"Converting a removable prosthetic option into fixed by using custom made non rigid connector"

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Abstract

Statement of the problem
Many partially edentulous situations are present whereby the choice between a removable and a fixed partial denture lies within the delicate balance of a single standing abutment. This abutment is called as a pier abutment. If and when a fixed fixed prosthesis is given in such a case, the retainer over the pier abutment acts as a fulcrum and invariably leads to cement failure of the weak retainer.

Purpose
To design, prosthesis that is fixed in nature, but provides small movements within the retainer over the pier abutment so that two separate units distribute the stresses independently.

Materials and Methods
A clinical case whose mandibular arch presents a Kennedy’s class III situation with modification one. The two edentulous areas being separated by a pier abutment.

Results
The prosthesis has been functional since more than three years and the clinical and radiographic condition of all the abutments including the pier abutment suggests a successful fixed movable prosthesis.

Conclusion
A fixed movable prosthesis design involving a semi precision non rigid connector can be used in clinical situations where two edentulous areas are separated by a single abutment.

Introduction

With more than 60,000 different combinations in a partially edentulous situation, there is one clinical situation that stands apart from testing the treatment planning ability of a prosthodontist. An efficient clinician with sound basic, clinical knowledge will steal the limelight as his treatment plan will make the difference between restoring such a situation with a fixed prosthesis rather than a removable prosthesis. This clinical situation is when a single abutment is surrounded anteriorly and posteriorly by two edentulous areas. The single abutment is called as a pier abutment. A single unit fixed fixed prosthesis utilizing rigid connectors in such a situation. In such prosthesis, there is a tendency of terminal abutments to intrude during function resulting in teetering movement, middle retainer acting as a fulcrum causes failure of weaker retainer. Utilizing a non rigid connector in such prosthesis prevents this. Various authors have suggested that the non rigid connector placed in one or more locations at mesial or distal portion of the pier abutment introduces a stress breaking mechanical union of retainer and pontic.

This article presents restoration of a mandibular left partially edentulous situation with a fixed, movable prosthesis utilizing an inexpensive custom made non rigid connector.

Aims and Objectives
To restore a Kennedy class III modification I partially edentulous situation in the right mandibular arch with a pier abutment supporting two different fixed partial dentures, one situated anteriorly and one posteriorly.

Clinical case report
A male patient aged 42 years came to Department of Prosthodontics with a chief complaint of difficulty in mastication since last 3 years due to missing lower right teeth. The patient’s medical history was noncontributory. Dental history revealed that the patient had got his lower right two posterior teeth extracted about more than three years at different intervals within a space of 6 months. The patient was not having any significant adverse habits like smoking, alcohol consumption or pan and tobacco chewing. Oral examination revealed missing right mandibular first premolar and first molar (Fig.1). Significant oral findings included crowding in relation to anteriors, good oral hygiene and a canine protected occlusion. Clinical evaluation of abutments revealed good periodontal condition with adequate crown root ratio. A favorable peri cemental area was evident from the radiographs. The prosthesis design that was considered most favorable for this situation was a fixed movable prosthesis with non rigid custom made connector placed on the distal aspect of the pier abutment.
CLINICAL AND LABORATORY PROCEDURE

Preliminary impressions of maxillary and mandibular partially edentulous arches were made with irreversible hydrocolloid (Thixotropic, Zhermach, Italy) and the impressions were poured with Type III dental stone (Elite Model; Zhermack, Badia Polesine, Rovigo, Italy). Centric and protrusive interocclusal records were made using wax (Take 1, Kerr, Romulus, MI, USA). The cast were mounted on a Hanau Widevue semi adjustable articulator (Waterpik, Ft Collins, CO, USA) using a Hanau spring bow. The articulator was programmed and the abutments were evaluated for their crown root ratio and other aspects of diagnostic procedure. Static and functional aspects of occlusion were evaluated and a treatment plan was formulated. The distance of the lever arm from one abutment to another was calculated and the position of the pier abutment was also calculated. The prosthesis designed involved pre prosthetic mouth preparation that included an oral prophylaxis, restorative filling in relation to maxillary posteriors followed by prosthetic rehabilitation with fixed movable bridge in relation to missing right first premolar and first molar.

All the necessary abutments were prepared to receive porcelain fused to metal crowns with full coverage porcelain as a retainer for the bridge (Fig.2). The fixed partial denture was prepared in two phases. In the first phase the anterior segment was prepared which extended from canine to second premolar. Teeth were prepared and final impression was made, from which the working casts were mounted on the semi adjustable articulator. Wax patterns were made to receive PFM retainers with same pontic (Fig.3). The preparation on the abutments was conservative, which included the wing design for such retainers. On the distal aspect of the wax pattern of the pier abutment a box was first prepared into which, through the use of a surveyor a semi precision attachment was carved. The wax pattern was cast into alloy and then porcelain was fired onto the metal. After trials the first segment of the final restoration was cemented using zinc phosphate cement (Fig.5). The patient was given instructions regarding the maintenance of the prosthesis and was put on strict follow up regime every 3 months.

Discussion

Management of a pier abutment with fixed, movable prosthesis utilizing non rigid connector in the form of semi precision attachments is an area which has been studied to a very less extent. Placing the semi precision attachment on the mesial or the distal aspect at present is based on only one assumption that is any mesially directed movement will unseat the key. Less emphasis is on that actual lever arm and the position of the fulcrum. With the present knowledge, it is important that some sort of stress breaking mechanism like a non rigid connector is incorporated. Non Rigid Connector transfer shear stresses to supporting bone rather than concentrating them in connectors. It minimizes mesiodistal torquing of abutments and permits them to move independently. 11 It also allows mandibular flexure during opening and closing movements. 12 According to a study conducted by Selcuk and Arzu Atay, the stress distribution and values of an FPD and pier abutment are affected by the presence and location of a non-rigid connector. 12 The area of minimum stress concentration occurs in pier abutments when a non-rigid connector is located in the distal region of the pier abutment for a 5 unit fixed partial denture with a pier abutment.

It is important to determine that physiological and not adverse forces are being transmitted to the abutment. This was done by using bone index over a period of two years. Radiographs were compared after every three months and the bone mass index of the periodontium including the alveolar bone proper and the trabecular patterns was evaluated. Clinically, this can be the simplest method to determine whether the prosthesis is doing what it was intended to do.

Conclusion

A pier abutment can successfully not only support a single prosthesis, but in fact two separate prostheses provided planned properly. This is one such treatment option which can make the difference between wearing a removable or a fixed prosthesis. Further studies need to be done to actually incorporate engineer principles so that one can soundly place the non rigid connector.
References


Illustrations

Illustration 1

Intra Oral View of Relation of Pier Abutment to Surrounding Edentulous Areas

Illustration 2

Prepared Abutment Teeth to Receive a Fixed Movable Prosthesis
Illustration 3

Wax Pattern With Semi Precision Attachment Design

Illustration 4

Fixed Movable Prosthesis With Unglazed Porcelain
Illustration 5

Fixed Movable Prosthesis Cemented in Patients Mouth

![Illustration of a fixed movable prosthesis cemented in a patient's mouth.](image-url)