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Fabrication of Fixed Partial Denture Using A Semi-Precision Attachment in A Pier Abutment Case

Dr.Jyoti Gupta Agrawal, Dr. Pankaj Datta, Dr. Mayank Aggarwal, Dr. Kritika Pandey

[1,3,4] *Post graduate student, Department of Prosthodontics, Indraprastha Dental college, Sahibabad*
[2] *Dean, Professor &Hod, Department of Prosthodontics, Indraprastha Dental College, Sahibabad*

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ABSTRACT
The most common clinical situation, either in the maxillary or mandibular arch, is of a missing first premolar and first molar, where the canine and the second molar are known as terminalabutments and second premolar is a pier abutment. This clinical situation poses challenge to prosthodontistin rehabilitation phase. In such case there is a tendency of terminal abutments to intrude during function results in a teetering movement, where the pier abutment acts as a fulcrum.This will lead to debonding of the less retentive terminalretainer. In order to overcome this, utilization of nonrigid connectors has been advised. This paper presentsa clinical case report which describes incorporation of semi-precision connector to rehabilitate pier abutment case.

Key words: Pier abutment, Non-rigid connector, Precision attachment, Tenon-mortise attachment

I. INTRODUCTION

The success of FPD depends upon a number of factorsbut the failure could be attributed to the occlusal forces appliedto prosthesis during the function. These forces are transmittedto the abutments all through the pontic, connectors, andretainers leading to abnormal stress concentration in FPD.[1]

An FPD with the ponticrigidly fixed to the retainer provides adequate strength andstability to the prosthesis and also minimizes the stressesassociated with the restoration. But if an edentulous spaceoccurs on both sides of a tooth, creating a pier abutmentthen physiologic tooth movement, arch position of theabutment, and a disparity in the retentive capacity of theretainers can make a 5-unit FPD a less than ideal planof treatment.[2]

Pier abutment also referred as"intermediate abutment", defined as "a natural tooth or implantabutment that is located between terminal abutments that serveto support a fixed or removable dental prosthesis".[3]

However, in suchclinical situations the pier abutment acts as fulcrum leading todislodgment of prosthesis during function. Selection of correcttype and right location of connector can determine success orfailure of the prosthesis. [5] There are of two types, rigidconnectors and nonrigid connectors.[6]Rigid connectors are made by different procedures such as casting, soldering, and welding. The castconnectors are to be properly shaped in wax patterns.

The nonrigid connector or stress breaker permits limited movementbetween the otherwise, independent members of the FPDs. The nonrigid connectorcould be made by incorporation of prefabricated inserts, by use of a custom-milling machine, or by use of theprefabricated plastic patterns.[6]

In pier abutment cases, a nonrigidconnector is advocated which act as a stress breakingmechanical union to circumvent alignment problems inabutment preparations and to separate occlusal stresses(Becerra, 1987). This "Broken-stress" principle can beachieved by means of an attachment either a precision orsemi precision attachment (Markley, 1951). The present casereport describes a simple technique to break stress around pierabutment by customizing semi precision attachment within aconvention 5-unit FPD.

II. CASE REPORT

A 55-year-old female patient reported to the Departmentof Prosthodontics in IP Dental College, Ghaziabad, India with a chief complaint of missing teeth, difficulty in mastication as well as aestheticproblem. Past medical history was insignificant and past dentalhistory revealed that patient had undergone extraction ofextensively decayed mandibular left1st molar and 1st premolar one year back.

Intraoral examination revealed missing left mandibular first premolar and first molar with left mandibular canine and second molar acting as terminal abutments and secondpremolar act as a pier abutment (Figure 1). The radiographic

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evaluationshowed that the abutment teeth had adequate bone support tobe used as abutment.

Figure1. Pre-operative Intraoral photograph

After discussingall the treatment options, it was decided to rehabilitatethe case with 5-unit FDP using nonrigid (semi- precision) connectors onthe distal aspect of pier abutment.

Clinical Procedure

Thetooth preparation was donefor porcelain fused to metal prosthesis on left mandibular canine and second mandibular premolar with equi-gingival margins to get desired aesthetics (Figure 2).

The gingival retraction was carried out to take final impressionusing elastomeric impression material (Dentsply Aquasil puttyand kit) with two step putty wash technique (Figure 3).

Figure2. Tooth preparation done

Figure 3. Two step putty wash impression

An interocclusal record was made using bite registration material (Futar Fast Bite registration material). The provisional restorations were fabricated with a tooth color auto-polymerizing acrylic resin and cemented with non-eugenol temporary cement.

The impression was poured in high-strength die stone(Kalabhai Karson Pvt.Ltd.). The Master cast was retrieved and die cutting was done followed with mounting of master cast on an articulator using interocclusal record.

Wax pattern was fabricated and then thetenon-mortiseattachment was placed on the distal aspect of the middleabutment (Figure 4&5). Casting was done in two parts. First, the anteriorsegment consisting of 33, 34 and 35 including the malecomponent of the attachment and laterwax pattern for theposterior segment consisting of 36 and 37 including the femalecomponent was fabricated sothat no interference or distortionwould be encountered (Figure 6).

The metal try-in was done on patient tocheck the proper seating of prosthesis. Then ceramic facing was added (Figure 7). Anterior segment with female portion and posterior segment with male portion were assembled together.

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During cementation, anterior three-unit segment with keyway was cemented first followed by cementation of posterior two-unit segment with key using glass ionomer cement (Figure 8).

The patient was instructed to maintain proper oral hygiene. Use of dental floss and interdental brush was recommended. The patient was evaluated after one week to assess the oral hygiene status

Figure 4 Wax Pattren for anterior segment

Figure5 Wax pattren for posterior segment

Figure6 Castings

Figure7 Ceramic layering

Figure8 Post-operative intraoral photograph

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III. DISCUSSION

Connectors are the part of a fixed partial denture (FPD) that unites the retainers and pontics.[1]Connectors may be rigid (solder joints or cast connector) or non-rigid (precision attachment or stress breaker). Rigid connectors between retainers and pontics are the preferred way of fabricating most FPD. But they are not indicated in all situations like an edentulous space on either side of pier abutment.[2] The selection of right type of connector during treatment planning is an essential step for success and failure of the prosthesis.[3]

The existence of pier abutment promotes a fulcrum-like situation that can cause the weakest of the terminalabutments to fail and may cause the intrusion of a pier abutment.[5]Withstress breaker, stresses are concentrated on thesupporting bone and not on the connector; hence the need for a stress breaker in pierabutment on both ends of the nonrigid connector is recommended. A stress breaker minimizes mesio-distaltorqueing of abutments and permits them to move independently.[11]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.[8,14]

This clinical case report discusses the use of non-rigid connector between distal of second premolar retainer and mesial of first molar pontic where second premolar act as a pier abutment and canine and second molar act as terminal abutments.

The four types of non- rigid connectors are the:

- Dovetail key-keyway or Tenon-Mortise type connectors
- Cross-pin and wing type connector
- Split type connector
- Loop type connector

The most common design of all used is Mortise female component placed within the contours of the retainers and a Tenon male component attached to the pontic. Accurate position of the dovetail shaped Mortise is critical; it must be parallel the path of withdrawal of a distal retainer.[16,17]

The location where thenon-rigid connector is to be placed is also crucial step of treatment planning. There is a conflicting opinion on where toplace the non-rigidconnector as Markleysuggested placementon oneof the terminal abutments and not at the pier abutmentwhereas, Adams and Shillingberg suggested to place connectorat the distalside of pier.[5,19]

Carl E Mischrecommended that in conventional FPD, the ‘male’ portion ofa non-rigid connector usually located on mesial aspect of theposterior pontic; whereas, the ‘female’ portion is in the distalaspect of the natural pier abutment.[17,18] Thisprevents mesial drift from unseating the attachment.

IV. CONCLUSION

The size, shape, and type of connectorsplay a key role in future success of a FPD.Treatment of cases involving pier abutmentsparticularly five-unit bridges,factors such as physiologic tooth movement, arch position of the abutments, and retentive capacityof retainers make the rigid connectors a less ideal plan.Broken-stress measures serve as “safety valves” against the tremendousleverage forces created by the rigid attachment to two or more teeth. The employment of nonrigid connector minimizes the stresses on the abutments. Precision and semi-precision attachments provide room for slight movements whichprevents loading of the pier abutment created due tothe fulcrum-like situation and increases the lifespan of5-unit FDP

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