CASE REPORT
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NON RIGID CONNECTORS IN FIXED PROSTHODONTICS: A STRESS BREAKER FOR PIER ABUTMENT

Prosthodontics

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ABSTRACT

Many times a dentist comes across a situation in which his clinical expertise and knowledge can play an important role in treatment planning. One such situation is case of a pier abutment. Pier abutment is an abutment with edentulous space on either side of it. Pier abutments act as a Class I fulcrum lever in a fixed partial denture with rigid connectors. Class I lever causing stress on the terminal abutments and failure of the Fixed Dental Prosthesis (FDP). This article describes the management of pier abutment with a simple method using customized semi precision attachments.

KEYWORDS

Pier Abutment, Non rigid connector, Semi precision attachment, Fixed Partial Denture, Stress Breaker

INTRODUCTION

Fixed partial denture treatment is always been the first choice for replacement of missing teeth. The success of Fixed Partial Denture (FPD) depends on the abutment teeth, pontic design retainer, connector and longevity of edentulous span[1]. The preferred method of fabrication of FPD is with rigid connectors. However, completely rigid restoration is contraindicated in some clinical cases like Pier abutment[2].

An edentulous space present on both side of tooth, creating a lone, freestanding pier abutment[3]. Pier abutment is a challenging case to prosthodontist[2]. Planning a FPD that has rigid connectors for a pier abutment result in debonding of the anterior abutment where middle retainer acts as a fulcrum[4]. Beside that a rigid connector is not indicated in pier abutment as physiologic tooth movement, arch position of the abutments and a retentive capacity of the retainers can make a rigid FPD a less than ideal treatment plan[3,5].

Pontic are the heartthrob of abutments since under occlusal load maximum stresses are concentrated on them. Selecting the right connector make a difference between success and failure[6]. This can be managed by the use of a non-rigid connector[5]. Non-rigid connector act as a stress breaker between retainer and pontic and have thus been recommended to diminish the forces. The non-rigid connector is enough to prevent the transfer of stress from segment being loaded to the rest of the FPD[2].

The indications of non-rigid connector[7,1].

1. The existence of Pier abutment, which act as a fulcrum that can cause failure of FPDs.
2. The existence of the malaligned abutment, where parallel preparation might result in devitalization.
3. In the mandibular arch, whenever FPD is consisting of anterior and posterior segments, a non -rigid connector is indicated as the mandible flexes mediolaterally during opening and closing strokes.
4. The inadequate retentive ability of the abutments.

Contraindications[1].

1. If the abutment is significantly mobile.
2. If the span between the abutments is longer than one tooth.
3. In certain situations like posterior retainer and pontic are opposed by RPD or an edentulous ridge while the two anterior retainers opposed by natural dentition.

The four types of non-rigid connectors are[7]

1. Dovetail (key-keyway) or Tenon-Mortise type connectors.
2. Cross-pin and wing type connector.
3. Split type connector.
4. Loop type connector.

This clinical report describes the prosthodontic management of an edentulous span on both sides of a pier abutment, with fixed partial denture having a non-rigid connector.

Case Report

A 38 year old female patient referred to the Department of Prosthodontics, Crown and Bridge, K. M. Shah Dental College and Hospital, Piparia, Waghodia, Vadodara, Gujarat, for the replacement her missing teeth. The patient had no significant medical history. The intraoral examination revealed missing maxillary left first premolar and first molar. Intra oral periapical radiograph showed good bone support for teeth to be used as abutment. The treatment options presented to the patients were:

a. Implant in edentulous spaces.
b. Fixed partial denture with the rigid connector.
c. Fixed partial denture with the non-rigid connector.

The patient refused for the implant due to financial problem. FPD with rigid connector would have resulted in the adverse effect on abutments and the prosthesis. Since the situation of the case requires the use of a FPD with a pier abutment therefore, FPD with the non-rigid connector of Semi precision attachment was selected.

The step by step procedure is as follow:

1. The tooth preparation for the abutments was done followed by impression procedure and master cast fabrication (Figure 1, 2)
2. The design of non-rigid connector incorporated consists of a mortise (female component) prepared within

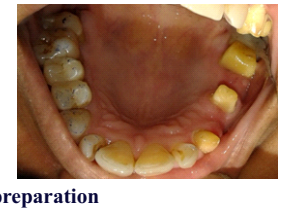

Figure 1. Tooth preparation

contours of the retainer and a Tenon attached (male component) attached to the pontic.

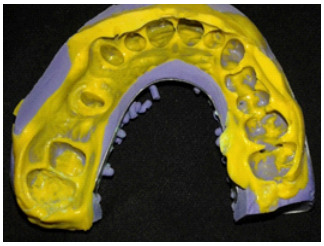

Figure 2. Final Impression

3. Accurate alignment of mortise is crucial, therefore a dental surveyor was used.
4. After casting, metal try-in was done to verify proper seating.
5. At the time of cementation, mesial segment was placed first followed by distal segment (Figure 3)

Figure 3. Cementation

The patient was given post cementation instructions and was instructed to maintain good oral hygiene, use of dental floss and interdental brush.

DISCUSSION

A natural tooth abutment that is located between terminal abutments that serve to support a fixed or removable dental prosthesis[8]. Connectors are the components of FPDs that join the retainer and pontic together[9]. The size, shape and type of connector play an important role in the success of an FPD[10]. We are using rigid connector since its placement requires just enough technical and laboratory expertise. The problem arises in a case of 5-unit FPD with a pier abutment[11]. When an occlusal load is applied, the pier abutment act as fulcrum, high stress concentration may occur at pier abutments resulting in failure of restoration[9].

Bothelo and Dyson reported that rigid FPDs with pier abutment were linked with higher debonding rates than short span prosthesis[12]. Thus, result in marginal leakage and caries[9]. In such a condition Non-rigid connector is generally recommended. The Non-rigid connector provides break type of connection in FPD[13,9].

According to Shillinburg, the ideal location of the keyway is on the distal of pier abutment while the key is on the mesial aspect of the distal pontic[3]. The reason is posterior teeth have a slight mesial inclination and shown to move more in this direction on application of occlusal forces. Placing the keyway on the distal aspect of the pier abutment helps in further seating of the key into the keyway every time occlusal forces are applied. Placing the keyway mesial to the pier abutment tend to dislodge the key from the keyway which might lead to fracture of the canine retainer or bone loss around the canine abutment.[5] This placement is supported by Finite element analysis done by Oruc et al who said that the area of maximum stress concentration at the pier abutment was decreased by the use of a NRC at the distal region of the second premolar[14].

Therefore, accurate planning of the design was critical for FPDs with non-rigid connectors, which prevented the leverage effect and imparted it to the long-term success of the FPD with pier abutments.

CONCLUSION

To prevent the debonding of the prosthesis and eventually the failure of FPDs, the right type of connector is selected during the fabrication of the prosthesis. When non-rigid connector is used it allows movement in the FPD, providing transfer of stresses away from the pier abutment. Hence, the selection of proper connector design is an important step in pier abutment case, which will decide the success of the FPD.

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