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Case Report

Breaking the stress using pier abutment - A case report

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ABSTRACT

A pier abutment is the lone standing abutment tooth between two critically situated edentulous spaces, in a frequently seen clinical situation, a missing first premolar and first molar is seen, which leads to a design where canine and the second molar acts as a terminal abutments and second premolar acts as a pier abutment. This pier abutment acts as a fulcrum which may lead to debonding of the less retentive terminal abutment during function, to overcome this situation a non rigid connector is advised. This paper presents a clinical case report which describes the incorporation of non rigid connector to rehabilitate the pier abutment case in unilateral maxillary and mandibular region.

1. Introduction

Fixed prosthodontics is a progressing branch as it has numerous advantages over removable prosthesis. The oral cavity for each case has its own complications therefore every individual case has its own treatment approach, keeping in mind the comfort, function, and aesthetics of the patient. One such case is a frequently encountered clinical situation where we find a lone standing abutment tooth between two edentulous spaces, which has a tendency of the terminal abutment to intrude during function which may pose as a challenge to a prosthodontist. In such cases it may lead to undesirable movements where the lone standing abutment or the pier abutment acts as a fulcrum.[1] This type of movements may lead to the debonding of the retainer which is less retentive.[2]

Rigid connectors are less than ideal treatment option in pier abutment situations. This case report describes how a non rigid connector can be used to reduce the forces on the lone standing abutment and provide a stress breaking effect.

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2. Case Report

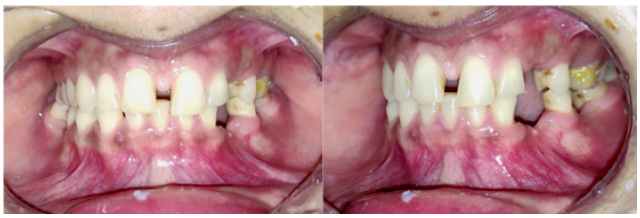

Fig. 1: Pre treatment-frontal and lateral view

A 37-year old female patient reported to the Department of Prosthodontics and Crown & Bridge with a chief complaint of missing teeth in upper and lower left tooth region due to which she was having difficulty in chewing food, she also had a complain of poor esthetics due to her midline diastema in her upper front tooth region. Intra oral examination revealed clinically missing maxillary and mandibular left canine and second premolar, leaving maxillary and mandibular first premolar as pier abutments. Patient also presented with approximately 2mm midline diastema in the maxillary anterior region (Figure 1). Past

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medical history was insignificant and past dental history revealed that patient had undergone extraction of grossly decayed maxillary and mandibular canine and second premolar few months back. On radiographic evaluation it was revealed patient had undergone root canal treatment for maxillary left first molar, mandibular left first premolar and first molar. The prosthodontic diagnosis was Kennedy's class III with modification II (Pier abutment).

After discussing various treatment options with the patient, we decided to rehabilitate the patient with a non rigid connector which will serve to function as a stress breaker between retainer and pontic.

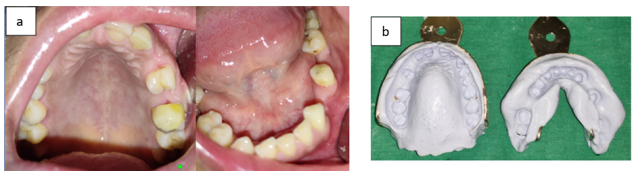

Fig. 2: a: Intra oral view showing pier abutment in maxillary and mandibular arch; **b:** Diagnostic impression

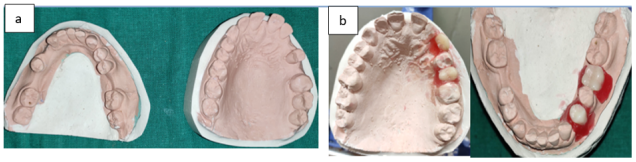

Fig. 3: a: Diagnostic cast; **b:** Diagnostic cast

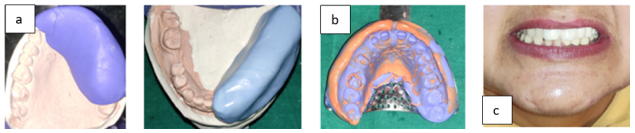

Fig. 4: a: Putty indexing; **b:** Final impression; **c:** Cementation of temporary crowns

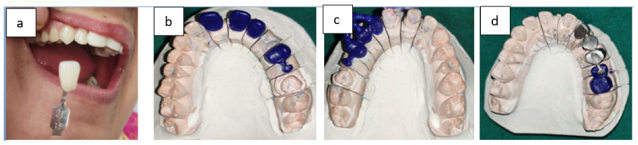

Fig. 5: a: Shade selection; **b:** Wax pattern of matrix; **c:** Spruing of wax pattern; **d:** Fabrication of patrix in the pontic region

2.1. *Procedure*

The following clinical steps were carried out for the patient's oral rehabilitation.

Diagnostic impression was recorded using irreversible hydrocolloid material (Zelgan 2002) and cast was retrieved.

Fig. 6: a: Casted matrix seated in casted patrix; **b:** Intra oral view of metal try in

Fig. 7: Ceramic build up done followed by cementation of prosthesis

Fig. 8: a: Wax pattern fabrication (matrix)for mandibular segment; **b:** Spruing of wax pattern; **c:** Casted patrix

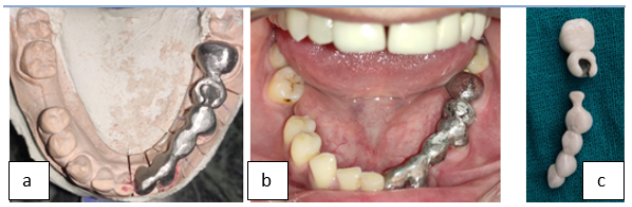

Fig. 9: a: Casted matrix seated in casted patrix; **b:** Intraoral view of metal try in; **c:** Ceramic build up

On the diagnostic cast, selected acrylic tooth was placed on the area of the missing tooth, and was sealed using carding wax. Following this, a silicone putty index was made for the fabrication of provisional restoration. The selected abutments were prepared for metal ceramic restorations with equigingival margins and a shoulder finish line. The gingival retraction was done using gingival retraction cord (Ultrapak) and final impressions were made using elastomeric impression material (Affinis, Coltene). Provisional crowns were cemented on the prepared teeth Type IV dental stone was used to pour cast. After the material was completely set, it was retrieved following which die cutting was done and the die pins were placed. Master cast was then mounted on an articulator with the help

Fig. 10: Post treatment view

of interocclusal record. Wax pattern was fabricated in Blue Inlay wax and the recess for the patrix was cut accordingly to fit the dovetail on mesial aspect of pontic dovetail patrix was placed within the correct contours of the pontic. Matrix was removed from the patrix, keeping inside of patrix free of wax. Any extension of the patrix above the occlusal of the abutment was removed. The pattern is invested, burned out, and cast in Nickel chrome alloy (Wiron 99, Bego, USA). After investing and casting, excess height of the patrix was reduced.

Casting of the matrix was contemplated and finally the matrix and patrix were assembled together. Metal try in was done and the cast metal framework was tried in patient and checked for any impingement of the basal tissues. Ceramic build up was done incrementally followed by cementation of the prosthesis using type-1 luting GIC cement.

3. Discussion

Careful treatment planning contributes greatly to the success and failure of posterior bridges. Posterior bridges can be classified into three groups: (1) the short span bridge; (2) the long span bridge; (3) the long span bridge with a pier.[3] Connectors are the portion of a fixed partial denture that unites the retainer(s) and pontic.[4]Usually this is accomplished with rigid connectors although nonrigid connectors are occasionally used. The latter is indicated when it is not possitble to prepare a common path of placement for the abutment preparations for a partial fixed dental prosthesis.[5]

In a pier abutment case, use of a rigid connector may lead to movements in divergent directions which can create stress within the prosthesis that will be transferred to retainers and their respective abutment teeth. The forces transmitted to the terminal retainers will in turn result in the middle abutment acting as a fulcrum, causing failure of weaker retainer, due to these dislodging forces rigid type of connector in pier abutment cases have a higher debonding rate than short span prosthesis, resulting in marginal leakage and caries.[6] Masticatory forces applied to a fixed partial denture (FPD) are transmitted to the supporting structures through the pontic connectors, and retainers.

To neutralize the outcome of these forces, the use of a non-rigid connector has been recommended which acts as stress breaker. The vertical resilience in a normal, healthy tooth in its socket, is approximately 0.1 mm to 0.2 mm whereas, a non rigid connector transfers shear stresses to supporting bone rather than concentrating them in connectors.[7] According to Shillinburg, the ideal location of the keyway is on the distal aspect of the pier abutment retainer while that of the key is on the mesial aspect of the distal pontic, this position minimizes the mesiodistal torquing of abutments and permits them to move independently. The movement in a non-rigid connector is enough to prevent the transfer of stress from segment being loaded to the rest of the FPD.[6] The types of non rigid connectors are cross pin and wing, loop, split pontic and the tenon mortise. The most commonly used are the tenon mortise also known as the key keyway type.[8]

This clinical case report discusses the use of non rigid connector in both the maxillary and mandibular region unilaterally. Where, in the maxillary and mandibular region, the first premolar acts as a pier abutments and lateral incisor and first molar act as terminal abutments.

4. Conclusion

It is imperative to foresee and understand demands arising in a pier abutment scenario. Precision and semi-precision attachments provide room for slight movements which prevents loading of the pier abutment created due to the fulcrum-like situation. Thus, the selection of right type of connector and the skillful use of a non-rigid connector can go a long way to allay the situation and is desirable for clinical success.

5. Source of Funding

None.

6. Conflict of Interest

None.

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