Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 4 (Issue 10): October 2017 ISSN: 2394-9414
DOI- 10.5281/zenodo.1003161 Impact Factor- 3.109

# SPRING FIXED PARTIAL DENTURE DESIGNING

**Lakshya Kumar[1], Khurshid Mattoo*[2] & Roma Goswami [3]**
[1] Department of Prosthodontics, Faculty of Dental sciences, KGMC University, Lucknow, India
*[2] Assistant Professor, Department of Prosthodontics, College of dentistry, Jazan University, (KSA)
[3] Professor, Department of Prosthodontics, Subharti dental college, SVS University, Meerut (india)

***Keywords:*** *cantilever bridge, fixed partial denture, ceramic, palatal bar, prosthesis adaptation*

***Abstract***

Most of the prosthodontic treatment options is based on principles of rigidity. There is rarely any prosthesis that will be basically flexible in nature. Spring fixed partial denture is one such versatile prosthetic option that can be used with metal ceramic. The spring design however is perilious in terms of hygiene maintenance, occlusal stress distribution (type of occlusion) and patient adaptability. A male patient reported with missing maxillary right central incisor and endodontically treated right lateral incisor. All relevant histories, examinations and investigations were non contributory. A spring fixed partial denture was designed for replacement of missing tooth using first premolar as an abutment. Designing of such bridge is discussed

## Introduction

Excessive partial edentulous space between naturally occurring abutments always pose a clinical challenge in terms of treatment option selected, esthetic outcome, fulfilling engineering biomechanics, durability without adversely affecting normal health and personal and patient satisfaction. Advances in material sciences in the last few decades have provided treatment options like dental implants, resin bonded fixed partial dentures and all ceramic restorations. [1,2] However, in countries belonging to Southeast Asia like India, some of these options cannot be afforded by ordinary citizens due to lack of affordable insurance and other avenues. Therefore, clinicians should have various treatment options in their armory to fulfill patient's desires. Scientific stigma attached to cantilever prosthesis has made use of such options very rare. Having different names like direct extension bridge, free end, swing on or throw off the bridge it is one of the types of fixed partial denture in which the pontic is retained and supported only on one end by one or more abutment. [3,4] When the distance of the abutment from the pontic is farther away it is called a spring cantilever bridge.

This article presents a case where maxillary right central incisor was successfully restored by using a spring bridge.

## Case report

A male patient aged 28years, was referred to the post graduate section for restoration of maxillary right lateral incisor (endodontically treated) which had an adjacent missing right central incisor. Medical, dental, social and drug related history was noncontributory. Extra oral examination revealed normal clinical features. Intra orally, maxillary right central incisor was missing with excessive interdental space, suggesting the existence of midline diastema when natural teeth were present.

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 4 (Issue 10): October 2017 ISSN: 2394-9414
DOI- 10.5281/zenodo.1003161 Impact Factor- 3.109


***Figure 1: (a) Tooth preparation (b) Wax up on working cast (c) Spring bridge cemented (d) Steepness of canine guidance***

Patient had a class 1 molar relation with mandibular anteriors slightly crowded. The incisors on the left side were also endodontontically treated. Preliminary occlusal analysis was carried intraorally followed by confirmation on mounted diagnostic cast on a semi adjustable articulator (Hanau Widevue, Waterpik, Ft Collins, CO, USA) that was programmed according to the patient generated guidances. Mock up on diagnostic casts revealed that incorporation of midline diastema were mandatory to fulfill esthetic objective. Therefore, a non conventional approach looked more appropriate in which maxillary right first premolar was to be used as abutment that would support the central incisor while the lateral incisor would be restored as a single crown. After consenting the treatment plan, maxillary right lateral incisor and right first premolar were prepared for metal ceramic (buccal facing) crown **(Fig.1a)**. All conventional procedures of fixed partial denture were carried to fabricate the prosthesis. Different designs of bar connector were made **(Fig.1b)** on the duplicate working cast, but after taking various factors into account, the bar was modified to a 'V' shaped the depth of 'V' being in the deepest portion of the palatal vault **(Fig.1c)** while flattening the connector bar at the bend to promote tongue adaptation. After necessary trial and error corrections on temporary restoration, the spring bridge was cast and porcelain fired to it. Later, the bridge was cemented to the first premolar with zinc phosphate cement (Harvard) while lateral incisor was cemented using glass ionomer cement **(Fig.1d)**. Instructions regarding tongue adaptation, oral hygiene maintenance were given. The patient was satisfied with the incorporation of midline diastema in the fixed partial denture.

## Discussion

Application of the cantilever principle in fixed partial denture excluding implants has been applied in two ways, a cantilever bridge and a spring bridge, the difference being the distance between the pontic and the retainer. In the case of spring bridge, the connection between the pontic and the retainer is achieved only by using a long palatal connector bar. [5,6] The chief indication of this design feature is when spacing between teeth is to be maintained thus eliminating use of connector between two adjacent restorations. Although popularized since 1897 by Essig, [7-9] there are still concerns about the design of the palatal connector bar.

The bar that was used in this design was modified on its sides and thickness to allow three important features that such design should have namely self cleansing ability (achieved by decreasing the angle between the tissue surface of the bar and its lateral sides), stress distribution ( making the palatal connector bar adapt to the palatal tissues so that some forces are transferred to the supporting palatal mucosa thus ensuring minimum forces reach to the

Open Access Journal
RESEARCHERID
THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 4 (Issue 10): October 2017 ISSN: 2394-9414
DOI- 10.5281/zenodo.1003161 Impact Factor- 3.109

abutment) and patient adaptability ( location of the bar decided by multiple trials of temporary restoration in patient, flattening the bar near the bend to allow tongue to intercept the bar same as the palatal surface). As can be seen the bar connector has two arms of a 'V' shaped connector. Both arms are parallel or nearly parallel to the long axis of their individual teeth. This design permitted the joint to be placed in the deepest portion of the palatal vault where usually tongue does not reach during any normal subconscious functions. In the region of this joint, the palatal bar connector was also kept flat with rounded angles from the outer surface so that it is less conspicuous to the tongue. This feature of the connector allows the tongue to perceive the bar as continuation of palatal surface and thus was more comfortable for the patient than rounded connector bar especially during swallowing of food.

Type of occlusion is one of the most important factors while designing the spring bridge. The problem of abutment rotation is discussed by Myers (1969)[10,11] and he points out that crown root ratio, existing periodontal support , relation of incisors during incising should be taken into consideration. For this patient, the canine guidance was steep (slight retroclination) and thus more favourable as recommended,[12] which enabled the patient to disclude in protrusion by the canines without involving the incisors.

## Conclusion

Management of excessive Interdental space between abutments can be successfully achieved by using a properly designed spring bridge that should be self cleansing, distribute stresses other than abutment and allow patient to adapt without annoying the tongue.

## Acknowledgements

The authors would like to acknowledge the efforts of the staff of the engineering college who helped in better designing of palatal connector bar.

## References

1. *Marinello CP, Meyenberg KH, Zimann N, Luthy H, Soom U, Imoberdorf M. Single-tooth replacement: Some clinical aspects. J Esthet Dent 1997;9:169-78.*
2. *Millar BJ, Taylor NG. Lateral thinking: The management of missing upper lateral incisors. Br Dent J 1995;179:99-106.*
3. *The glossary of prosthodontic terms. J Prosthet Dent 2005;94:10-92.*
4. *Lui JL. The spring bridge. Dent J Malaysia 1977;3:15-20.*
5. *The glossary of prosthodontic terms. J Prosthet Dent 2005;94:10-92.*
6. *Lemmer J. The design of spring cantilever bridge. J Dent Assoc South Afr 1963;18:433.*
7. *Thompson A. Two new abutments for the spring bridge. Br Dent Dig 1947;1:135.*
8. *Heigeiway HE, Williams RW. The spring cantilever bridge. Br Dent J 1962;113:420-5.*
9. *Johnston JF, Dykema RW, Phillip S. Modern practice in crown and bridge prosthodontics. 3rd ed. Philadelphia: W. B. Saunders; 1971. p. 537.*
10. *Myers GE. Textbook of Crown and Bridge Prosthodontics. St.Louis: C. V. Mosby; 1969. p. 155.*
11. *Nally JN. The fixed bridge for anterior teeth. Int Dent J, 1962;12:1-6.*
12. *Brar A, Mattoo K, Jain P. Designing Cantilever Prosthesis: A Case Study. Research & Reviews: A Journal of Dentistry 2014; 5(3): 5-9*