CASE REPORT

Unique, Cost-effective and Retentive Removable Prosthesis to Rehabilitate Long Span Kennedy’s Class I Edentulism with Custom Attachment System: A Case Report

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ABSTRACT

Aim: This case report describes about a distinctive custom-made attachment on the abutment teeth to improve the retention and stability of the removable partial denture (RPD). It also throws light on the cost-effective method for altering the abutment teeth with the aid of the crowns and custom-made attachments.

Background: Achieving retention in Kennedy’s class I bilateral edentulism usually affects the abutment teeth’s periodontal health and eventually the retention is compromised. Distal extension edentulism also affects patient’s masticatory efficiency. The rehabilitation of a patient with the long span Kennedy’s class I condition complicates the problem because of the unavailability of enough abutments to support the prosthesis. Conventional removable prosthesis with clasps and cantilever fixed partial prosthesis are not advisable in this situation for the same reason.

Case description: A case with Kennedy’s class I modification 1 partially edentulous arch with 1st and 2nd molars missing along with central incisors was rehabilitated with an inexpensive custom attachment using die pin and sleeve for giving a fixed prosthesis on abutment teeth and removable prosthesis with missing teeth.

Conclusion: This technique has advantages of retention better than conventional RPDs, protection of abutment health by restoring it with crown, easy to place and remove and very cost-effective.

Clinical significance: The entire technique demands less skill compared to semi precision and precision attachments.

Keywords: Cantilever fixed partial dentures, Custom attachment, Die pins and sleeves, Distal extension removable partial denture, Kennedy’s class I edentulism.

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BACKGROUND

Erosion/loss of tooth is a major problem affecting an individual in all aspects. Tooth loss is recognized by an edentulous space which could be partial or complete.1 There are several classifications recommended to classify the edentulous arches in order to identify the combinations of teeth to ridges. Currently, Kennedy’s classification is considered the most broadly accepted classification for partially edentulous arches and offers immediate visualization, prosthesis support recognition, and assessment of removable partial denture (RPD) design features.2-4

Rehabilitation options for the partially edentulous patient with a single tooth or multiple missing teeth include interim acrylic resin RPD, conventional cast partial denture, partial denture with attachment, fixed partial denture (FPD), or implant retained prosthesis. Clinical decision making is critical in deciding the most suitable treatment option for a patient.5

The cantilever FPD—forces transmitted through the cantilevered pontics can cause tilting and rotational movements of the abutments. To improve the prognosis of the FPD cantilever, the number of abutments should be increased and the number of pontics should be decreased. Implant is a treatment choice as compared to RPD or FPD but due to systemic conditions, bone availability and cost may alter the treatment plan. RPDs are considered a widely acceptable means of replacing missing natural teeth for restoring esthetics and function in partially edentulous patients.5 The widespread use of acrylic partial denture is attributed to advantages like the ease of fabrication and modification.7 Practitioners and researchers have shown that when a RPD is placed into a healthy oral environment, when the design is developed by a dentist to meet specific needs of the patient, and when good oral hygiene is maintained, long-term success with RPD treatment can be expected.8 Different methods to control the load delivered from Kennedy’s class I RPDs to both teeth and residual ridges were suggested by Lammie and Laird.9 These methods include reducing the load, distributing the load between teeth and residual ridges, and distributing the load widely.

This case report discusses about the cost-effective method to increase the retention and enhance the stability of the RPD by modifying the abutment teeth with the help of crowns and custom-made attachments (consisting of matrix made of sleeve and patrix made of die pin).

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CASE DESCRIPTION
A 58-year-old male patient reported to the Department of Prosthodontics, KAHER Vishwanath Katti Institute of Dental Sciences, Belgum, Karnataka with a complaint of unaesthetic appearance and difficulty in chewing and swallowing food because of the completely edentulous mandibular arch and multiple missing upper anterior and posterior teeth due to decay. On examination of the maxillary arch, there was a Kennedy's class I modification 1 partially edentulous arch with 1st and 2nd molars missing along with central incisors (Figs 1 and 2A). A customized attachment retained removable prosthesis was planned for the rehabilitation of the maxillary edentulous space using die pin and sleeve system.

Diagnostic impressions were made using irreversible hydrocolloid impression material (Tropicalgin; Zhermack, Italy). Casts were prepared using type III dental stone (Kalstone; Kalabhai Karson Pvt. Ltd, Mumbai, Maharashtra, India). Tentative jaw relation records were checked to assess the interarch space, which was found to be satisfactory. A complete mandibular denture and a maxillary RPD was fabricated without clasps in heat cure acrylic resin (Meliodent heat cure, Kulzar Mitsui Chemicals Group).

Four maxillary premolars were prepared with shoulder finish line to restore them with porcelain fused to metal crowns. Final impression was made using two stage technique with putty and light body consistency of polyvinyl siloxane impression material (Aquasil Ultra Monophase; Dentsply, Germany). Cast was poured with die stone (Ultrarock; Kalabhai Karson Pvt. Ltd, Mumbai, Maharashtra, India).

A mold of die pin (Crosspin; Nordin, Switzerland) was made with the help of putty consistency polyvinyl siloxane and was replicated with pattern resin wax (Pattern Resin; GC Corporation, Tokyo, Japan). Four straight die pin replicas were made. These die pin replicas were attached to the horizontal extension of wax in continuation with wax coping of the prepared premolar crowns as shown in (Fig. 3A). Parallelism of these die pin replicas was checked with a surveyor. Entire assembly was then invested and casted with cobalt chromium alloy. Casted assembly was finished and polished and was tried intraorally for evaluating the fitting of prosthesis before ceramic layering.

After this, the ceramic layering was carried out on the crowns (Fig. 3B). Total thickness of maxillary removable prosthesis was measured from intaglio surface to occlusal surface of the acrylic teeth with the help of an Iwanson dental gauge and then the die pin extensions were trimmed based on the thickness of the prosthesis and die pin sleeves were tried on it to achieve perfect fit (Fig. 4). The entire framework was placed in patient's mouth (Fig. 5) and with the help of articulating paper (Deepti Dental Products India Pvt. Ltd; M.I.D.C. Ratnagiri) the four points were marked on the intaglio surface of RPD where the sleeves will be placed eventually. Holes were made on these four points wide enough to fit the sleeves and in a manner, which will not perforate the overlying acrylic teeth. Trial of denture was done along with sleeves placed on the die pin extensions. Retention was achieved and proper occlusion of maxillary RPD was established with mandibular complete denture.

Prepared assembly is cemented on the four prepared premolars with GIC luting cement (GC Luting and Lining Cement; GC Corporation, Tokyo, Japan). Hard liner (Kooliner-Hard chairside denture reline; GC America Inc. ALSIP IL 60803) was applied on the holes of RPD and petroleum jelly was applied on the die pin extensions for easy removal. Sleeves were placed on the extensions and the RPD with hard liner was placed and the patient was asked to bite in centric occlusion. After the setting of hard liner, the RPD was removed and it was observed that sleeves were incorporated in the intaglio surface of denture (Fig. 6). The excess was trimmed off from the tissue fitting surface of the prosthesis. Prosthesis was inserted with oral hygiene instructions and patient was intimated about the importance of recall visits (Fig. 2B).

DISCUSSION
Distal extension RPDs have long been implicated in the increase in mobility and the destruction of the supporting structures of the primary abutment teeth. Various clasping systems have traditionally been used to retain distal extension RPDs, and other designs have been proposed to minimize torquing forces on the abutment teeth. Movement of the abutment teeth is influenced by many factors, such as the location of rests, the contour and rigidity of connectors and the extension of the denture base.10

Status of the abutment teeth in distal extension situation were affected by RPD wearing. According to a study by Mahmood almost 30% of the abutments progressed to periodontal disease, 16.9% developed caries and 12.4% had to be extracted when the denture was used for a mean of 2–6 years. Caries activity and extraction of...
the abutments were observed more in the third to ninth years of denture wearing.\textsuperscript{11–13}

Displacement of the denture, especially in the area of the distal extension, is more likely. To prevent displacement of the denture, precision attachments or conventional clasps have been widely used. In addition, denture bases are usually fitted to the surrounding tissue as accurately as possible. However, the rotational tendency of the RPD after long-term use cannot be eliminated completely, regardless of design and fit of the denture.

Dental implants are not considered in all patients due to systemic conditions and as many patients cannot afford them, particularly those with large edentulous areas. For reconstruction among these patients, fixed type prostheses usually require more implants for support than removable prostheses. In addition, these patients may require several surgeries to increase bone mass, thus making the entire treatment complicated. However, if a traditional RPD is used, insufficient retention may induce problems.\textsuperscript{14,15}

In this case, FPD was contraindicated due to a long edentulous span and the cost factor which contraindicated implant supported prosthesis. This custom attachment was then designed with inexpensive materials like straight die pins and sleeves making it affordable for the patient. The unique yet not at all technique sensitive design was easy to understand by the lab technician also as compared to semi precision and precision attachments. Periodontal health of the abutment teeth was preserved, and retention achieved was snap fit as seen in cast partial denture. Flexible nature of sleeves helped to distribute the occlusal forces and will lead to
less resorption. Retention was increased so as the stability of the overall prosthesis. Occlusal efficacy was also increased. Prosthesis was cost-effective.

Periodic recalls are a must in this case. Maintaining good oral hygiene will make this prosthesis last for a very long time by not affecting the periodontal health of the abutments.

**Conclusion**

Case report describes about a novel technique of custom made attachment restoring the lost teeth in Kennedy’s class I by taking into consideration the disadvantages of treatment options like conventional RPD (hampering the periodontal health of abutment teeth) and implant supported prosthesis (with its limitation) and having advantages of retention better than conventional RPDs, protection of abutment health by restoring it with crown, easy to place and remove and very cost-effective.

**Clinical Significance**

The entire technique demands less skill compared to semi precision and precision attachments.

**References**