

Prosthodontic Rehabilitation of a Patient with Kennedy's Class I and Class II Using an Extended Precision Attachment: A Case Report

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ABSTRACT

Aim: To achieve a full-mouth rehabilitation of partial edentulousness using modified/extended precision attachments in a removable partial denture (RPD).

Background: The success of a prosthodontic rehabilitation requires crucial balance between the modern and conventional treatment techniques. The attachment-retained partial dentures are one such type of prosthodontic treatment modality. Most traditional RPD are well designed but not used by the patient only because the individual does not prefer its appearance and the retentive quality. A modified extended precision attachment for eliminating metal display to upgrade the esthetics and to improve the retention of a long-span partial edentulous arch restored with a prosthodontic rehabilitation is described in this article.

Case description: A 58-year-old male patient was referred to the Department of Prosthodontics for the replacement of missing teeth. On clinical examinations, it was diagnosed Kennedy's class I in the maxillary arch and class II in the mandibular arch with a reduced vertical dimension of occlusion. Precision attachment-retained partial dentures were planned in the maxillary and the mandibular arch.

Conclusion: The success of the RPD depends on the retentive components and the underlying residual alveolar ridge. This case report highlights the esthetic outcome and improved retention in the maxillary and mandibular partial denture using precision attachments.

Clinical significance: The treatment plan explained satisfactorily restores the esthetics, masticatory function, and improves the retention of the prosthesis by using precision attachment.

Keywords: Fixed partial denture, Full-mouth rehabilitation, Precision attachment, Removable partial denture.

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INTRODUCTION

Attachment-retained removable partial denture (RPD) has been a long-standing form of treatment in prosthodontics. In the present society, the esthetic consideration in the prosthodontic rehabilitation is a need of an hour. However, credits to the abundance of options between precision attachment designs in the market and the technical sensitivity of its production and delivery, the treatment option is left unconsidered by many dentists.¹

Most traditional RPDs that are well fabricated are not used by the patient only because the individual does not prefer its appearance. The removal of a facial or labial direct retainer or clasp arm would be a critical factor in creating a cosmetic design.²

The success of a full-arch dental restoration requires a crucial balance between the modern and conventional treatment techniques, and attachment-retained partial dentures are one such type of prosthodontic rehabilitation. The available restorative space along with the number of teeth missing and the periodontal health of the abutment teeth pose a significant challenge while determining the design and fabrication of specific RPD attachments for extracoronal fittings. A modified extended precision attachment system to achieve optimum retention, stability, and enhancing the esthetics by eliminating the visible metal components is described in this article.³

CASE DESCRIPTION

A 58-year-old male patient, referred from the Department of Oral Medicine and Radiology to the Department of Prosthodontics

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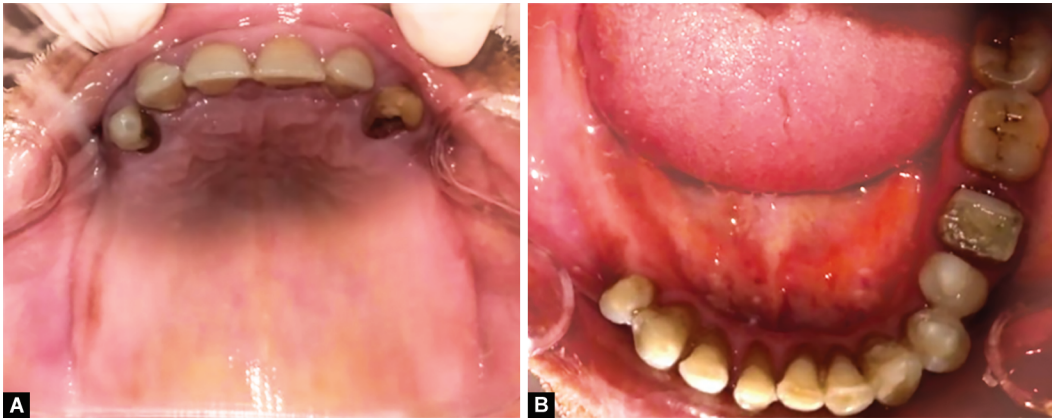
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and Crown and Bridge, KLE Vishwanath Katti Institute of Dental Science, Belagavi, Karnataka, India, for the replacement of missing teeth. Patient's chief complaint was that he had lost the teeth due to caries and had been partially edentulous for the past 2 years. He complains of an unappealing, unattractive appearance and difficulty in chewing food due to the missing teeth in his upper and lower posterior region. On clinical examination, teeth present were 11, 12, 13, 21, 22, and 23 in the maxillary arch and 44, 43, 42, 41, 31, 32, 33, 34, 35, 36, 37, and 38 in the mandibular arch, and a dislodged metal crown with 36 with reduced vertical dimension of occlusion was present (Fig. 1).

Clinical and radiographic examination revealed the presence of generalized attrition and reduced vertical dimension of



Figs 1A and B: (A) Preoperative view of the maxillary arch; (B) Preoperative view of the mandibular arch



Fig. 2: Frontal view showing reduced vertical dimension

occlusion, which necessitates the elective endodontic treatment of all the maxillary and the mandibular teeth and 13 and 23 were restored with customized post and core to increase the crown length in order to restore the lower facial height, which was reduced due to the loss of maxillary and mandibular posterior teeth (Fig. 2). The patient was diagnosed as a favorable partially edentulous case for full-mouth rehabilitation as Kennedy's class I in the maxillary arch and class II in the mandibular arch, respectively.

The treatment option suggested was the precision attachment-retained cast partial denture in the maxillary and mandibular arch.

A diagnostic wax mockup was modified according to the Broadrick's occlusal plane analyzer to establish the curve of Spee (Fig. 3). An interim removable prosthesis with a 2 mm increase in vertical dimension was fabricated and delivered. The patient was advised to wear this for a period of 6 weeks to get accustomed to this modified vertical dimension.

Intentional endodontic therapy was performed in all the remaining teeth in both the arches and 13 and 23 were restored with custom post and core restorations to enhance the crown length.

The prosthodontic rehabilitation includes RPD with precision attachments in the maxillary and the mandibular arch.

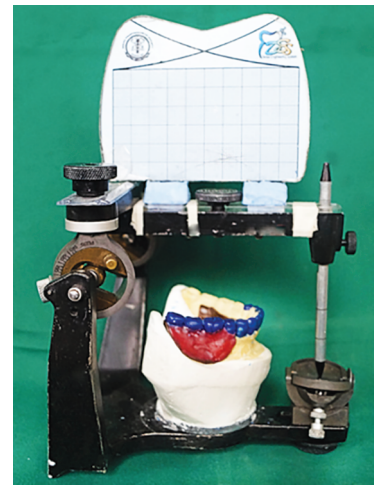


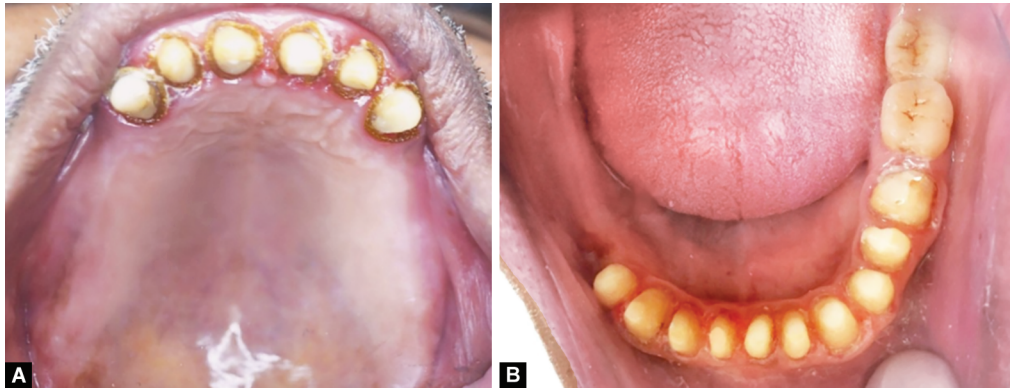
Fig. 3: Wax mock-up according to the Broadrick's occlusal plane analyzer

Technique

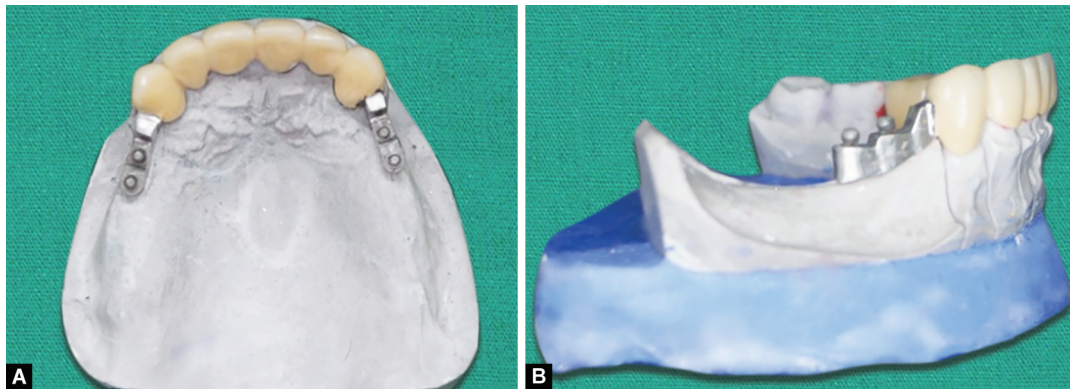
Diagnostic impressions of the maxillary and mandibular arches were made using irreversible hydrocolloid (Tropicalgin, Zhermack, Italy). The casts were poured with model plaster (Kalabhai, Kaldent, India) and were articulated using facebow and centric bite record. On these casts, a diagnostic wax pattern was fabricated of the teeth at an additional increase of 2 mm to the current vertical dimension in occlusion, on the semi-adjustable articulator (Hanau Wide-View). The occlusal plane was corrected according to the Broadrick's analysis. A putty index of this pattern was made using addition silicone putty material (Aquasil, Dentsply, Germany) to fabricate temporary restoration at a later stage.

The mandibular abutment teeth were prepared to receive porcelain fused to metal restoration with lower central incisor, lateral incisor, canine, and first premolar (41–44) as a single unit on the right side and the central, lateral, canine (31–33) and first premolar, second premolar, and first molar (34–36) as two separate units on the left side (Fig. 4). A two-stage putty-light body impression of the lower arch was made and poured in die stone (Pearlstone, Asian Chemicals, India). Temporary fixed partial denture (FPD) was fabricated using the putty index and cemented using temporary cement (Temp-Bond, Kerr Corporation, Romulus).

Wax patterns were fabricated for all the prepared teeth and a wax custom bar running over the edentulous area was connected



Figs 4A and B: (A) Abutment preparation in the maxillary; (B) Abutment preparation in the mandibular arch



Figs 5A and B: (A) Bisque trial in the maxillary arch; (B) Bisque trial in the mandibular arch

to the prepared wax patterns of 41–44. Ball attachment patterns (Rhein 83, USA) were attached to the custom bar in the region of the second premolar and first molar. Length of the cantilever was decided based on remaining teeth and type of support received from the abutment.

The pattern was invested and casted with Ni–Cr alloy, which was finished and polished according to the manufacturer's instructions. The framework try-in was done to assess the fit and available interarch space. Ceramic (VITA Zahnfabrik, Germany) layering was done with respect to all the retainers and the bisque trial was done to evaluate the shade and fit of the fixed prosthesis (Fig. 5).

Undercut block out of the framework was done and single-stage putty-light body addition silicone (Aquasil, Dentsply, Germany) pickup impression was made with retention caps placed over the stud attachments and the cast was poured with die stone. Temporary denture base and the wax occlusal rims were fabricated covering the edentulous area. The jaw relation was recorded and articulation was done. The teeth arrangement was done in a class I molar relation with a bilateral balanced occlusion and after satisfactory try-in, the trial dentures was processed using heat-polymerized acrylic resin (Trevalon HI, Dentsply, India). Finishing and polishing of the prosthesis were done. Standard retention caps were inserted in the slot present on the undersurface on the RPD.

The prosthesis framework with auxiliary attachment was cemented using type I glass ionomer cement (GC Gold Label 1, Japan) and the removable denture was retained over this framework using the ball attachment.

The maxillary abutment teeth were prepared to receive porcelain fused to metal restoration with 11, 12, 13 and 21, 22, 23

as two separate units. A two-stage putty-light body impression of the lower arch was made and poured in die stone (Pearlstone, Asian Chemicals, India). Temporary FDP was fabricated using the putty index and cemented using temporary cement (Temp-Bond, Kerr Corporation, Romulus).

Wax patterns were fabricated for all the prepared teeth and two wax custom bars running over the edentulous area were connected to these prepared wax patterns 11–13 and 21–23. Ball attachment patterns (Rhein 83, USA) were attached to the custom bar in the region of first premolar and second premolar region bilaterally.

The laboratory procedures were followed same as mentioned above for the mandibular partial denture and maxillary RPD was delivered to the patient and post-insertion instructions were explained (Fig. 6).

The patient was trained about insertion and removal of the prosthesis followed by home care instructions. The 1-, 3-, and 6-month follow-up was found to be satisfactory in terms of function, esthetics, and maintenance of the prosthesis.

DISCUSSION

Despite the increasing trend toward the use of the fixed dental prosthesis and dental implants to preserve more teeth in older age groups, the application of cast partial dentures in prosthodontics remains predominant.⁴

Another important factor in determining the prosthetic outcome is the amount of exposure of anterior tooth surfaces with lips at rest or during function. Any prosthetic replacement that is within the smile zone of the patient is a critical factor to be considered for optimal esthetic results.⁵



Figs 6A to C: Prosthesis *in situ*: (A) Left lateral view; (B) Frontal view; (C) Right lateral view

The preservation and restoration of form, functions, and esthetics of RPDs, particularly the extracoronal form of attachments, are deemed more efficient.⁶

If adequate numbers of implants could have been placed, a full-arch fixed prosthesis could be made. However, it can be financially inconvenient for the patients to seek out comprehensive fixed dental implant-supported prosthesis. The implant-supported prosthesis was not taken into consideration because the patient was apprehensive to undergo an elective surgical procedure. The preference of a retainer for removable dental prosthesis depends primarily on health of the abutment teeth, the inter- and intra-arch restorative space available, esthetics, and economic aspects.

While clasps may disrupt with esthetic needs in the esthetic zone, attachments in the labial region are nearly invisible.⁷

Most of the currently used extracoronal attachments have resilient and durable properties. For highly resilient extracoronal attachments, connection orientation isn't quite as crucial due to the potential omniplanar movement. This produces the advantage of various paths of placement and removal for the prosthesis.⁸

In the current case for the maxillary arch, Rhein 83 extracoronal castable attachments have been attached to a full-coverage retainer; this extracoronal attachment was modified in a way that it extended longer than the conventional type with two sphere attachments following the bar ledge that was attached to the retainer.

These attachments are extracoronal resilient and economical. These attachments are based on broken stress philosophy, permit vertical movement, and reduce stress transfer to abutments.⁹

Centrals, laterals, and canines were included in the retainer design as abutments for the extra leverage required while conventionally only one or two abutments would have sufficed. The choice of the abutment also plays an important role in the attachment-retained prosthesis. Canines have been chosen as anchors because of their proprioceptive nature, form and strategic position, and the wider periodontal fixation area. Partial dentures made on them are less prone to breakage and are efficient in distribution of temperature changes.¹⁰

In the case scenarios reported by Gupta et al. and Burns et al., the selection criteria for choosing the attachment and the procedure that was followed are similar to the techniques that were used to rehabilitate Kennedy's class I and class II partially edentulous conditions using a combination prosthesis with extracoronal precision attachments, such as the Rhein 83 OT CAP attachments system. These extracoronal castable attachment positioned on the distal of the crowns as an extension, allowing a lot of vertical space for optimal esthetics. The castable OT CAP male can be easily shaped together with the crowns during the waxing-up stage avoiding complicated adaptation procedures like welding a metal attachment after crown casting. The male component design is sphere with a flat head and the female

component is retentive nylon caps that are color-coded according to different retentive properties. The procedure that was done using the RHEIN 83 OT CAP allows fabrication of very functional and comfortable prosthetic solution for the edentulous bilateral distal extension cases. The attachments retention can be easily monitored and upgraded during time just replacing retentive caps into the framework of dentures for patients' comfort and satisfaction.¹¹⁻¹³ In a similar clinical situations, Vaidya et al. and Wichmann et al. suggested Preci-vertex (Ceka) attachments and stud attachments (OT CAP, Rhein 83 Inc., USA) that were claimed to enhance the frictional retention to the maxillary cast partial denture. The Preci-vertex (Ceka) attachments are extracoronal devices in which exchangeable plastic layers of various sizes are used in the female elements to vary the retention force. Preci-vertex 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.^{14,15} Different patients with esthetic and retention challenges can be treated with correct selection of precision attachment. The need for treatment revolves around health, function, or esthetics; the attachment-retained prosthesis has the capacity to improve the esthetics and functional perception of the patient toward the prosthodontics rehabilitation.

CONCLUSION

The prosthodontic treatment's success is based on the suitable choice of the accurate fixation to ensure optimal retention, esthetics, and stability. The contemporary course of treatment (attachment-retained prosthesis) can satisfactorily cope with complex situations such as unilateral or bilateral distal extension. Attachment-retained partial dentures guarantees the patient with fairly long-term stability and more satisfaction than clasp-retained dentures, hence improves the quality of life of the patient.

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