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Pier Abutment: Non-Rigid Stress Breaker Appliance -A Case Report

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Abstract **Case Report**

Nonrigid connector (NRC) in a fixed partial denture having pier abutment increases the life of the prosthesis. Rigid connectors though most commonly use they result in early failure of the prosthesis such as debonding as well as put adverse effects on the abutments when have been used in the case of pier abutment. This case report presents with the missing first premolar and first molar rehabilitation on the maxillary left arch using non-rigid connector.

Keywords: Fulcrum, nonrigid connector, pier abutment.

INTRODUCTION

A common clinical situation that presents itself to a dentist is the missing first premolar and molar in maxillary or mandibular arch. For a fixed dental prosthesis (FDP) treatment plan, the canine and the second molar must act as terminal abutments while the lone standing second premolar with edentulous space on either side serves as the pier abutment. We, as dentists, are more accustomed to use rigid connectors in our FDPs. However, a completely rigid restoration is not indicated for situation like this as physiologic tooth movement, arch position of the abutments, and a disparity in the retentive capacity of the retainers can make a rigid five-unit FDP a less than ideal treatment plan [1]. The non-rigid connector becomes the choice of treatment option in this scenario.

CASE HISTORY

A 30-year-old male patient was reported to the Department of Prosthodontics of MCDRC, Anjora Durg, India with a chief complaint of missing teeth and difficulty in mastication and esthetic concern. Past medical history was in significant and past dental history revealed that patient had undergone extraction of the badly carious left maxillary first premolar and first molar few months back (Fig. 1).

Fig. 1: Pre-operative View

Intraoral examination revealed missing left maxillary first premolar and grossly decayed maxillary

first molar with left maxillary canine and left maxillary second molar acting as terminal abutments and second premolar acting as a pier abutment. Grossly decayed third molar was also found with occlusal caries with maxillary second molar.

On radiographic evaluation the abutment teeth had adequate bone support to be used as abutment.

Different treatment options were discussed with the patient, and with the patient's consent, it was decided to rehabilitate the edentulous space using nonrigid connector in the distal aspect of the pier abutment. This prevents mesial drift from unseating the attachment and moreover seats the key into the keyway more solidly [2]. A precision attachment named Preci-Vertix (Ceka Preci line system) was selected in this case. It had frictional retention and plastic pattern male/patrix and female/matrix, with built-in paralleling mandrels.

- **Fixation:** Male/patrix cast as part of pontic pattern; female/matrix cast as part of crown pattern
- **Space Requirements:** Height - 2 mm, preparation depth - 2 mm, and width - 2.6 mm

The following clinical steps were carried out for oral rehabilitation. The patient preferred metal ceramic restoration. Hence tooth preparation was done on left maxillary canine, second premolar, and second molar (Figure 2) with equigingival margins and shoulder finish line incorporated in the preparation for better outcome of the restoration.

Figure 2: Tooth preparation of maxillary left canine, second premolar, and second molar

The gingival retraction was done with gingival retraction cord and final impression was made using elastomeric impression material with two-stage putty wash technique. Interocclusal record was made using bite registration material to obtain good occlusion of the patient. Provisional temporary restoration was given using tooth colored auto polymerizing resin and was cemented using noneugenol temporary cement (Fig. 3). Type IV dental stone was used to pour cast. Master cast was then mounted on an articulator with the help of interocclusal record.

Fig. 3: Temporization done with non-eugenol luting cement

Wax pattern (Figure 4) was fabricated in the laboratory on the maxillary left canine, first premolar, and second premolar with a female prefabricated attachment on the distal aspect of pier abutment. The pattern is invested, burned out, and cast. After the casting has been cleaned and pickled, any part of the keyway portion of the attachment that protrudes above the occlusal surface is carefully cut off.

Fig. 4: Wax pattern fabrication

Metal try in was done (Fig. 5). Occlusion was checked. Ceramic buildup was done and the final prosthesis was delivered to the patient.

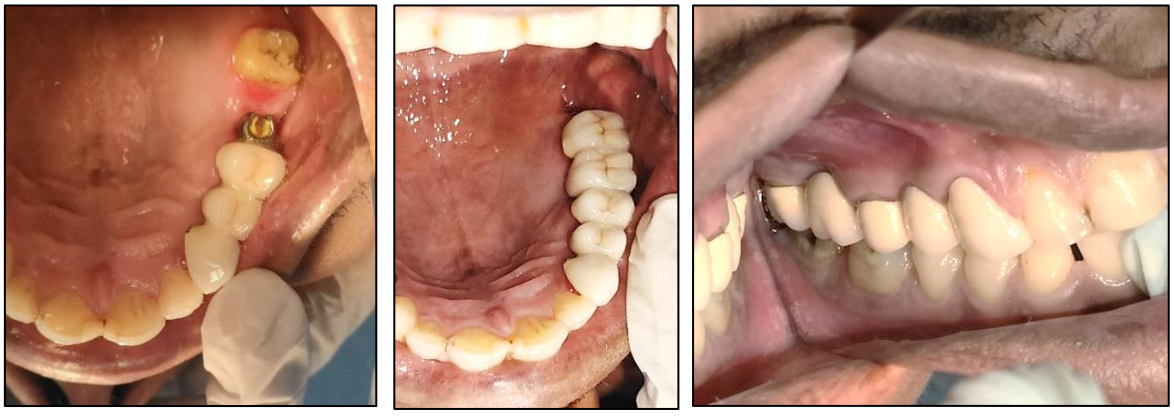
a b

Fig. 5: Metal try a)occlusal view b) lateral view

Figure 6: Creamic buildup with the ceka attachment

Completed five-unit FPD in the Fig 6- Anterior segment with female portion (keyway mortise) and posterior segment with male portion (key tenon) were assembled together in the working cast completing the laboratory procedure.

Oral hygiene was given to the pateint. Use of dental floss and interdental brush was recommended and a follow up of 7 days was done for evaluationof oral hygiene status.



a b c

Figure 7: Post cementation a) with mesial abutment b) occlusal view c) lateral view

DISCUSSION

Connectors are the part of a FPD that unite the retainers and pontics [3] Connectors may be rigid (solder joints or cast connector) or nonrigid. Although rigid connectors are most commonly fabricated, in some situations like using pier abutment, NRCs are indicated [4].

Teeth in different segments of the arch move in different directions. The facio-lingual movement of an anterior tooth occurs at a considerable angle to the facio-lingual movement of a molar, because of the curvature of the arch. These movements of measurable magnitude in divergent directions can create stresses in a long span prosthesis that will transferred to retainers and their respective abutments teeth [5].

If rigid connector is given in a prosthesis with pier abutment, the pier abutment may act as a fulcrum having edentulous span on both side of the abutment. Tensile forces may then be generated between the retainer and abutment at the other end of the restoration making anterior or posterior abutments to experience an extrusive force. The resultant tensile force at the retainer to abutment interface may lead to potential loss of retention for these restorations, thus resulting in marginal leakage, caries of abutment, and disodgment of FDP and ultimately its failure [6]. Savion *et al.*, stated that the possible reason for debonding is development of extrusive reactive forces at the canine retainer as the first molar is loaded due to flexural forces developed within the FPD [7].

The use of a NRC has been recommended to reduce this hazard. The NRC act as stress breaker between retainer and pontic instead of usual rigid connector. The movement in a NRC is enough to prevent the transfer of stress from segment being loaded to the rest of the FPD [8]. In addition, stress concentration is originated in the connectors of the prosthesis and in the vicinity of the cervical dentin near the edentulous ridge. When a NRC is integrated at the distal region of the pier abutment, the area of stress concentration in pier abutment is reduced. NRC transmits shear stresses to supporting bone rather than concentrating them in connectors. It minimizes mesiodistal torquing of abutments and allows them to move independently [9].

Advantages of non rigid connectors are they, transmit shear stresses to supporting bone rather than concentring them in connectors. It minimizes mesiodistal torquing of abutments and allow them to move independently [10]. Disadvantage of non rigid connectors are: (1) More tooth reduction of pier abutment, (2) Increased laboratory time and expense. (3) In the absence of occlusal stability some, key have been observed to lift off from their keyway [5]. Markley (1951) suggested that non rigid connector should be placed at one of the terminal retainers [10]. The area of maximum stress concentration at the pier abutment is decreased by the use of a nonrigid connector at the distal region of the second premolar [11].

CONCLUSION

The size, shape and type of connectors play important role in future success of a FPD. The selection of proper connector is important step in treatment planning of pier abutment. Non-rigid connectors transfer less stress to abutments also allowing physiologic tooth movement. Thus, the design and passive fit of non-rigid connectors is significant to success of a long span fixed partial denture. The potential hazard of debonding of the prosthesis and eventually the failure of the fixed dental prosthesis can be taken care of if the right type of connector is selected during the fabrication of the prosthesis. Hence, proper treatment planning can increase the life span of the prosthesis.

Conflicts of Interest: There are no conflicts of interest.

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