Attachment Retained Cast Partial Denture Prosthesis

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ABSTRACT

The presence of natural teeth in maxillary and mandibular arches can never be substituted equivalently with any kind of artificial prosthesis. Although every patient is keen to get his missing teeth replaced by fixed prosthodontic option like implants, all the patients cannot afford the cost. A few who can afford may have limitations like systemic diseases, or the anatomical considerations may contraindicate the dental implant options. A few may prefer quicker and shorter treatment modalities due to lack of time. For all those who may not be able to get their missing teeth replaced by implant, prosthesis overdenture is an alternative choice which is more durable and satisfactory to the patients. The use of precision attachments along with the cast partial denture prosthesis offers a variety of solutions to challenge the balance between the functional ability and esthetics. Such prostheses are called attachment retained cast partial dentures. The principle of their function is to distribute the masticatory forces to the wide area thereby reducing the damage to the abutments, soft tissues and bony ridges in addition to improved esthetics and proprioception. This manuscript is showcasing a study, which is a cheaper, but effective way to provide the best treatment to the patient.

Keywords: Combination syndrome, Complete edentulous maxilla, Kennedy’s Class 1 edentulous, Precision attachments, Retention, Rheine 83 OT CAP, Stability

INTRODUCTION

Replacement of missing teeth by prosthesis is always a challenge to the dentist. Treating an edentulous condition does not really mean just replacement of missing teeth with a prosthesis. Instead, the clinician should thoroughly examine, diagnose and design a treatment plan assessing the prognosis, to achieve a successful restoration that provides esthetics, function, comfort, and health to the patient.

The replacement of missing teeth with a removable prosthesis that possesses good stability and retention has been a daunting task to the prosthodontist. The job becomes even tougher and challenging with respect to grossly resorbed ridges and contributes very little to retention and stability. In generally, the retention of removable partial denture (RPD) is obtained from clasps, telescopes or some form of attachments. A caries-free tooth which is intact and is intended to serve as a retentive abutment is best provided with a clasp or adhesive attachments.¹ Although survival rate of the vital tooth as a telescopic abutment in retaining removable dental prostheses is 89%, root canal treatment increases the risk factor of abutment loss² and the visible component of clasp jeopardizes the esthetics.³ When literature is reviewed retrospectively, survival of attachment retained partial denture shows 83.3% for 5 years, 67.3% up to 15 years and of 50% when extrapolated to 20 years.⁴ ⁵ Hence, when the removable dental prostheses are fabricated with precision/semi-precision attachments for retention and support, they are believed to be the best prosthesis available to dentistry especially in conditions where fixed restorations are contraindicated.⁶

Retention of the denture prostheses can also be increased using attachments. A RPD with a retained attachment system is one of the treatment modalities which may assist the prosthodontist to achieve the goals of successful restoration.
An attachment is defined as “A mechanical device for the fixation, retention, and stabilization of a prosthesis.” It is a connector consisting of two parts, one part is connected to a root, tooth or implant and the other part of a prosthesis. Mensor (1971) has classified attachments as intracoronal, extracoronal, push button type, bar type, and auxiliary type. They are also classified as solid or rigid, with or without a U-pin or screw and based on resiliency (vertical, hinge, and rotatory type).

Selection criteria for attachments are based on location, function, retention, space, and economy. Depending on the location, intracoronal, extracoronal, radicular/intraradicular stud type, and bar type could be used. Intracoronal type, as designed by Herman Chayes in 1906, consisted two parts, a slot (female) and a flange (male). The flange is connected to the removable prosthesis which fits into the slot embedded in a fixed restoration. Advantages being the occlusal forces which are close to the long axis of the tooth and better esthetics as an attachment is within the crown of the abutment tooth; but also disadvantageous as it is not always possible to create box preparation for female element in every case. Radicular/intraradicular stud type is composed of a projection soldered to a post-type crown and a corresponding female receptacle that is embedded in an overlay type of denture prosthesis.

**CASE REPORT**

A 57-year-old male patient came to the Department of Prosthodontics, G. Pulla Reddy Dental College, Kurnool, Andhra Pradesh, India, for the replacement of his missing teeth in maxillary and mandibular arches. The teeth were lost due to dental caries and periodontal disease. On intraoral examination very few teeth were remaining, viz., 13, 15, 17, 21, 22, 23, 24, 26, 31, 32, 33, 34, 35, 38, 41, 42, 43, and 44. The maxillary teeth had poor prognosis total extraction of teeth in the maxillary arch was advised and planned accordingly (Figures 1 and 2).

With respect to mandibular arch, tooth number 38 had root stumps and 44 possessed Grade 3 mobility; hence, the patient was advised to undergo extraction of 38 and 44. The remaining teeth in the lower arch showed Grade 1 mobility with the radiographs showing advance loss of alveolar bone and gingival recession. The periodontist was consulted to know the prognosis of the remaining teeth in the mandibular arch. The objective of the prosthodontic team was not just to replace the missing teeth, but the retention and stability of the prosthesis were the major concern. In addition to this, the possibility of occurrence of combination syndrome is foresighted (maxillary complete denture against Kennedy’s Class 1 RPD).

The various treatment modalities were explained to the patient. The reduction of crown height and permanent splinting of remaining mandibular teeth (after periodontal and endodontic therapies) followed by attachment retained cast partial denture in the mandibular arch, and complete denture prosthesis in the maxillary arch was one treatment procedure explained to the patient. Fixed partial denture (FPD) in relation to 35-43 was planned so as to splint the mandibular remaining teeth. The other possible treatment options explained to the patient were overdenture prosthesis with mandibular canines as abutments and implant supported prostheses. The patient was not keen on the later options due to various reasons (fear of surgery, cost of treatment, unwillingness toward the overdenture prostheses).

Thus, considering the pros and cons of the various treatment options and patient’s choice, the attachment retained cast partial denture with splinting of lower remaining teeth with metal, ceramic FPD in relation to
35-43 to which the Rheine 83 extracoronal attachments were attached was planned for the mandibular arch. Moreover, conventional complete denture prosthesis for the maxillary arch was the final treatment plan.

**CLINICAL PROCEDURE**

After the periodontal and intentional endodontic therapies, the patient was referred back to the Department of Prosthodontics. The preliminary impressions were taken, border molding was carried out using green stick compound on a custom-made tray. Impressions were made by dual impression technique followed by tentative jaw relations to assess the vertical dimensions and to recheck the inter-ridge space available for attachments and the overlying prosthesis.

Once it was reconfirmed, the actual treatment was started with reducing the crown height of the remaining teeth, and the tooth preparation was done for the metal-ceramic prosthesis. The impressions were made using the two-step putty wash technique with a polyvinyl siloxane (PVS). The impressions were poured with Type IV gypsum and casts were obtained.

After meticulous surveying of the cast, wax up was done to fabricate metal ceramic FPD. The terminal teeth, i.e., 35 and 43 are selected as abutments to which the semi-precision attachments were to be attached on their distal ends. Rheine 83 semi-precision attachment was selected. The matrix part of this attachment is attached to the distal side of the wax pattern of both 35 and 43 and their parallelism was checked with the help of the dental surveyor (Figure 3). Figure 4 represents the cast with a wax pattern in relation to 35-43 with the Rheine attachments attached at the distal end of 35 and 43.

After casting the wax pattern along with the castable parts of Rheine 83 attachment (Figure 5), try in of the casted pattern was done in the patient's mouth to check the fit of the prosthesis. Once the metal fit seemed to be satisfactory, ceramic build up was done and finally the metal ceramic FPD with the attachment after finishing, and polishing was cemented using glass ionomer luting cement (GC FUJI I, GC Corporation, Tokyo, Japan) (Figures 6 and 7).

After cementation, the final impression was made using PVS impression material (Figure 8). The area of the attachment in the impression was poured in acrylic, and the rest was poured in dental stone. OT cap is placed over the attachment duplicated in acrylic (Figure 9). The wax pattern for the cast partial denture was fabricated over the cast. After spruing, investing, burnout and casting; the metallic framework of RPD was made ready. Try in of the metallic framework was done (Figure 10) followed by jaw relation (Figure 11). The acrylisation of RPD and maxillary complete denture was done using DPI – Acrylyn H (Figure 12). The finishing and polishing of the maxillary denture and mandibular cast partial denture was accomplished assess esthetics, occlusion, and speech.

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*Figure 3: Rheine 83 attachment fixation*

*Figure 4: Wax pattern with Rheine 83 attachment*

*Figure 5: Metal framework of fixed partial denture with attachments*
The retentive caps were picked up within the partial denture with the help of self-cure acrylic resin using DPI-Cold Cure (Figure 13). Finally, the upper complete denture and the lower attachment retained cast partial denture was fitted in the patient’s mouth and the occlusion was checked (Figure 14). Esthetics and speech were also assessed. Figure 15 shows the frontal view of the patient after the insertion of the prosthesis.

Figure 6: Final fixed partial denture prosthesis with casted Rheine attachments
Figure 7: Cementation of fixed partial denture in relation to 34-43
Figure 8: Final impression with the polyvinyl siloxane impression material
Figure 9: Master cast with OT CAP
Figure 10: Checking fit of Cast Partial Denture framework
Figure 11: Jaw relations
The patient was thoroughly instructed and educated about the use of the prosthesis and maintenance of oral hygiene. The importance of 24 h recall checkup and thereafter the periodic checkups (1 week, 1 month, 3 months, and every 6 months) was explained. The evaluation of the tissues for any irritation, trauma, and occlusal prematurity was done during periodic recalls. The patient seemed to be happy and satisfied with the treatment.

**DISCUSSION**

In the past, when patients were presented themselves as candidates for a denture with teeth that were badly broken down, with periodontal involvement, or without not being able to afford the cost of extensive restorative treatment, perhaps teeth were extracted, that could have been retained under more favorable circumstances. This, of course, leads to complete denture as the only treatment option with all of its pitfalls.

The first denture was usually satisfactory, but with each year passing and with each subsequent denture, the patient becomes intolerant of their prosthesis. The resorption of the bone begins, a vicious cycle of an ill-fitting denture causing inflammation, which in turn increases the resorption process, creating an even more unstable base, repeating the entire process once again.

The “denture cripple” presented with a denture with little support and retention due to the resorbed underlying ridge and, second a decreased physiologic ability to manipulate the denture in the oral environment. This becomes a pathetic situation to deal with, the patient unhappy about the unstable denture and the prosthodontist helpless with no other option left apart from the implant treatment if possible.

There are several treatment options for the rehabilitation of partial edentulism. Depending on several given
diagnostic factors and the patient’s perspective, best treatment plan should be selected for the patients. Despite the fact that implants supported prosthesis is the best in providing retention and stability to the prosthesis, the expense and the patient’s fear of surgery and time is always a limitation. In general, retention of RPD is obtained by the use of clasps. However, the force exerted on the abutment with metal, ceramic restoration may cause ceramic fracture as the tensile strength of ceramic is very less.

Alternatively, attachments have a number of desirable qualities that indicate their use in place of conventional clasps. By definition, an attachment is a mechanical device for the fixation, retention, and stabilization of dental prostheses. For RPD prosthodontics, it is a mechanical device, other than a clasp, that functions as a direct retainer. Attachments may be classified as either precision or semi-precision, depending on the method of fabrication and tolerance of fit. Precision attachments are wholly or partially machined accessories used for retention of a removable prosthesis. These devices allowed prosthesis to combine the advantages of both fixed and removable restorations.

Precision attachments have been constructed into two halves, a matrix and a patrix. The halves being so arranged that they articulate with one another to form a precise but separable joint. Precision attachments are available as prefabricated and resin patterns. Resin patterns can be customized to the space available without affecting esthetics and function. Numerous attachments are available in the market, of which Rheine 83 OT CAP is used in this case as they are simple and offer spherical retention. The versatility of applications to many restorations, solutions offered by the spherical retention is widely recognized in the treatment of the partially and totally edentulous patients.

Rheine 83 OT CAP is an extracoronal castable attachment positioned on the distal side of the crowns as an extension allowing vertical space for optimal esthetics. The castable OT male cap can be easily shaped with the crowns during wax up stage. Besides to this, it offers considerable advantages by acting such as a stress breaker, and minimizing the stress on distal abutment, provides comfort, increases chewing ability, satisfaction as well as the distribution of occlusal loads, and preservation of abutment teeth. However, the use of this attachment requires a thorough knowledge of basic prosthodontics principles, appropriate training, and experience along with technical skills, clinical ability, and judgement.

**CONCLUSION**

Attachment retained RPD is a viable treatment option in case of distal extension partial dentures providing better resistance to the movement of the prosthesis toward the tissue and away from the tissue and also acts as “stress breaker” by minimizing the stress on the distal abutment.

Emphasis must be placed on proper patient selection, patient motivation, basic prosthodontics principles, detailed home care instructions, and treatment recall. Dental caries and periodontal breakdown are the factors that may jeopardize the success. If these two factors are well controlled by proper home dental hygiene methods, the prosthesis may last long for many years.

**REFERENCES**


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