IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 12 Ser.8 (December. 2023), PP 05-11
www.iosrjournals.org

Non-Rigid Connector: A Key To Break The Stress Of Pier Abutment (Case Report)

Prasanna.B.G
Hombesh .M.N
V. Haritha
Rajesh H.M
Vasavamba D.S

Professor , Department Of Prosthodontics,College Of Dental Sciences. Davangere , Karnataka,India
Professor , Department Of Prosthodontics,College Of Dental Sciences,Davangere , Karnataka, India
Pg Student , Department Of Prosthodontics, College Of Dental Sciences,Davangere,Karnataka,India
Assistant Prof.,Svs Institute Of Dental Sciences,Mehaboobnagar,Telangana,India
Pg Student , Department Of Prosthodontics, College Of Dental Sciences,Davangere,Karnataka, India

Abstract :
A frequent clinical situation is that the patient has a missing first premolar and first molar, which requires a fixed partial denture design. The design involves using the canine and second molar as terminal abutments, with the second premolar acting as a pier abutment. However, there is a risk of the terminal abutments intruding during function, causing tooth movements and potentially leading to the debonding of the less retentive terminal retainer. To address this risk, the utilization of non-rigid connectors has been recommended. These connectors help to distribute the forces evenly among the abutments, reducing the stress on the terminal retainer. This clinical case report focuses on the incorporation of a non-rigid connector to rehabilitate a pier abutment case. It is important to note that the success of this approach may vary depending on individual patient factors and the specific clinical situation.

Keywords: *Fixed partial denture, Non-rigid connector, Pier abutment*

Date of Submission: 18-12-2023 Date of Acceptance: 28-12-2023

I. Case report:

A 38-year-old female patient was reported to the Department of Prosthodontics, College of Dental Sciences, Davangere, India with a chief complaint of missing upper left back teeth region(24,26), and difficulty in mastication as well as aesthetic problems [Table/Fig-1]. Past medical history was in significant and past dental history revealed that the patient had undergone extraction due to caries of the left maxillary first premolar and first molar one year back.

Intraoral examination revealed missing left maxillary first premolar and maxillary first molar with left maxillary canine and maxillary second molar acting as terminal abutments and the second premolar act as a pier abutment. Five-unit metal bridge prosthesis seen with right maxillary, left and right mandibular first premolar to third molar region.[Table/Fig-2].On radiographic evaluation the abutment teeth had adequate bone support to be used as abutment.

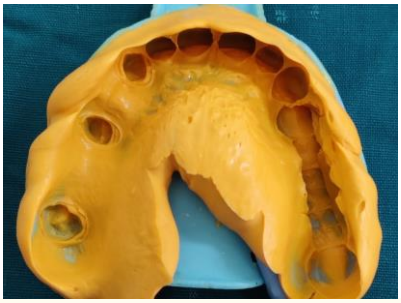
[Table/Fig-1]:
Intraoral preoperative view

[Table/Fig-2]:
Missing of left maxillary first premolar and first molar

After discussing all the treatment options and their pros and cons, it was decided to rehabilitate the case with five unit FPD using non-rigid connectors on the distal aspect of a pier abutment. Its risks and benefits were explained to the patient and written informed consent was obtained from the patient.

Clinical Procedure:
The following clinical step by step procedure was followed for oral rehabilitation,
• Tooth preparation was modified for porcelain fused to metal prosthesis on left maxillary canine (PFM facing) and maxillary second premolar with Equigingival margins and shoulder finish line in order to enhance the aesthetics.
•Tooth preparation was modified for porcelain fused to Metal on left maxillary second molar with supragingival margin and chamfer finish line.
•The gingival retraction was carried out with a gingival retraction cord [Table/Fig-3] and final impression were made using elastomeric impression material with two step putty wash technique[Table/Fig-4].

[Table/Fig-3]:
Tooth preparation with left maxillary canine,second premolar and second molar



[Table/Fig-4]:
Final impression

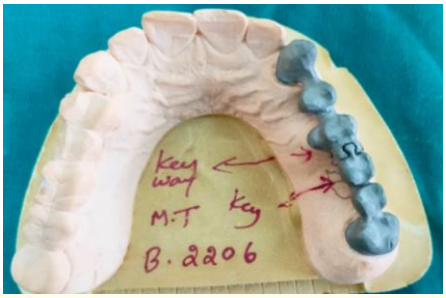
Lab procedure:

Final impression poured by type V dental stone (high strength, high expansion) master cast has been obtained. Master cast is scanned by using a 3D lab scanner and designed by CAD/CAM wax. wax pattern was made for anterior three unit I.e, maxillary left canine, first premolar and second premolar (pier abutment) and a female attachment(keyway-Mortise) was customised and attached to distal portion of second premolar with the help of surveyor and then it was casted first [Table/Fig-5].

After three unit casting female attachment was obtained,it was seated on the cast and wax pattern of posterior three unit was made with male attachment (key-tenon) extending into previously casted customized female attachment and then casting has done[Table/Fig-6].

After the three unit casting with the female attachment was obtained, it was seated on the cast and the wax pattern of the posterior two unit FDP was made with a male attachment/ tenon extending into the previously casted customized female attachment. After the casting of the posterior two unit FDP (Fig. 4), it was fitted with the anterior unit and a metal coping trial was done . 5). After verifying the fit of the casting, as well as that of the customized tenon-mortise attachment, ceramic build up (Vita, Germany) was completed and the FDP was cemented (Fig. 6) after necessary occlusal adjustments using Glass Ionomer luting cement After the three unit casting with the female attachment was obtained, it was seated on the cast and the wax pattern of the posterior two unit FDP was made with a male attachment/ tenon extending into the previously casted customized female attachment. After the casting of the posterior two unit FDP (Fig. 4), it was fitted with the anterior unit and a metal coping trial was done . 5). After verifying the fit of the casting, as well as that of the customized tenon-mortise attachment, ceramic build up (Vita, Germany) was completed and the FDP was cemented (Fig. 6) after necessary occlusal adjustments using Glass Ionomer luting cement After the three unit casting with the female attachment was obtained, it was seated on the cast and the wax pattern of the posterior two unit FDP was made with a male attachment/ tenon extending into the previously casted customized female attachment. After the casting of the posterior two unit FDP (Fig. 4), it was fitted with the anterior unit and a metal coping trial was done . 5). After verifying the fit of the casting, as well as that of the customized tenon-mortise attachment, ceramic build up (Vita, Germany) was completed and the FDP was cemented (Fig. 6) after necessary occlusal adjustments using Glass Ionomer luting cement After the three unit casting with the female attachment was obtained, it was seated on the cast and the wax pattern of the posterior two unit FDP was made with a male attachment/ tenon extending into the previously casted customized female attachment. After the casting of the posterior two unit FDP (Fig. 4), it was fitted with the anterior unit and a metal coping trial was done . 5). After verifying the fit of the casting, as well as that of the customized tenon-mortise attachment, ceramic build up (Vita, Germany) was completed and the FDP was cemented (Fig. 6) after necessary occlusal adjustments using Glass Ionomer luting cement After the three unit casting with the female attachment was obtained, it was seated on the cast and the wax pattern of the posterior two unit FDP was made with a male attachment/ tenon extending into the previously casted customized female attachment. After the casting of the posterior two unit FDP (Fig. 4), it was fitted with the anterior unit and a metal coping trial was done . 5). After verifying the fit of the casting, as well as that of the customized tenon-mortise attachment, ceramic build up (Vita, Germany) was completed and the FDP was cemented (Fig. 6) after necessary occlusal adjustments using Glass Ionomer luting cement After the three unit casting with the female attachment was obtained, it was seated on the cast and the wax pattern of the posterior two unit FDP was made with a male attachment/ tenon extending into the previously casted customized female attachment. After the casting of the posterior two unit FDP (Fig. 4), it was fitted with the anterior unit and a metal coping trial was done . 5). After verifying the fit of the casting, as well as that of the customized tenon-mortise attachment, ceramic build up (Vita, Germany) was completed and the FDP was cemented (Fig. 6) after necessary occlusal adjustments using Glass Ionomer luting cement Metal try-in was performed in patient's mouth to check marginal fit and shade selection has done [Table/Fig-7]. porcelain build-up has been done to metal copings.

[Table/Fig-5]:
Wax pattern of anterior three unit along with customised female attachment attached to distal part second premolar



[Table/Fig-6]:
Complete casting of anterior and posterior units with fitting of Non- rigid connector

[Table/Fig-7]:
Metal try-in was done in patient mouth to check marginal fit

Fixed movable bridge was checked in the patient's mouth, premature contacts were adjusted and occlusion was checked [Table/Fig-8]and cemented with GIC luting cement (type 2). During cementation, anterior 3 unit has been cemented first [Table/Fig-9], followed by posterior segment. Intraoral image of final prosthesis [Table/Fig-10].

Post-restorative instructions were advised to the patient including oral hygiene instructions. The patient was recalled after 1 week for follow-up and to assess oral hygiene status.

Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment.

The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment. The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment. The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment.

The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment. The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment.

The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment.

The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment.

The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment.

The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted Wax pattern for the coping was made for the anterior three unit i.e. on the canine abutment, first premolar pontic and second premolar pier abutment. For a custom made female attachment (mortise), a die pin sleeve was then cut into half longitudinally and its height was adjusted according to the height of the pier abutment.

The customized sleeve was then attached to the distal aspect of the pier abutment wax pattern using a surveyor and the pattern was casted

[Table/Fig-8]:
Pre and post operative occlusion of maxillary left quadrant

[Table/Fig-9]:
Cementation of anterior three unit sement


[Table/Fig-10]:
Intra-oral image of final prosthesis

II. Discussion:

Because the rigidity of the connection between the pontic and the retainers gives the prosthesis the desired strength and stability while limiting the stresses involved with the restoration, conventional rigid connectors are the preferred method of fabricating FDP. This solution, however, isn't appropriate in every situation.[1]

The curve of the arch causes the teeth in different segments to move in different directions in cases of pier abutments. This is due to the fact that a molar segment's faciolingual movement differs from that of faciolingual movement an anterior tooth.[2,4]Stresses of varying magnitudes and different directions may be applied on a long-span prosthesis. Because of this, there may be a concentration of stress on the pier abutment due to the forces created by the occlusion not being distributed equally across the arch. Tensile force will be created between the retainer and the abutment teeth at the other end by the pier abutment acting as a fulcrum. During fulcrum action, extrusive stresses will be applied to the anterior or posterior abutment; the resulting tensile strength at the retainer to abutment contact causes debonding of prosthesis.[5,6]

It was recently speculated that masticatory forces are transferred to the terminal retainers as a result pier abutment act as fulcrum causing failure of weaker retainers if rigid connectors are used.[8] In such situations, a non-rigid connector can be used to allow for some movement between the pontic and retainers, thereby lessening the strain placed on the abutments and surrounding bone.

The loop connector, the stress breaker connector, and the modified ridge lap connector are all examples of non-rigid connectors.

Non-rigid connectors are of various types:
a) key-keyway or dovetail
b) loop connector
c) split pontic
d) cross-pin and wing.

As per Sheillinburg, the best area of the keyway is on the distal part of the peir abutment retainer while that of the key is on the mesial part of the distal pontic.[2] The reason is that the posterior teeth have a slight mesial inclination and have been shown to move more in this direction on application of occlusal forces. Placing the keyway on the distal part helps in additional seating of the key into the keyway each time when occlusal forces are applied. Placing the keyway mesial will generally dislodge the key from the keyway on occlusal loads which also leads to fracture of the canine retainer or debonding of prosthesis. Therefore, it is essential to carefully consider the keyway's location in pier abutment cases in order to secure the restoration's optimal stability and longevity.[9]

III. Conclusion :

In case of pier abutment placing two implants one in each edentulous regions followed by single crowns, is one of the treatment option, by placing implants, we are completely eliminating the occlusal load and fulcrum-like situation associated with the pier abutment. However, implants can only be placed only after complete medical and radiological evaluation. In cases where implants cannot be placed because of inadequate bone support or financial conditions non-rigid connectors are advised. The conventional use of Non-rigid connectors aids in compensating stress distribution on abutment teeth.

Conflict of interest: None

References:

[1]. Fernandes Fll., Chaware Sh., Sachdev Vr., Sharma Mr. Precision (Tenon-Mortise) Attachment For Pier Abutment - A Case Report. Iosr Journal Of Dental And Medical Sciences 2017; 16(10): 88-91.
[2]. Shillingburg Ht Et Al. Fundamental Of Fixed Prosthodontics. 4th Ed. Chicago: Quintessense; P. 213-7
[3]. Glossary Of Prosthodontic Term. 9th Ed. J Prosthet Dent 2017; 117: 50.
[4]. Venkataraman K., Krishna R. The Lone Standing Abutment: A Case Report. International Journal Of Applied Dental Sciences 2016; 2(1): 20-3.
[5]. Pandey P., Mantri Ss., Deograde S., Gupta P., Galav A. Two Part Fpd: Breaking Stress Around Pier Abutment. Iosr Jounal Of Dental And Medical Sciences 2015; 14(6): 68-71.
[6]. Kuruvila A., Joseph S., Jayalekshmi Nl., Menon Sk. The Key To The Management Of Pier Abutment: An Alternative Approach. J Int Oral Health 2017; 9: 136- 9.
[7]. Garg S, Shukla S. Restoration Of Arches With Pier Abutment Using Non Rigid Connector. Int J Res Dent 2014;4:224-8.
[8]. Shillingburg Ht, Fisher Dw. Non Rigid Connectors For Fixed Partial Dentures. J Am Dent Assoc 1973;87:1195-9
[9]. 8. Oruc S, Eraslan O, Tukay Ha, Atay A. Stress Analysis Of Effects Of Non-Rigid Connectors On Fixed Partial Dentures With Pier Abutments. J Prosthet Dent 2008;99:185-92
[10]. Dange Sp, Khalikar An, Kumar S. Non-Rigid Connectors In Fixed Dental Prosthesis — A Case Report. J India Dent Assoc 2008;2:356.2.