Case Report

Achieving an esthetic smile with fixed and removal prosthesis using extracoronal castable precision attachments

Sharad Vaidya, Charu Kapoor[1], Yujika Bakshi[2], Sonam Bhalla[3]

Departments of Prosthodontics & Implantology, Himachal Dental College, Sundernagar, Mandi, and [1]Oral Pathology and Microbiology, Bhojia Dental College, Nalagarh, Himachal Pradesh, [2]Department of Prosthodontics, DJ Dental College, Modinagar, [3]Oral Pathologist and Microbiologist, Private Practitioner, Dental Clinic-Jawahar Market, Rajpura, Punjab, India

Abstract

Satisfactory restoration in a patient with a partially edentulous situation can be challenging especially when unilateral or bilateral posterior segment of teeth is missing. Successful restoration can be done with various conventional and contemporary treatment options. One such treatment modality is attachment-retained cast partial dentures. A key to success for an attachment retained cast partial denture is the strategic selection of teeth for retention. This clinical report discusses rehabilitation of a patient with the help of a combined prosthesis in the upper arch and stud retained overdenture in the lower arch.

Key Words: Overdenture, precision attachment, preci-vertix attachment

Address for correspondence:
Dr. Sharad Vaidya, Department of Prosthodontics and Implantology, Himachal Dental College, Sundernagar, Himachal Pradesh, India.
E-mail: drsharadvaidya83@gmail.com
Received: 23rd July, 2014, **Accepted:** 24th March, 2015

INTRODUCTION

The preservation of teeth to support an attachment-retained prosthesis whether fixed or removable is an appropriate and stable alternative to extractions and complete dentures. Combinations of fixed and removable partial dentures using precision/semi-precision attachments represent one high-tech solution in the field of prosthodontics. Combined fixed/removable partial denture prosthesis usually refers to the use of precision attachments, double crowns and sometimes overdentures with root attachments. Tooth-supported overdentures can be retained with the help of precision attachments and can improve both retention and stability while simultaneously reducing alveolar bone resorption.[1]

Access this article online

Quick Response Code:

Website: www.j-ips.org

DOI:

They may also be more cost-effective and maintain more dental proprioception than implant supported overdentures. An attachment derives its functions through closely fitting, coupling parts. It incorporates one component into the removable partial denture, and the connecting component is traditionally incorporated into a cast crown or a fixed partial denture, sometimes referred to as patrix and matrix. The classic indication for precision attachments is in patients with natural anterior teeth and unilateral or bilateral distal extension cases for whom high esthetic demands must be met.[2] Attachment-retained cast partial dentures facilitate both esthetic and functional replacement of missing teeth. Studies have shown a survival rate of 83.35% for 5 years, of 67.3% up to 15 years, and of 50% when extrapolated to 20 years.[3] This case report describes the rehabilitation of a partially edentulous patient by use of preci-vertix attachment in the maxillary arch and stud attachments in the mandibular arch.

CASE REPORT

A 50-year-old female patient in good general health presented with poor esthetics and compromised masticatory function to the Department of Prosthodontics and Implantology. The clinical

examination revealed several missing teeth both in the mandibular and maxillary arch with no loss of vertical dimension. Maxillary lateral incisors were found to be supra-erupted, buccally inclined with grade II mobility [Figure 1a]. Second premolar in the left maxillary arch presented with grade III mobility. The remaining maxillary canines and 1st premolars presented good periodontal support and mandibular canine/premolar presented with reasonable bone support. Radiographs were made [Figure 1b], diagnostic casts were articulated at the existing occlusal vertical dimension, and the treatment was carefully planned taking into account patient's esthetic demand and economical condition. Inter-arch space was found to be 14.03 mm [Figure 2], adequate for the use of precision attachments in both the arches. Treatment plan included extraction of hopeless teeth (i.e., maxillary lateral incisors and second premolar in the second quadrant), followed by rehabilitation of maxillary arch with combined fixed/removable prosthesis (using preci-vertix precision attachment) and overdenture with stud attachment in the mandibular arch.

Diagnostic impressions were made and mounted on semi adjustable articulator using a face bow, following which diagnostic wax-up was done on the mounted casts. A putty matrix (Express STD Putty; 3M ESPE, St. Paul, Minn.) was made over the completed diagnostic wax-up for evaluation of the existing space for the extra-coronal resilient attachments.

Maxillary canines and 1st premolars were prepared to receive porcelain-fused-to-metal crowns [Figure 3a and b]. Impression was made in polyvinyl siloxane impression material (Affinis, Coltene/Whaledent, Altstätten, Switzerland) and the cast was poured in die stone (Kalrock, Kalabhai Karson, Mumbai). Crowns were waxed to full contour and milled in wax for maximum guiding plane surface. Burnout plastic male (Preci-vertix standard attachment) with built in paralleling mandrel was attached to the distal surface of the waxed abutment using a dental surveyor, lingual to the center of proximal contour [Figure 4a and b]. This ensured that the bulk of the matrix does not interfere with esthetics of the buccal cusp of replacing a tooth. The height of the standard plastic male was 5.0 mm which was sufficient to provide lateral stabilization to the prosthesis. Eight unit fixed partial denture along with a male part of preci-vertix attachment was cast in Ni-Cr alloy [MeAlloy, Dentsply, UK, Figure 5a]. Porcelain

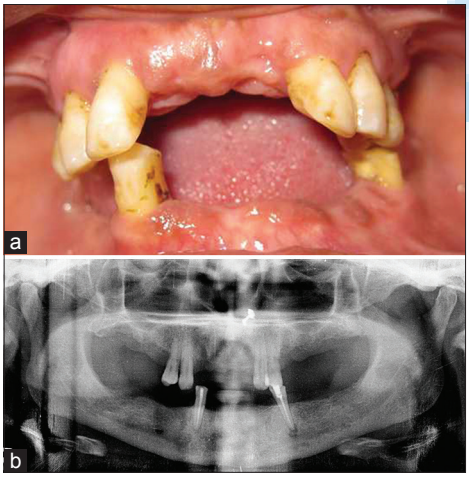

Figure 1: (a) Pre- treatment patient presentation (b) Pre treatment orthopantomogram of the patient showing healthy abutments after extraction of hopeless teeth

Figure 2: Digital vernier caliper showing available inter-arch space

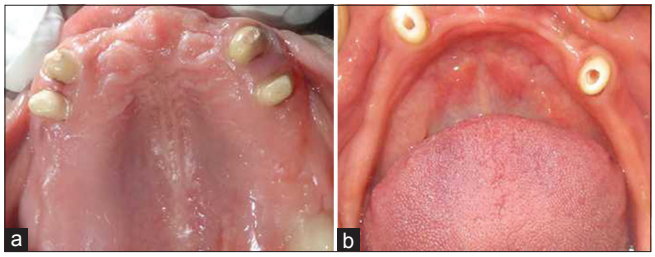

Figure 3: (a) Abutments prepared to recieve 8 unit PFM bridge (b) Prepared canine and premolar teeth to recieve cast pivots with short copings

Figure 4: Burn-out plastic male with paralleling mandrel attached to distal surface of waxed 8 unit segment

build-up of the 8 unit fixed partial denture was completed and tried in the patient's mouth [Figure 5b]. After the cementation of the bridge, impression was made in polyvinyl siloxane impression material (Affinis, Coltene/Whaledent, Altstätten, Switzerland) and poured in die stone. Female polypropylene hader clips were attached to the cast male component. Wax-up of the cast framework was completed on the master cast, and the entire cast partial framework was cast in Co-Cr alloy [Jinbego-FH, China, Figure 6a and b]. Patient was instructed regarding insertion and removal of the prosthesis.

Similarly, mandibular abutments (canine and premolar) were prepared to receive short copings. Postspace was prepared and the impression made in polyvinyl siloxane impression material (Aquasil LV, Dentsply, Caulk, Germany) for indirect technique. Plastic post with sphere were placed in prepared root space and checked for parallelism with the help of Ney's surveyor [Figure 7a]. Wax patterns of the pivots were cast in Ni-Cr alloy (MeAlloy, Dentsply, UK). Retentive nylon caps were placed over master cast, wax block out completed [Figure 7b] and cast partial framework was fabricated in Co-Cr alloy [Jinbego-FH, China, Figure 8a and b]. Maxilla-mandibular relationships were recorded, and occlusion was evaluated [Figure 9a].

Overdenture prosthesis for the mandibular arch and cast partial denture prosthesis for the maxillary arch was fabricated in heat-cure acrylic resin [Leucitone 199 Denture Resin; Dentsply, Trubyte, York, Pa, Figure 9b]. Balanced occlusion was achieved and home care instructions regarding insertion and cleaning of the prosthesis were given to the patient.

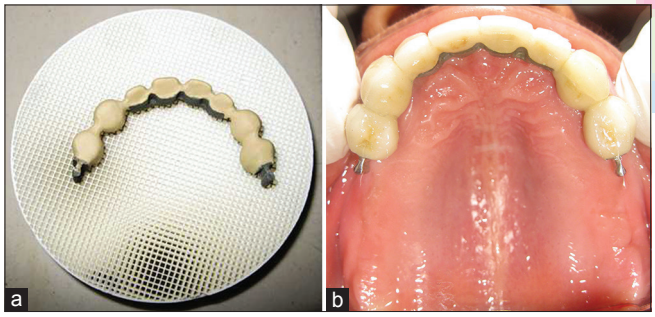

Figure 5: (a) Casting with opaque layer: 8 unit metal framework with male preci-vertix attachment (b) Try-in of 8 unit PFM bridge with male attachment

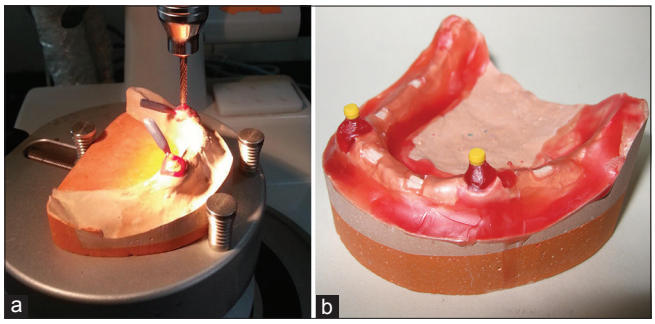

Figure 7: (a) Wax milling of copings with plastic posts and sphere to achieve parallelism (b) Wax block out of master cast with retentive nylon caps

DISCUSSION

Attachments have always been surrounded by an aura of mystery, primarily because of a lack of familiarity and experience. Glossary of prosthodontic terms 8th edition defines attachment as a mechanical device for the fixation, retention, and stabilization of a prosthesis or as a retainer consisting of a metal receptacle and a closely fitting part; the former (the female [matrix] component) is usually contained within the normal or expanded contours of the crown of the abutment tooth and the latter (the male [patrix] component), is attached to a pontic or the denture framework. Attachments may be classified as either precision or semi-precision, depending on the method of fabrication and tolerance of fit.[1] Precision attachments have prefabricated, machined components with precisely manufactured metal-to-metal parts with close tolerances. The fabrication methods for semi-precision attachments yield a less precise tolerance. These attachments have a long track record of more than 50 years and have been preferred in cases of reduced tooth support.[2,3]

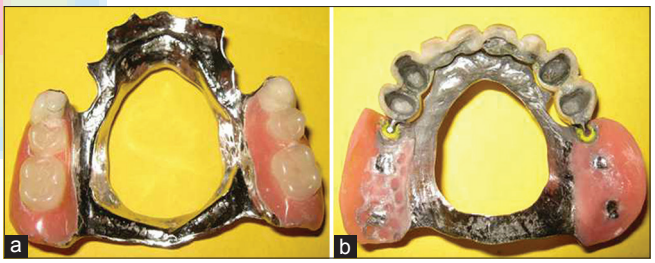

Figure 6: (a) Acrylized Cast partial framework (b) Acrylized combined prosthesis showing orientation of hader polypropylene clips with eight unit FPD

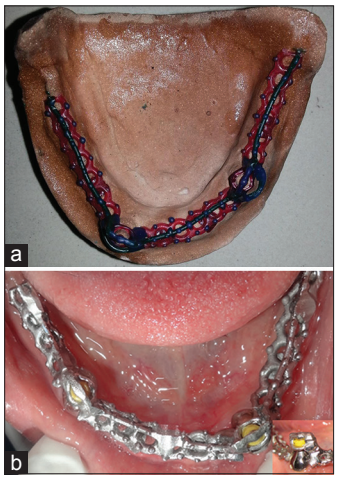

Figure 8: (a) Wax pattern cast partial framework over the refractory cast (b) Try-in of co-cr cast framework with retentive nylon caps

Attachments have a number of desirable qualities that indicate their use in place of conventional clasp retained removable partial dentures. The primary indication is esthetics. Conventional clasp assemblies and rests may be visible and unesthetic whereas preci-vertix and stud attachments get enclosed within contours of the part of the prosthesis. A major advantage of the use of attachments is that the point of force application to the tooth is more apical than for occlusal or incisal rests, thus shortening the lever arm and decreasing torqueing forces.[4] Attachments may also allow better cross-arch force transmission and stabilization than clasps, but this is determined by the type of attachment used, the number of guiding surfaces and the design and adaptation of the framework and the attachment.[5] The majority of extracoronal attachments available have resilient attributes. Attachment alignment is not as critical in highly resilient extracoronal attachments due to the omniplanar motion possible. This creates the advantage of multiple paths of placement for the prosthesis.[6] Poor dental motivation and manual dexterity of the patient may result in earlier failure than with the use of conventional clasping. Repairs or alterations are difficult or impossible with these attachments. Short clinical crowns contraindícate the use of attachments. A minimum of 4 mm of vertical space is necessary for most attachments.[6]

In this particular case Preci-Vertix (Ceka) attachments[6] and stud attachments (OT CAP, Rhein 83 Inc., USA) were used that provided frictional retention to the maxillary cast partial denture as well as for the mandibular overdenture. Preci-Vertix (Ceka) attachments are extra-coronal devices in which exchangeable plastic layers of various sizes are used in the female elements to vary the retention force.

The female plastic insert (made up of polypropylene) used in this case provided standard retention to the prosthesis. Moreover, cross arch splinting of the upper canines and premolars provided better stress distribution thus reducing the rate of alveolar bone resorption.[7]

Preci-vertix resilient attachments permit vertical movement during mastication reducing stress transfer to the abutments (stress breaking function) and direct the forces to the residual ridge acting as stress redirectors. These attachments are based on a broken stress philosophy, thus help to distribute forces equally between soft and hard tissues and are advocated in Kennedy class I situations. Due to reduced tooth support provided by the mandibular arch and to reduce the masticatory load over canine/premolar teeth, it was decided to use resilient stud attachments that will redirect the forces to the residual ridge thus preventing the torqueing of the abutment teeth, justifying the use of resilient attachments in both the arches.

According to Feinberg classification of precision attachments, preci-vertix is categorized as Passive (free moving, stress-breaking action type of attachment). These attachments are passive, and free-moving that dissipates destructive lateral forces, preventing their infliction on the abutment teeth.[7] Thomas Forde, in The Principles and Practice of Oral Dynamics, theorizes that vertically directed forces drive the hydraulic system of dentitional blood supply to the periodontal structures, whereas rocking or rotational forces disrupt the dentitional blood supply, causing "force-induced mouth degeneration" and loss of teeth. The tissue under a passive, free-moving attachment case is generally pink and healthy as a result of the vertically-directed physiologic stimulation during function.[7]

Various stud attachments available are selected based on vertical space available, crown/root ratio, type of coping, number of teeth support, amount and quality of bone support, location of abutments, type of opposing dentition, angulation of the root to the occlusal plane, chewing pattern and the musculature of the patient and patient desire.[8] Rheins stud attachments[9] to retain mandibular overdenture were used in this case due to their simplicity in design, ease in maintenance and minimum

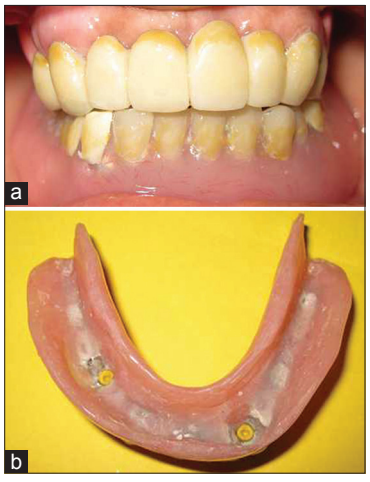

Figure 9: (a) Post insertion picture with combined prosthesis seated (b) Overdenture prosthesis with nylon retentive caps

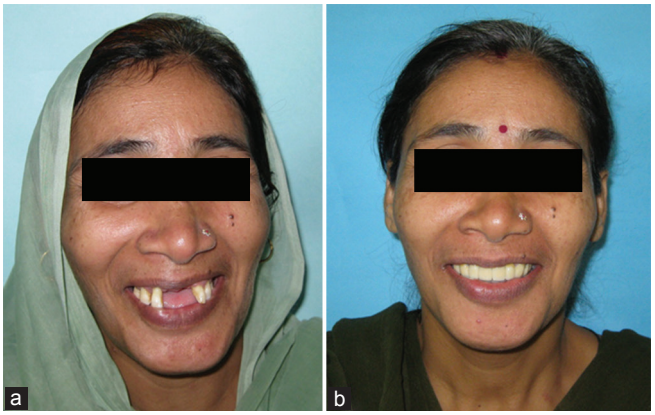

Figure 10: (a and b) Pre and post-treatment photograph of the patient

leverage. The abutment selection also plays a vital role in the prognosis of overdentures.[10,11] Canines are the most important proprioceptive organs, the shape and strategic position, and the larger periodontal attachment area make them ideal abutments.[12] The metal denture fabricated to serve as overdenture is less subject to breakage and denture supporting tissues respond more favorably to metal base which may be related to greater ease in maintaining cleanliness of metal base and to effective transmission of thermal changes through the metal base.[13,14]

Various cases with esthetic and retention challenges can be solved with correct selection of attachment. Whether the need for treatment revolves around health, function or esthetics, attachment retained prosthesis have the capacity to impact patients in life-changing ways. Attachment-retained dentures provide long-term prosthetic stability compared to conventional clasp retained removable partial dentures along with support to the oral and facial soft tissue, which can bolster patient's confidence and alleviate insecurity [Figure 10a and b].

REFERENCES

1. Burns DR, Ward JE. Review of attachments for removable partial denture design: Part 1. Classification and selection. Int J Prosthodont 1990;3:98-102.
2. Burns DR, Ward JE. A review of attachments for removable partial denture design: Part 2. Treatment planning and attachment selection. Int J Prosthodont 1990;3:169-74.
3. Wichmann MG, Kuntze W. Wear behavior of precision attachments. Int J Prosthodont 1999;12:409-14.
4. Schuch C, de Moraes AP, Sarkis-Onofre R, Pereira-Cenci T, Boscato N. An alternative method for the fabrication of a root-supported overdenture: A clinical report. J Prosthet Dent 2013;109:1-4.
5. Staubli PE. Attachments and Implants: Reference Manual. 6th ed. San Mateo, CA: Attachments International; 1996.
6. Extracoronal Attachments. Belgium. Available from: http://www.ceka-preciline.com. [Last cited on 2014 Jul 21].
7. Feinberg E. Precision attachment case restoration with implant abutments: A review with case reports. J Oral Implantol 2011;37:489-98.
8. Lorencki SF. Planning precision attachment restorations. J Prosthet Dent 1969;21:506-8.
9. Attachment and Prefabricated Castables Component. Available from: http://www.rhein83.com. [Last accessed on 2014 Jul 20].
10. Preiskel HW. Precision Attachments in Prosthodontics: Overdentures and Telescopic Prostheses. Vol. 2. Chicago, Il: Quintessence Publishing Co. Ltd.; 1985.
11. Tokuhisa M, Matsushita Y, Koyano K. *In vitro* study of a mandibular implant overdenture retained with ball, magnet, or bar attachments: Comparison of load transfer and denture stability. Int J Prosthodont 2003;16:128-34.
12. Feinberg E. Diagnosing and prescribing therapeutic attachment-retained partial dentures. N Y State Dent J 1982;48:27-9.
13. Owall B. Precision attachment-retained removable partial dentures: Part 2. Long-term study of ball attachments. Int J Prosthodont 1995;8:21-8.
14. Shetty NB, Shetty S, Nagaraj E, Shetty O, D'souza R. Precision attachments for aesthetics and function: A case report. J Clin Diagn Res 2014;8:268-70.

How to cite this article: Vaidya S, Kapoor C, Bakshi Y, Bhalla S. Achieving an esthetic smile with fixed and removal prosthesis using extracoronal castable precision attachments. J Indian Prosthodont Soc 2015;15:284-8.

Source of Support: Nil, **Conflict of Interest:** None.