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Case Report

Prosthetic Rehabilitation of Siebert's Class II Case and Pier Abutments - Case Report

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Abstract

Replacement of teeth with periodontally compromised abutment is a challenge. A tough choice of aesthetics over function is often made by the operator for the satisfaction of the patient. The modified concepts of fixed partial dentures allow one to choose longevity of the prosthesis by not compromising on the aesthetic factors. Ridge defect often leads to a convenient treatment option of removable partial dentures which will not be preferred by the patient. Andrews bridge a fixed removable type of prosthesis is perfect solution for this situation. In long span multiple missing cases Nonrigid connectors have been recommended to reduce the forces as they provide a stress-breaking effect. In this case report, there are two opportunities that allow us to incorporate the modified fixed partial denture technique. Andrews bridge in the lower anterior segment to mask the ridge loss and the posterior long span FPD with a tenon mortise attachment. These two attachments used in this case not only prolongs the life of already compromised anterior teeth but also allows the posterior abutment to remain healthy throughout in long span fixed partial dentures.

Keywords: Andrews Bridge; Pier Abutments; Removable Fixed Prosthesis; Multiple Missing Teeth; Hader Bar; Tenon Mortis

Introduction

A smile is one of the first things that we notice about each other. A confident smiling individual is often deemed more approachable, more pleasant and more attractive than those who don't smile as openly. The loss of teeth devoid an individual of functional and psychological stability. In order to restore the patients, complete physical and mental health the prosthesis offered should be scientifically and aesthetically accurate.

The loss of teeth invariably is followed by the loss of soft tissue. Loss of residual ridge contour leads to food impaction, unaesthetic open gingival embrasures and percolation of saliva during speech [1]. There is a high incidence (91%) of the deformity in the residual ridge following anterior tooth loss [2]; the majority of these are Class III defects. Because patients with Class II and III defects are often not satisfied with the aesthetics of their fixed partial dentures (FPDs), a pre-prosthetic surgery to augment the residual ridge to the appropriate form and height must be carefully considered [3]. Aesthetic surgical replacement is difficult and unpredictable, particularly when the interdental papilla in the aesthetic zone needs to be restored.

One choice is a fixed removable prosthesis retained by an Andrews bar and sleeve system. The prosthesis is designed to fulfil the requirements for aesthetics, phonetics, hygiene, comfort, and favourable stress distribution to the abutment and soft tissues [4]. The Andrews bar joins and splints single or multiple abutment teeth on either side of the edentulous area. A precision fit metal sleeve inserts retentively on the bar. The narrow width and great strength allow for restoration of all-natural contours without creating unnatural bulk which cause unaesthetic appearance [5].

A frequent clinical situation, either in the maxillary or mandibular arch, is of a missing first premolar and first molar, resulting in fixed partial denture design in which the canine and the second molar act as terminal abutments and second premolar act as a pier abutment. It has been postulated that the tendency of terminal abutments to intrude during function results in a teetering movements, where the pier abutment act as a fulcrum. These movements will eventually result in debonding of the less retentive terminal retainer. In order to overcome this potential risk, utilization of nonrigid connectors has been advised.

Case Report

A 57-year-old female patient reported to the hospital with the chief complaint of inability to chew from one side because of multiple missing teeth in right upper and lower posterior region. Medical and Dental history was obtained. Dental history revealed that the lower anterior teeth were extracted due to severe mobility and the right posterior teeth were extracted due to decay.

Intra oral examination: On examination we noticed the missing teeth associated with 14, 16, 31, 41, 44, 46. There was a considerable reduction in width and height of the mandibular anterior ridge. One of the abutment teeth, 32 was Grade 1° mobile.

The patient was then advised Scaling. With regular oral prophylaxis and follow-ups, the periodontal condition was seen to be improved.

Radiographic examination confirmed the bone support of all the abutment teeth.

Figure 1: Maxillary arch.

Figure 2: Mandibular arch.

Figure 3: Frontal view.

After the patient was prepared with periodontal care the treatment plan was formulated. A Fixed removable prosthesis- Andrews Bridge was planned from 33 to 42. 5 unit fixed partial dentures were planned with Non-rigid connectors from 13 to 17 and 43 to 47.

Maxillary and Mandibular Impressions were made in Irreversible hydrocolloid. Orientation Jaw relation was recorded.

Wax mock-up was done in the mandibular anterior relation to establish an Anterior Guidance.

Wax mock-up of the posterior teeth was completed thereafter.

Tooth preparation to receive a Porcelain fused to metal fixed partial denture was done with 33, 32 and 42. Gingival displacement was done with a 000 Retraction Cord and final impressions were made in Elastomeric impression material.

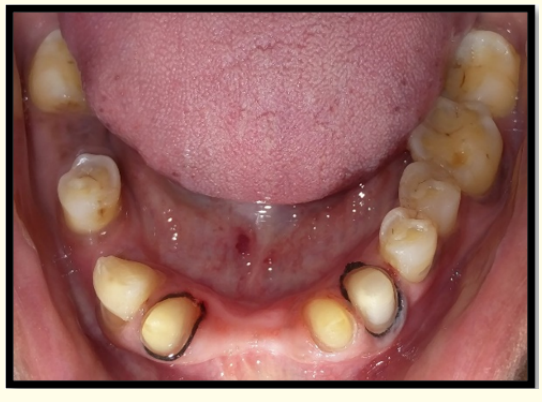

Figure 4: Tooth preparation with 33, 32, 42.

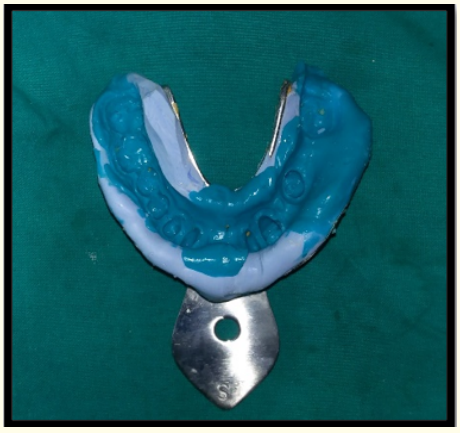

Figure 5: Elastomeric impression.

Temporization with 31, 32, 33, 41, 42 was completed with the established anterior guidance in tooth coloured self-cured acrylic.

Metal trial of the bar in between 32 and 42 was checked for adequate space for maintenance of oral hygiene.

Figure 6: Metal trial with hader bar.

Figure 7: Friction clip and removable acrylic partial denture.

Final prosthesis of the fixed crowns and bar and the removable portion with a yellow friction clip were cemented and fixed.

Figure 8: Occlusal view of the hader bar.

Figure 9: Occlusal view with placement of the acrylic part.

Figure 10: Frontal view of the Andrews bridge.

Tooth preparation with 43, 45, 47 was done. Gingival displacement and final impressions were made in Elastomeric impression materials, following which temporization was done. Tooth preparation of 13, 15 and 17 was continued. Gingival displacement and final impressions were made in Elastomeric impression materials, following which temporization was done. Metal trial of the upper

and the lower 5 unit fixed partial dentures was done to check the fit and the friction locking of the Non-Rigid connector. After ceramic build up cementation was carried out with the same.

Figure 11: Tooth preparation and gingival displacement with 43, 45, 47.

Figure 12: Tooth preparation and gingival displacement with 13, 15, 17.

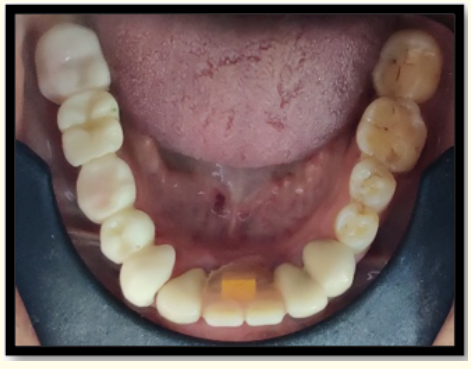

Figure 13: Temporization with 43, 45, 47.

Figure 14: Temporization with 13, 15, 17.

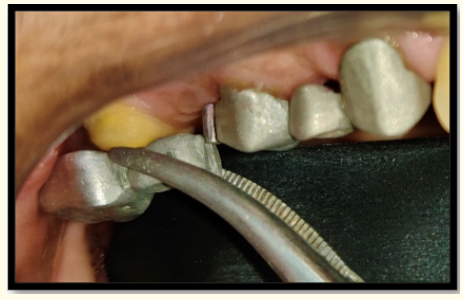

Figure 15: Placement of maxillary tenon and mortise attachment-Intraorally.

Figure 16: Tenon and mortise attachment.

Figure 17: Placement of mandibular tenon and mortise attachment.

Figure 18: Placement of mandibular tenon and mortise attachment-Intraorally.

Figure 19: Cementation of the maxillary FPD.

Figure 20: Cementation of the mandibular FPD.

Discussion

Rehabilitation of multiple missing teeth has numerous treatment options. The most common and non-invasive being the Removable partial denture. The removable partial denture has its own benefits like being easy to maintain and clean and disadvantages like uncomfortable and psychologically disturbing.

The most practiced treatment being Fixed partial dentures (FPD) has its own limitations. Following are factors governing Abutment Selection in FPD.

- Crown-root ratio
- Crown
- Root configuration
- Root surface area
- Location in the arch
- Periodontal factors
- Long axis relationship.

In clinical scenarios all the factors contributing to the success of an FPD are not available hence, Modified Fixed partial dentures were introduced.

Andrews bridge

Andrews bridge system is a fixed-removable prosthesis that is indicated in patients with few missing teeth and large localized ridge defects. This functionally fixed prosthesis successfully replaces the missing teeth along with complete closure of the defect, restores speech and aesthetics.

The advantages of the Andrew's bridge system are adequately reported in the literature, which includes better aesthetics, hygiene along with better adaptability and phonetics. It is comfortable and economical for patients. As there is no palatal extension as in the case of removable partial dentures they are comfortable to adapt to and aid in better phonetic results. Good soft tissue response due to less soft tissue impingement. This type of prosthesis is more retentive and stable with minimal extension. The system avoids transfer of unwanted leverage forces to the abutment teeth by acting as a stress breaker [4,6-9]. The Andrew's system is usually of two types based on the area of bar attachment:

- Pontic supported Andrew's bar system.
- Bone anchored or implant supported Andrew's bar system.

Such an assembly provides maximum aesthetics and phonetics in class III ridge defect cases, when other traditional treatment options prove to be a failure (like implants/FPD). Another main advantage is the removable part which can be easily used by the patient for hygienic access to abutments and surrounding structures. A gauze piece can be used to clean the areas below the bar. The

system allows a precision fit between fixed and removable components without compromising the retention.

The bone anchored Andrew's bar system is another prosthetic alternative. In some cases, the Andrew's bar system is superior to the implant-supported removable prosthesis and other implant supported fixed prosthesis. It can be indicated when alignment of the opposing arches and/or aesthetics arch position of the replacement teeth create difficulties because of its flexibility in arranging teeth [6,7]. In the present case, implant placement was a questionable procedure due to the absence of good quality and quantity of bone. Taylor CL and Satterthwaite JD in 2014 stated an alternative solution for a complex prosthodontic problem. The rehabilitation of posterior mandibular defect after the excision of an odontogenic myxoma was achieved using a modified Andrews's fixed dental prosthesis. The prosthesis design consisted resin bonded retainers with Hader bar attached to it and partial removable dental prosthesis. Considering the size and location of the restoration, rehabilitation using modified Andrew's bridge provides a minimally invasive medium-term solution.

Pier abutment

Factors such as physiologic tooth movement, arch position of abutment and retentive capacity of retainers make rigid connectors less than ideal treatment in case of pier abutments. Physiologic tooth movement in the buccolingual direction of different teeth ranges from 56 to 108μ and apical movement/intrusion of 28 μ has been recorded for maxillary incisors. Due to the curvature of the arch, the facio-lingual movement of an anterior tooth occurs at a substantial angle to the facio-lingual movement of a molar. These movements in divergent directions can generate stresses in a long-span prosthesis that will be transmitted to retainers and their respective abutment teeth [10,11].

Fulcrum like action of the middle abutment results in the transmission of forces to the terminal retainers, thus leading to the failure of the weaker retainer [12]. The position of the nonrigid connector in the five-unit pier abutment restoration is critical. Nonrigid connector has been advocated by many and has suggested various locations such as terminal retainer, distal of the pier abutment, and one more at distal of anterior retainer at one side or both sides of pier abutment [13]. Shillinburg suggested nonrigid connector on the middle abutment as its location on either of the terminal abutments would result in the pontic's acting as a lever and middle abutment functioning as a fulcrum [10,11]. Therefore, he [15] suggested placement of connector at the distal aspect of pier abutment and has been supported by finite element analysis study done by Oruc., *et al* [16,17]. A controlled study [18] showed that nearly 98% of the posterior teeth measured tilted mesially when subjected to occlusal forces. If the keyway of the connector is placed on the distal side of the middle abutment, any mesial movement tends to seat the key into the keyway more solidly. Placement of the keyway on the mesial side, however, causes the keyway to be unseated during its mesial movements.

However, Savion., *et al.* [19] suggested that the possible aetiology of debonding in pier abutments is due to the development of extrusive reactive forces at the anterior abutment and flexural forces in the posterior abutment. Moulding., *et al.* [20] gave an alternative method of orientation of nonrigid connectors in FPD to overcome space limitations which may require overreduction of the preparation or over contouring of the retainer to place to keyway within the retainer wall. Here, key is given on distal surface of the retainer and keyway on mesial surface of pontic. This method of alternative orientation was used in this case as it offers several advantages over disadvantages. This offers many advantages such as:

1. Conventional tooth abutment preparations with less reduction
2. Suitable axial contours
3. Simplified angulation and placement of the nonrigid connector with mesially inclined posterior abutment
4. Improved aesthetics with porcelain.

Disadvantages being:

1. Chances of key getting unseated from keyway on mesial movement of the abutment
2. Fabrication of nonrigid connector is technique sensitive and requires increased laboratory time and
3. Expense [10].

These, in turn, form the strength and limitation of the case. The alternative orientation of the key and keyway makes this case different as the key is given on distal surface of the retainer and keyway on mesial surface of pontic, whereas the commonly used nonrigid connector comprises a key that is attached to the pontic and keyway placed within the retainer [10,11].

When prognosis of the distal abutment is questionable and fabrication of the removable partial denture is the subsequent treatment step, nonrigid connector can resolve the problem of repeating restoration of remaining abutments. It could be used in cases of osseointegrated implants. Contraindication for nonrigid connector:

1. If the abutment presents significant mobility
2. If the span between the abutments is longer than one tooth because the stresses transferred to the abutment tooth under soldered retainer would be destructive
3. If the posterior retainer and pontic are opposed by a removable partial denture or an edentulous ridge while the two anterior retainers are opposed by natural dentition.

FPDs have been considered the standard of care before the advent of implant therapy. The long-term survival of FPDs has been reported to be 87% at 10 years and 69% at 15 years. Factors that predisposed to failure included nonvital anterior abutments and pier abutments [13]. Hence, in such cases, dental implant can be a better alternative to the patient provided the patient is medically fit with good bone support and financially affordable.

Conclusion

Andrews Bridge system is a fixed-removable prosthesis that is indicated in patients with few missing teeth and large localized ridge defects. This functionally fixed prosthesis successfully replaces the missing teeth along with complete closure of the defect, restores speech and aesthetics.

The size, shape and type of connectors play important role in future success of Fixed Partial Denture. The selection of proper connectors 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 long span fixed partial denture.

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