention, guiding them towards the optimal attachment type for each patient. This makes overdentures a valuable alternative for individuals with teeth who prefer to avoid implant surgery.

Ball attachments boast impressive retention, thanks to their secure fit, while also acting as shock absorbers and stress redirectors, leading to comfortable and durable overdentures. Their ease of insertion and removal makes them well-suited for most patients. The metal OT cap attachment system is recognized for its excellent resilience in overdenture applications, offering a reliable alternative to ball attachments.[11]

Rather than relying on pre-made systems, we took a creative approach for this patient's overdenture. We fashioned custom ball attachments that seamlessly interlock with readily available orthodontic separators, offering a cost-effective and readily customized solution. Separators are relatively easy to use since the diameter of required dimension is available. Inner and outer diameters of the separator are almost 2.23 and 4.23 mm respectively[12].

Ball attachments were made 1 mm larger than the inner diameter of the separators to provide frictional retention. One study by Sidhart Bansal showed when it was stretched by 1 mm, the outer diameter became a 5.23 mm and the amount of frictional retentive force applied by the separator on the ball attachment was calculated with the help of an instrument known as a dontrix gauge and it was found to be 2.7 N. 12 Tests showed prefabricated stud attachments generate retentive forces between 3.2 and 11 N, surpassing the grip of custom ball abutments.[13,14].

The force generated by these attachments, while substantial for secure retention, falls within safe limits for the abutment teeth. Moreover, any gradual decrease



in grip due to wear over time can be easily addressed by replacing the readily accessible matrix component right at the dentist's office.[15]

Conclusion

Customized ball attachments, utilized in conjunction with orthodontic separators, represent a viable and economical alternative to prefabricated attachment systems for improving the retention of tooth-supported overdentures.

This innovative approach leverages the simplicity and affordability of orthodontic separators and integrates them with custom-fabricated ball attachments, achieving enhanced retention potential for tooth-anchored prostheses.

CONFLICT OF INTERESTS

There is no conflict of interests

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