Management of Pier Abutment Using Non Rigid Connector: A Case Report

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ABSTRACT

In certain partially edentulous cases, the pattern of missing teeth may lead to use of fixed partial denture on pier abutment. However, it has been reported that restoration of two missing teeth and an intermediate pier abutment with a rigid FPD is not an ideal treatment option. Using rigid connector in such situation leads to concentration of stresses on pier abutment. Pier abutment in such case acts as fulcrum leading to more debonding of fixed dental prosthesis which ultimately affects the success of fixed partial denture. Non rigid connector can overcome these problems. Non rigid connector transfers shear stresses to supporting bone & permits abutments to move independently. The non-rigid connector acts as stress breaker between retainer and pontic instead of usual rigid connector .This case report presents a simple method to rehabilitate pier abutment cases using prefabricated semi precision attachment.

KEYWORDS: Pier Abutment, Non Rigid Connector, Semi Precision Attachements.

INTRODUCTION

Replacement of missing teeth always fascinated restorative dentistry. Fixed partial denture treatment is always been accepted as the first modality for replacement of one or two teeth. The success of fixed partial denture depends upon the selection of abutment teeth, retainer, connector, pontic design, and longevity of edentulous span. During the function, the occlusal forces are applied to fixed partial denture prosthesis. These forces are transmitted to the abutments all through the pontic, connectors, and retainers. Biomechanical factors like overload, torque, leverage, and flexing bring about abnormal stress concentration in a fixed partial denture. Stress concentration is found maximum at the region of the connectors of the prosthesis and the cervical dentin area of prostheses near to the edentulous ridge.[1]

Selection of the correct type of connector can determine success or failure of the prosthesis. We are more adapted to the use of rigid connector in clinical practice since its placement requires just enough technical and laboratory expertise. The real concern arises when we come across with case of 5-unit fixed dental prosthesis with a pier abutment.[2] A pier abutment or intermediate abutment is a natural tooth located between terminal abutments that serve to support a fixed or removable dental prosthesis.[3] It has been postulated in literature that the by the use of rigid connectors there are forces which act on terminal abutments during the function, pier abutment acts as a fulcrum [4] resulting in higher debonding rates. As a consequence of this, these restorations may result in marginal leakage and caries. Non rigid connectors are suggested as a solution to these difficulties. The non-rigid connector acts as stress breaker between retainer and pontic. The movement in a non-rigid connector is adequate to avoid the conduction of stresses from segment being loaded to the remaining of the Fixed Partial Denture [5]

CASE REPORT

A 40- year- old female patient was referred to the Department of prosthodontics, with the chief complaint of inability to masticate and unpleasant aesthetics. The intraoral examination revealed missing teeth 24 and 26(FDI tooth numbering system). Intra oral periapical radiograph showed good bone support for all the teeth hence can be used as an 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 did not agree for the implant due to surgical intervention and financial problem. The treatment of the patient with Fixed Partial Denture with rigid connector would have resulted in the adverse effect on abutments as well as the final prosthesis. Therefore, treatment option chosen was to restore with fixed partial denture with the nonrigid connector of Semi precision attachment.

Technique: The patient was treated as per following procedure:

1. The tooth preparation of 23, 25 and 27 was done for metal-ceramic fixed partial denture with buccal facing ceramic and non-rigid connector (semi –precision

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between 25 and 26. [Fig.1]

Fig.1 Gingival retraction and Tooth preparation of 23,25 and 26

2. Putty-wash impression (Extreme Putty, Medicept, United Kingdom) was made for the preparation of the working model. It was poured in high-strength die stone (Kalabhai Karson Pvt.Ltd.).[Fig.2]

Fig.2: Final Impression

3. Provisional restorations were fabricated with a tooth colour auto polymerizing acrylic resin and cemented with non eugenol temporary cement (NETC cement)

4. Fixed partial denture with non-rigid connector was prepared. Wax pattern was fabricated for 23, 24, and 25 first. On the distal surface of the wax pattern of 25, a plastic castable male semi- precision attachment (Preci-vertix male, Ceka attachment, Belgium) was waxed up. Surveying was done to determine the position/parallelism of plastic male attachment. Investing and casting were done.

5. Wax pattern for 26 and 27 was prepared. Yellow Elastic female (Preci-vertix female, Ceka attachment, Belgium) was placed on the casted male attachment. Recess for the male was cut accordingly to fit the elastic female on the mesial side of wax pattern of 26. Carefully wax pattern of 26, 27 was removed. The elastic female was removed, and wax pattern of 26 and 27 was invested and cast. The yellow elastic female was luted inside the casting at specific recess. [Fig.3]

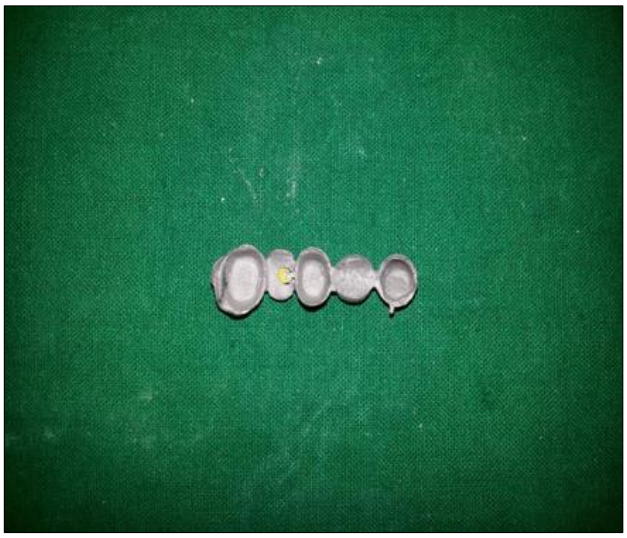

Fig.3: Metal coping with semi precision Attachment at 25 and 26

5. After casting, metal try-in of the individual units were done to verify proper seating. Then ceramic facing was added.

6. At the time of cementation, the mesial segment was cemented first followed by cementation of the distal segment. Cementation was done with Type II GIC cement (GC Fuji). [Fig.4]

Fig.4 Final cementation

The patient was instructed to maintain proper oral hygiene. Use of dental floss and an interdental brush was recommended.

DISCUSSION

The size, shape and type of connector play an important role in the success of an FPD. [6] when the rigid connectors are used in case of pier abutment, an occlusal load applied to the abutment tooth at one end of a fixed partial denture (mainly the molar retainer), the pier abutment may function as a fulcrum. While at the other end of restoration mostly in the canine retainer, tensile forces may then be generated between the retainer and abutment. The consequence of such tensile force at the retainer to abutment interface may lead to potential loss of retention for these restorations, hence resulting in marginal leakage, caries of the abutment, and FPD failure. [2] Bothelo and Dyson reported that rigid FPDs with pier abutment were linked with higher debonding rates than short span prosthesis. [7] In such a condition Non-rigid connector is generally recommended. The Non-rigid connector provides the opportunity to provide the break type of connection in fixed partial denture. [8]

The movement in a non-rigid connector is adequate to avoid the conduction of stresses from segment being loaded to the rest of the FPD. The most broadly used nonrigid connector is a key and keyway (Tenon-Mortise), a T-shaped key is attached to the pontic and a dovetail key way is placed on the retainer. [9] Other designs of the Non-rigid connectors are cross – pin & wing, loop and split connectors. The accurate position of the dovetail or cylindrically shaped mortise is critical; it must parallel the path of withdrawal of a distal retainer. [10]

Indication for non- rigid connector [10]:

- In the case of pier abutment which promotes a fulcrum-like condition, which affects the weakest of the terminal abutments to fail and may cause the intrusion of a pier abutment.
- The existence of the malaligned abutment, where to attain parallelism abutment preparation might result in extensive preparation, which may lead to pulp exposure. In such conditions, intracoronal attachment is useful as connectors.
- In the case of long span FPD, which can be distorted due to shrinkage and thus, affect the fitting of the prosthesis on the teeth.
- 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.
- The inadequate retentive ability of the abutments.

Contraindications for non- rigid connector [9].

- If the abutment is significantly mobile.
- 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.
- In certain situations of varying force magnitude like 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.

This clinical case report discusses the use of non rigid semi-precision type of connector between distal of 25 and mesial of 26 pontic where 25 act as a pier abutment and 23 and 27 act as terminal abutments.

There is a conflicting opinion on where to place the non-rigid connector. Markley [11] suggested placement on one of the terminal abutments and not at the pier abutment Adams [12] suggested placing the connector at the distal side of pier, and if desired, adding one more at the distal side of the anterior retainer, while Gill [13] proposed to place it on one side or both sides of the pier. Shillingberg et al. [9] suggested placing the connector at the distal aspect of pier abutment. Selcuck Oruc et al. [14] evaluated the effects of rigid and non- rigid connector design type on stress distribution for managing pier abutment case by means of finite element method.The results of the study showed that the area of maximum stress concentration occurs in pier abutments and the stress concentration was decreased with the use of non-rigid connectors when placed at the distal region of the pier abutment.

Use of semi-precision attachment as a non- rigid connector was done previously. [15] The location of the semi-precision attachment, in this case, was within the pontic of first molar and at the distal side of the second premolar. The attachment was well placed within the pontic, thus, it avoided the overcontouring, which is the common problem of using extracoronal semi-precision attachment. Moreover, this semi-precision attachment allows the vertical movement of the fixed partial denture prosthesis by means of dividing the prosthesis into two segments. This helps in transferring stress away from the pier abutment.

At the same time, considerations should be given regarding disadvantages of non-rigid connectors like, (1) Increased laboratory time and expense. (2) expertise required for fabrication. Thus, for the longevity of the long -standing bridge having pier abutment, the selection of proper non- rigid connector is very important.

CONCLUSION

When semi-precision attachment type of non-rigid connector is used, it allows movement in the fixed partial denture prosthesis, providing transfer of stresses away from the pier abutment. Hence, the selection of proper connector design is an important step in treatment planning in case of pier abutment, which will decide the success of the fixed partial denture prosthesis.

REFERENCES

1. SP Dange , AN Khalikar , Shiv Kumar. Non-rigid Connectors in Fixed Dental Prosthesis - ACase Report JIDANov 2008;2(11):356.

2. Banerjee S, Khongshei A, Gupta T, Baneerjee A. Non-rigid connector: the wand to ally the stresses on abutment. Contemp Clin Dent. 2011; 2:351-54.
3. Glossary of the Prosthodontics terms. 8th edition. J Posthet Dent. 2005; 94:11-95.
4. Parikh Pooja, Shah Khyati, Patel Pathik, Sethuraman Rajesh, Naveen YG, Chhabra Tamanna. Perceive means to manage pier abutments. European Journal of Dental Therapy and Research. 2013; 3:160-66.
5. Akulwar RS, Kodgi A. Non-Rigid Connector for Managing Pier Abutment in FPD: A Case Report. J Clin Diagn Res. 2014;8:ZD12-3.
6. Tylman's theory of fixed Prosthodontics;. St. Louis; 1989;8: 74 -5.
7. Botelho MG, Dyson JE. Long-span, fixed-movable, resin-bonded fixed partial dentures: a retrospective, preliminary clinical investigation. Int J Prosthodont 2005;18:371-6.
8. Chaturvedi S, verma AK vadhvani P. Non –rigid connector: relay the stress. Ind J Dent Sci. 2012; 4:53-5.
9. Shillinburg HT jr, Sather DA, Wilson EL, Cain JR, Mitchell DL, Blanco LJ, et al. Fundamental of fixed Prosthodontics. Chicago: Quintessence; 2012;4:91-2.
10. Badwaik PV, Pakahan AJ. Non rigid connectors in fixed Prosthodontics: current concepts with a case report. J Ind Prostho Soc. 2005; 5:99-102.
11. Markley MR. Broken stress principle and design in fixed bridge prosthesis. J Prosthet Dent. 1951; 1:416-23.
12. Adams JD. Planning posterior bridges. J Am Dent Assoc. 1956; 53:647-54.
13. Gill JR. Treatment planning for mouth rehabilitation. J Prosthet Dent. 1952; 2:230-45.
14. Oruc S, Eraslan O, Tukay HA, Atay A. Stress analysis of effects of non rigid connector on fixed partial denture dentures with pier abutments. J Prosthet Dent. 2008; 99: 185-92.
15. Khurshid Matto, Shailesh Jain. Managing a case of sensitive abutment situations through use of fixed removable prosthesis- a clinical report. JMSCR. 2014;2:1858-1863.

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