Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1566-1568 | ISSN:2251-6727

Non rigid connector: Breaking the stress on pier abutment-A case report

Dr. Baisakhi Mallick[1], Dr. Mandira Ghosh[2], Dr. Sushobhan Pramanik[3], Dr. Tridib Nath Banerjee[4], Dr. Saurav Banerjee[5]

Assistant Professor, Dept. of Prosthetic Dentistry, Dr. R Ahmed Dental College and Hospital, Kolkata[1](Corresponding author)

Associate Professor, Dept. of Prosthetic Dentistry, North Bengal Dental College, Darjeeling[2]

Associate Professor, Dept. of Pharmacology, KPC Medical College, Kolkata[3]

Associate Professor, Dept. of Prosthetic Dentistry, Dr. R Ahmed Dental College and Hospital, Kolkata[4]

Associate Professor, Dept. of Prosthetic Dentistry, Dr. R Ahmed Dental College and Hospital, Kolkata[5]

(Received: 27 October 2023 Revised: 22 November Accepted: 26 December)

KEYWORDS

pier abutment, fixed movable bridge, non-rigid connector, Matrix

ABSTRACT:

Introduction: Natural tooth abutment of a restoration has always been critically questioned because the natural teeth are affected by such procedures. Selection of a natural tooth to support a prosthesis is always diagnostically challenging. The single standing natural tooth between two partially edentulous spaces is termed as pier abutment which act as a class I fulcrum lever while used in a fixed partial denture with rigid connectors. This situation leads to failures in FPD.

Methods: To overcome this situation, a fixed movable bridge with a non-rigid connector is used to break the stress on pier abutment. In our study, we used Dovetail (key-keyway) type non-rigid connector for breaking the stress on pier abutment in fixed movable bridge.

Conclusions: Non-rigid connector reduce stress on pier abutment in fixed movable bridge, thus reduce the failure in FPD.

1. Introduction

A fixed prosthesis can be either a conventional fixed partial denture (FPD) that includes single crown or it can be an implant supported single crown or an FPD [1,2]. The success of FPD in such situations depends on the longevity of pier abutment. It was suggested that instead of using a rigid connector, one must use at least one non-rigid connector at any end. which would break the stresses and the FPD will be functionally independent of each other [3]. Through the pontic, connectors, and retainers the occlusal forces applied to a FPD are transmitted to the supporting structures [4,5]. The excessive flexing of the long-span FPD, which varies with the cube of the length of span, can lead to material failure of prosthesis or to an unfavourable response [4]. Biomechanical factors such as overload, leverage, torque, and flexing induce abnormal stress concentration in FPD [6,7]. Stress concentration is found in the connectors of the prosthesis and in the cervical dentin area near the edentulous ridge. This factor plays an important role in the potential for failure in long-span FPD [7]. The Non-rigid connector could be made by an incorporation of prefabricated inserts, by use of a custom-milling machine or by use of the prefabricated plastic patterns. The four types of NRCs [1,2,8] are the Dovetail (key-keyway) or (Tenon–Mortise) connectors, Loop connectors, Split connectors, Cross pin and wing connectors. In our case report, we used Dovetail (key-keyway) type non-rigid connector for 5-unit bridge.

2. Objectives

Our aim was to reduce stress on pier abutment by providing non rigid connector.

3. Methods

A 45 years old lady reported with the complaints of difficulties of chewing due to absence of few posterior teeth for last six months. Oral examination revealed 16,14 were missing (Fig 1a,1b), 15 was present and healthy. So, we decided to provide non-rigid connector with 5-unit bridge using 15 as pier abutment. Teeth preparation of 13, 15 was done for metal-ceramic bridge and 17 preparation was done to receive all metal crowns

Journal of Chemical Health Risks
www.jchr.org
JCHR (2024) 14(1), 1566-1568 | ISSN:2251-6727

on first and second molar. Final impression (Fig 1c) was taken by putty and light body impression material and poured by Type V die stone. Interocclusal record was taken using bite registration material to obtain good occlusion of the patient. Provisional restoration was given. Facebow transfer (Fig 1d) was done and master cast was then mounted on an articulator with the help of interocclusal record.

FIG 1: Fig 1a: Examination of patient's mouth reveals missing 14,16. Fig 1 b: Crown reduction in upper right canine, second premolar, second molar. Fig 1c: Final impression of upper arch after teeth reduction Fig 1d: Facebow transfer

In the laboratory wax pattern was fabricated on the maxillary right canine, first premolar, and second premolar with a male CEKA prefabricated attachment on the distal aspect of pier abutment. The pattern was invested, burned out, and casting done. After the casting was over, occlusion of 3-unit bridge with key tenon and with attachment (Fig 2a,b,c,d)was checked in the articulator and in the patient's mouth (Fig 3a).

FIG 2: Fig 2a,2b: 3-unit bridge with metal coping with key connector trial in patient's mouth. Fig 2c: CEKA prefabricated attachment used for fabrication of non-rigid connector. Fig 2d: 3-unit PFM bridge attached by key and prefabricated keyway connector.

In the lab, wax pattern was then fabricated on right first and second molar with female prefabricated CEKA attachment. Surveying was done to check position and the parallelism of key-keyway connector within the contours of the pier abutment. In the working cast, after checking marginal fit (Fig 3b,3c), the distal part was then invested separately.

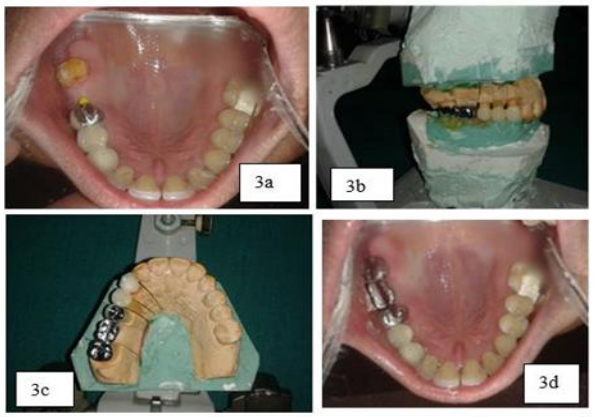

FIG 3: Fig3a: Trial of Tenon key-keyway connector with 3-units bridge in the patient's mouth. Fig 3b, 3c: Check the marginal fit in working cast in the laboratory after fabrication of 5-units bridge with non-rigid connector. Fig 3d: Final prosthesis cemented by type 1 GIC in the patient's mouth

After the casting was over, excess material was carefully reduced so the key (key tenon) and keyway were in flush with each other. First, the anterior segment of 3-unit PFM bridge with key tenon followed by posterior segment with key way was cemented by Type 1 glass ionomer cement (Fig 3d).

Then the excess cement is removed and the occlusion was checked. The patient was advised to maintain good oral hygiene and to review after one week for post insertion check-up. She was quite satisfied with the prosthesis (Fig 4a,4b).

FIG 4: Fig 4a: Intra oral view of final prosthesis in occlusion. Fig 4b: Front view of patient in follow up.

4. Discussion

For the success of a FPD the size, shape and type of connector play a crucial role. If we are using rigid connector its placement requires just enough technical

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(1), 1566-1568 | ISSN:2251-6727

and laboratory expertise. In a case of 5-unit FPD with a pier abutment the problem increases. When an occlusal load is applied, the pier abutment act as fulcrum causing high stress concentration at pier abutments resulting in failure of restoration. Bothelo [9] and Dyson reported that rigid FPDs with pier abutment were linked with higher debonding rates than short span prosthesis. Thus, result in marginal leakage and caries. To prevent the debonding of the prosthesis and eventually the failure of FPDs, the right type of connector is selected during the fabrication of the prosthesis. When non-rigid connector is used it allows movement in the FPD, providing transfer of stresses away from the pier abutment. It provides break type of connection in FPD. Placing the keyway on the distal aspect of the pier abutment helps in further seating of the key into the keyway every time occlusal forces are applied. Placing the keyway mesial to the pier abutment tend to dislodge the key from the keyway which might lead to fracture of the canine retainer or bone loss around the canine abutment. This placement is supported by Finite element analysis done by Oruc et al who said that the area of maximum stress concentration at the pier abutment was decreased by the use of NRC at the distal region of the second premolar [10]. Therefore, accurate planning of the design is critical for FPDs with non-rigid connectors, which prevent the leverage effect and imparted it to the long-term success of the FPD with pier abutments. In this case first, the anterior segment of canine, first and second premolars with metal ceramic restoration with the key tenon on its distal aspect was fabricated. Then the second and first molars FPD with all metals with keyway on its mesial aspect was fabricated so that no stress concentration can occur over the pier abutment.

5.Conclusion

Ideally, the long axes of abutments should be parallel to each other, but in malaligned teeth and/or edentulous space the preparation of FPD gets complicated. This could be avoided by the use of non-rigid connector [4,5,6,7]. Moreover, the design and passive fit of NRC also plays a crucial role for the success of a long span FPD.

References

1. Sherring-Lucas, Martin. Attachments for prosthetic dentistry: Introduction & application. Quintessence: London; 1994.
2. Al-Quran FA, Al-Ghalayini RF, Al-Zu'bi BN. Single-tooth replacement: factors affecting different prosthetic treatment modalities. BMC oral health. 2011 Dec; 11(1): 1-7.
3. Shillingburg HT, Fisher DW. Nonrigid connectors for fixed partial dentures. J Am Dent Assoc1973; 87: 1195-99. [8] Standlee JP, Caputo AA. Load transfer by fixed partial denture with three abutments. Quintessence Int 1988; 19: 403-10.
4. Rosenstiel S, Land M, Fujimoto J. Contemporary fixed prosthodontics. 3rd Edn. Harcourt: India; 2002. p. 65-81.
5. Matichescu A, Ardelean LC, Rusu LC, Craciun D, Bratu EA, Babucea M, Leretter M. Advanced biomaterials and techniques for oral tissue engineering and regeneration—a review. Materials. 2020 Nov 23; 13(22): 5303.
6. Shillinburg HT Jr, Hobo S, Whitsett LD, Jacobi R, Brackett SE. Fundamentals of fixed prosthodontics. 3rd edn. Passi; India; 1997. p. 95-100.
7. Mattoo K, Brar A, Goswami R. Elucidating the problem of pier abutment through the use of a fixed movable prosthesis – A Clinical case report. International Journal of Dental Sciences and Research 2014; 2(6): 154-157.
8. Jerkins G. Precision attachments, a link to successful restorative treatment. Quintessence: London; 1999. p. 127-31.
9. Botelho MG, Dyson JE. Long-span, Fixed-movable, resin-bonded fixed partial dentures: a retrospective, preliminary clinical investigation. Int J Prosthodont2005;18:371-6.
10. 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.

Acknowledgement: None

Conflict of Interest: There were no conflicts of interest related to this case report.