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RESEARCH ARTICLE

AN INNOVATIVE CUSTOMIZED ATTACHMENT FOR INTERMEDIATE ABUTMENT REHABILITATION CASE

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ABSTRACT

Attachments in prosthodontics are the means of stress equalizing for any rigid connector prosthesis. These attachments may be custom made or prefabricated. Prefabricated attachments are highly precise and need technical dexterity to achieve optimum results. Custom made attachments or the Semi-precision attachments are cast in the laboratory and specially made for each patient. This case report describes an inexpensive technique to rehabilitate an intermediate abutment case using acrylic and pen refills as their attachment.

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INTRODUCTION

An attachment is defined as a mechanical device for thefixation, retention, and stabilization of a prosthesis (The Glossary of Prosthodontic, 2017). The success of fixed partial denture depends upon the selection of abutment teeth, retainer, connector, pontic design, and longevity of edentulous span. During 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 (Saumitra, 2016). 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 (Dange, 2008). Management of the connector stress concentrations is of utmost importance for a longspan intermediate abutment case. An intermediate abutment is a natural tooth or implant located between terminal abutments that serve to support a fixed or removable dental prosthesis (The Glossary of Prosthodontic, 2017). It has been postulated that the tendency of terminal abutments to intrude during function results in a teetering movements, where the intermediate abutment act as a fulcrum. These movements will eventually result in de-bonding of the less retentive terminal retainer. In order to overcome this potential risk, utilization of non-rigid connectors has been advised (Akulwar, 2014).

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Case Report

A female patient aged 35 years reported to the department of prosthodontics, crown & bridge with chief complaint of difficulty in mastication. The intraoral examination showed missing 24, 26, 36, 46, 47. The missing maxillary left first premolar and first molar were replaced with canine and second molar were the terminal abutments and second premolar as an intermediate abutment .Diagnostic Mounting gave a clear picture of the comprehensive treatment plan to be administered (Fig. 1). Periapical radiograph showed good bone support for all the teeth to be used as abutment. Considering patient's age, clinical and radiological examination, a two part, 5 - unit Porcelain fused to metal FDP with 23,24 and all metal FDP with 25,26,27 along with a non-rigid connector, interposed between intermediate abutment and distal pontic, was planned. Tooth preparation of 23, 25, and 27 was completed following the biomechanical principles (Fig. 2). Provisional restoration was made with auto-polymerizing acrylic resin as five- unit bridge (Fig. 3). Final impression was made by addition silicone (Photosil DPI, India) with two step putty wash technique. Master cast was poured with Type IV stone (Kalabhai Die stone, India) and die pins (Zahnsply, China) were attached. Die sectioning was done (Fig. 4). Articulation was done on semi-adjustable articulator (BIO-ART A-7, Brazil) using inter-occlusal bite record. Wax pattern were fabricated for 23, 24, 25. Semi precision attachment was made with sleeve of Pen Re-fill. Pen Refill having an inner diameter of 4 mm and outer diameter of 5 mm,was selected and the sleeve was opened

Fig.1. Diagnostic Mounting

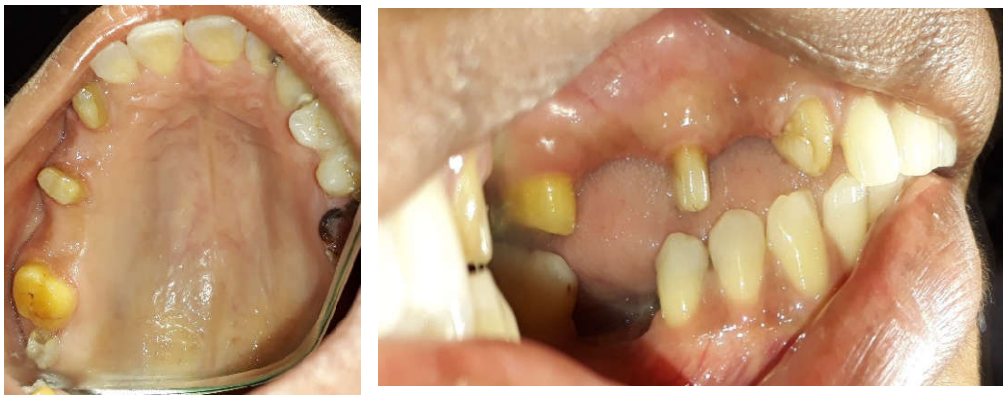

Fig. 2. Tooth preparation of 23,25,27 (Mirror Images)

Fig. 3. Temporization of 23,24,25,26,27 (Mirror images)

Fig. 4. Die Sectioning

from one side with a B.P blade(parallel to long axis of the tooth) to make a keyway (Fig. 5).

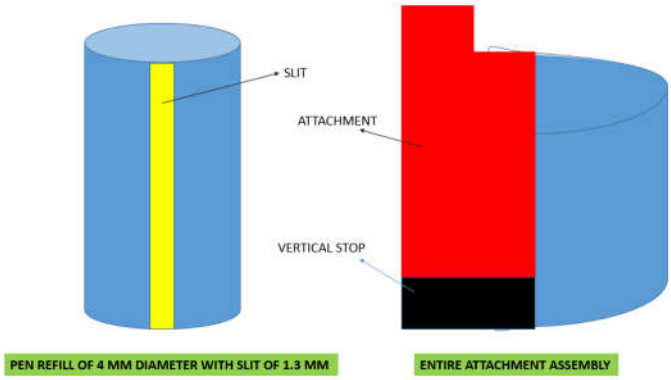

Fig. 5. Schematic representation of the attachment design

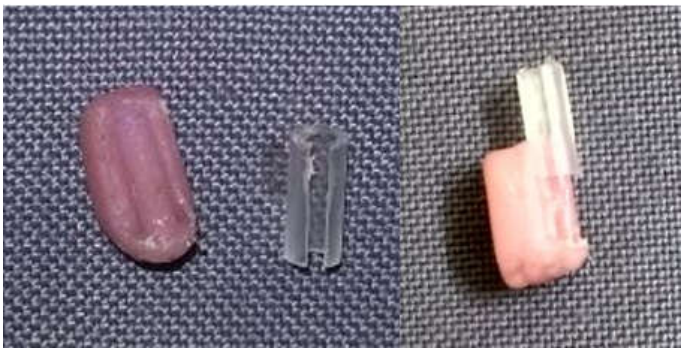

Fig. 6.

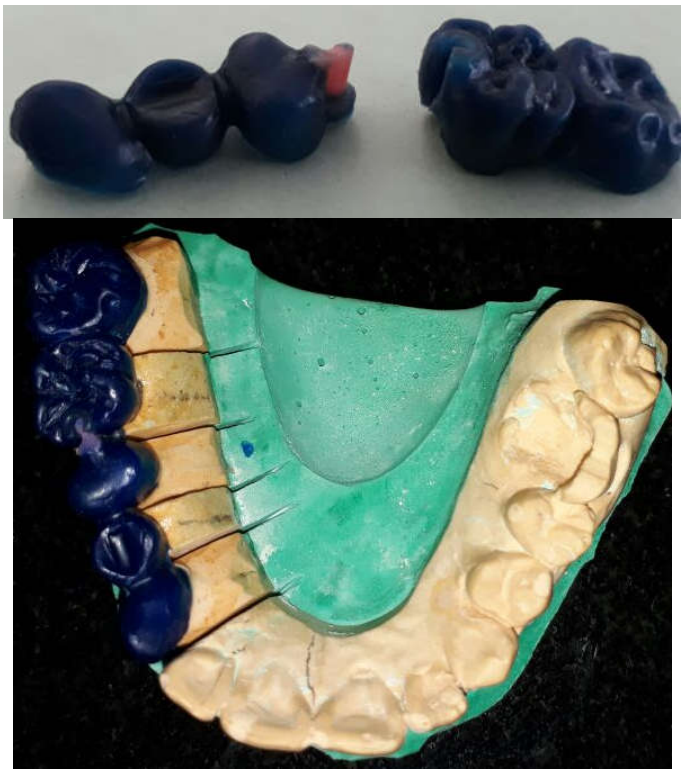

Fig. 7.

It was ensured that the slit made was 1.3 mm in width to accommodate adequate amount of the metal to be cast. The attachment design ensured an encirclement of over 180 degrees of the pen refill providing adequate mechanics. After which petrolatum jelly was coated on the intaglio surface and Autopolymerising Polymethylmethacrylate was mixed in dough consistency and filled into the slit of the Pen refill. After complete polymerization was attained, the key and keyway were separated and finished to accommodate the pontic space.Within the slit, a vertical stop was fabricated using Polymethylmethacrylate resin in order to prevent the impingement of tissues by vertical stresses. Keyway was attached to the distal aspect of 25 wax pattern (Fig. 6). Casting was carried out (Fig. 7). Metal try-in was done. Then wax pattern was fabricated of 26 and 27 with key made with acrylic resin and casted (Fig. 8). After ceramization, FPD was finished and glazed (Fig. 9). Anterior 3 unit fixed partial denture was cemented followed immediately by posterior 2 unit fixed partial denture using glass ionomer luting cement.

Fig. 8.

Fig. 9.

DISCUSSION

Non rigid connector (NRC) is any connector that permits limited movement between otherwise independent members of a fixed partial denture (The Glossary of Prosthodontic, 2017). The NRC could be made by an incorporation of prefabricated inserts, by use of a custom-milling machine or by use of the prefabricated plastic patterns (Sherring-Lucas, 1994). The indications of the NRC are:

- The existence of Pier/intermediate abutment, which promote a fulcrum-like-situation that can cause the strongest of the terminal abutments and retainers to fail and may cause intrusion of the pier abutment.
- The existence of mal-aligned abutment, where parallel preparation might result in devitalisation. Such situations can be solved through the use of intracoronal attachments as connectors.
- The presence of mildly mobile (grade I) teeth, which need to be splinted together with the fixed prosthesis. In such situations, it is not practical to cement a splinting type restoration with numerous teeth involved. Through the use of interlocks, smaller segments can be cemented with the splinting effect provided by the interlocks.
- Long span, FPDs, which can distort due to shrinkage and pull of porcelain on thin sections of framework and thus, affect the fitting of the prosthesis on the teeth.
- In situations where questionable distal abutment exist and fabrication of the removable partial denture is considered to be the next treatment step, the use of the NRC may solve the problem of repeating the restoration of the remaining abutments.
- It could be also used in cases of osseo-integrated implants. The NRCs are mainly used to relieve stress on the abutment and to accommodate mal-aligned implant as abutments (Badwaik, 2005).

Contraindication for non- rigid connector

- If the abutment presents significant mobility
- If the span between the abutments is longer than one tooth, because the stresses transferred to the abutment tooth under fixed retainer would be destructive.
- 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 (Shillinburg, 2009).

In this case report a semi-precision attachment has been fabricated using a pen refill which was later modified in order to fulfill the needs of a non-rigid attachment.

The pen refill attached to the distal surface of the pier abutment and played the role of the female component while the acrylic portion which was filled into the sleeve acted as the male component. The fabricated attachment mimicked the expensive preformed inserts available in the market. Parallelism of the attachment with the path of insertion was the mechanism of action achieved in order to decrease the leverage forces. The stress equalising effect was achieved by the placement of the attachment on the distal surface of the abutment with a vertical stop (fabricated with acrylic).

Conclusion

The rehabilitation of a intermediate abutment is a challenge to every dentist as a rigid connector may concentrate stresses on the abutment. It is therefore useful to place a stress breaker distal to the intermediate abutment in order to dissipate the forces acting on the tooth. Clinical & Laboratory Dental Practice indeed needs such efficient inexpensive techniques to render to the economically deprived patients. This was one such small attempt.

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