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Case Report

Esthetic rehabilitation utilizing concept of golden percentage and loop connectors: A clinical report

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ABSTRACT

Rehabilitation of a missing tooth with a Fixed Dental Prosthesis is a commonly used treatment option with proven clinical results and longevity. Recreating good proximal contacts is the key to successful rehabilitation. However, in clinical situations where a certain amount of diastema may be desired by the patient or deemed necessary by the clinician to achieve esthetic treatment, use of loop connectors is necessary. Digital evaluation of the tooth material arch length discrepancy and following esthetic proportions like golden percentage ensures a well planned treatment procedure and a more predictable treatment outcome. This case report highlight rehabilitation of a missing anterior tooth in esthetic zone utilizing digital planning software and using loop connector to maintain esthetics. The intent of this case is to highlight loop connector as a viable treatment option for maintenance of diastema in cases where desired and the use of simple, commonly available software to implement esthetic proportions in designing of restorations.

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1. Introduction

Diastema is a clinical situation in which gap is present between the teeth due to discrepancy between arch length and tooth material. It may be an undesirable condition requiring Orthodontic correction in some. However, in certain clinical conditions, maintenance of this gap may be desirous in patients especially in those with slight relapse post Orthodontic treatment. Prosthodontic rehabilitation in well aligned arches with tight proximal contacts advocates use of rigid connectors for longevity and acceptable esthetic treatment outcome. As per principles of esthetics, any tooth which is bigger than the adjacent tooth shows dominance.¹ Central incisor dominates the anterior sextant, but both the central incisors should coordinate with each other in mesiodistal, occlusocervical dimension and in shade. To redistribute the space in anterior segment, connectors such

as loop connectors are used. They allow maintenance of diastema by a loop shaped connector on the palatal aspect. The connector is in form of a loop on palatal aspect of the FDP connecting adjacent retainers and pontics.² Esthetic proportions used in dentistry include golden proportion, RED proportion, Preston's proportion, Golden percentage and others. These indices allow designing of restorations based on various mathematically governed ratio and proportion to recreate symmetry which is esthetically pleasing and scientifically driven.

This case report highlights Prosthodontic rehabilitation of a missing tooth in anterior esthetic region using loop connector for maintenance of uniform spacing.

2. Case Report

A 25 years old patient reported to a tertiary care dental centre, Maharashtra with a chief complaint of poor esthetic due to missing front tooth secondary to trauma since

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05 months. Past History revealed that patient fell from a bicycle 05 months ago and sustained trauma to front tooth. The tooth was mobile and radiograph revealed horizontal root fracture at region of middle third. The tooth was extracted, following which a PMMA removable denture was fabricated for the patient. Endodontic treatment was done for maxillary left lateral incisor. Intraoral Examination revealed well aligned maxillary and mandibular arch with missing central incisor on left side and bilaterally missing mandibular first molars.[Figure 1] Spacing was seen in between maxillary and mandibular anterior teeth.[Figure 2] Examination of edentulous site revealed increased interabutment space mesiodistally and the bone was deficient in buccolingual and mesiodistal aspect (Siebert Class III edentulous ridge). Radiographic examination revealed missing maxillary central incisor and mandibular first molars with normal bony trabeculae. No abnormal radiographic finding were seen in these regions. [Figure 3] Based on clinic-radiographic findings, a diagnosis of PDI Class II Partially edentulous maxillary and mandibular arch was made.³ Patient was advised for Orthodontic correction of diastema followed by rehabilitation of missing 21,36 and 46. However, she was not convinced for getting Orthodontic treatment done and desired maintenance of space instead. The treatment options for rehabilitation were:

1. Implant retained prosthesis irt 21,36 and 46
2. Fixed Dental Prosthesis irt 22,21,11 with a loop connector for maintenance of diastema and conventional FDP irt 36,46.
3. Fixed Denture Prosthesis irt 13,12,11,21,22,23 with Prosthodontic closure of diastema and conventional FDP irt 36,46.



Fig. 1: Pre-treatment

As the endodontically treated 22 required a full coverage restoration and due to compromised bone quality (Siebert Class III), implant prosthesis was ruled out and fabrication



Fig. 2: Pre-treatment intraoral view



Fig. 3: Radiograph



Fig. 4: Digital evaluation and planning



Fig. 5: Final Impression and provisionalization



Fig. 6: Laboratory steps



Fig. 7: Definitive prosthesis in-situ

of Fixed Denture Prosthesis irt 22,21,11 with a loop connector for maintenance of diastema and conventional FDP irt 36,46 was planned.

Life size pre-treatment frontal images were taken using DSLR camera (Nikon D5600, Japan) and digital planning was done to estimate the space available and the planning of redistribution of space. Based on evaluation, it was noticed that a gross discrepancy was seen in dimensions of 22 and 12, the space available for the pontic was 0.13mm more than the adjacent natural tooth hence a redistribution of space between 11 and 21 was planned.[Figure 4] Diagnostic impressions were made using irreversible hydrocolloid impression material and diagnostic wax up was done. Tooth preparation was done for Porcelain fused to Metal restoration with 2mm of tooth reduction on incisal aspect, 1.5 mm on buccal aspect and 1mm on palatal aspect with a shoulder margin of 1.5 mm buccally and chamfer margin of 0.7mm on palatal aspect. Once tooth preparation was done, gingival displacement was done using 000 non impregnated gingival retraction cord (Sure cord, Sure endo, Korea) to allow proper recording of margins while making an impression. Two stage putty wash impression was made using polyvinyl siloxane impression material (Affinis, Coltene, Switzerland) and impression was examined for voids or defects. The diagnostic wax up was used as an index for fabrication of provisional restorations by direct technique using Chairside provisional material (cooltemp Natural, Coltene, Switzerland). [Figure 5] The cast was fabricated and die cutting with ditching was done. Wax pattern was fabricated using type II inlay wax using indirect technique. A complete anatomic wax pattern was made with connectors joining the junction of middle and incisal third of wax pattern and a loop on palatal aspect joining the three wax patterns. The purpose of connectors was to hold the pontic in position while the loop was being made in wax, following which the connectors were neatly cut and spacing between the wax patterns were achieved. A uniform cut-back was provided for ceramic. The wax pattern was cast in Ni-Cr alloy (Wirocer Plus, Bego, United States) and metal try-in was done. The copings were checked for marginal fit and the shape of the copings. It was ensured that a uniform clearance of 0.5mm was achieved.⁴ [Figure 6] Ceramic veneering was done on the buccal, incisal and incisal one-third portion of the prosthesis. The space distribution was again verified using digital ruler scale in photoshop (Adobe Photoshop CC, 2015, United States) to confirm the space as planned earlier following the rules of golden percentage. The prosthesis designed was in consensus with golden percentage and provided an esthetic outcome. The metal portion was highly polished to maintain a self-cleansing area. The restoration was luted using Type I glass Ionomer Luting agent (GC Fuji, Tokyo). The restoration was checked for occlusal contacts in centric and in eccentric positions. Patient was instructed to maintain the area under

the loop using water jet. Uniform diastema was achieved with desired esthetic outcome. The mandibular missing 36 and 46 were rehabilitated with conventional 3 unit FDP using full coverage PFM retainers on 35,37,45,47 as abutments and 36,46 as pontic. Sanitary pontic was given with a clearance of 2mm below the pontic to maintain self-cleansing area.[Figure 7] The patient was kept on a regular follow-up for 48 hrs, 01 week, 01 month, 03 months and 06 months.

3. Discussion

Various types of connectors used in Fixed Prosthodontics include rigid and non-rigid connectors.⁵ Rigid connectors include cast, welded or soldered connectors in conventional situations with good contact points, non-rigid connectors include tenon mortise, cross pin and wing connectors and split pontic indicated in compromised abutments like tilted or pier abutments. Loop connectors are recommended for situations which require maintenance of diastema. They are considered less rigid as compared to conventional FDP connectors.⁶ The indications for loop connector include maintenance of diastema, presence of excessive mesiodistal pontic space, prosthetic restorations for pathologically migrated and periodontally weak abutments.⁷ The esthetic proportions and its correlation with dentogenic concept based on sex, personality and age of the patient is one of the major factors that should be considered while designing of restorations. The most accepted proportion for esthetic restorations is golden percentage. Other common indices like golden proportion and RED proportion by Ward have not been found commonly in natural dentition⁸ According to Golden Percentage, the width of each central incisor, lateral incisor and canine divided by total width of maxillary anteriors multiplied by 100 is in the ratio of 25:15:10 when viewed in frontal plane.⁹ This utilization of esthetic proportion allows fabrication of well calculated, properly planned and precisely executed prosthesis with enhanced esthetic results. The advantages of loop connectors is that it provides a semi-rigid type of connector, the cross-sectional area of loop, length of loop and the design of loop may provide limited amount of flexibility to the prosthesis, it helps in maintenance of diastema if patient desires.¹⁰ The disadvantage is that it requires an additional laboratory expertise to design a self-cleansing loop, the loop needs to have adequate clearance from palatal mucosa to avoid food lodgment and alter phonetics. The prosthesis might be uncomfortable to the patient initially. The clinical survivability and longevity of loop connectors in 08 years follow up has been observed to be around 90.0% and it has been accepted as a viable treatment option for maintenance of diastema.¹¹

4. Conclusion

Pretreatment planning using simple digital software may provide to be a very helpful tool in guiding the fabrication

of prosthesis. Loop connector is an unconventional design in fixed dental prosthesis that enables the clinician to maintain the desired diastema with redistribution of available space to provide esthetically pleasing restorations as desired by the patient. The cross section, extension, thickness and clearance from palatal mucosa are key factors governing the success of prosthesis with loop connectors. This article shows that a loop connector can be used as a treatment option for maintenance of diastema. Use of digital planning and golden percentage aids to achieve predictable esthetics and success of prosthesis.

5. Source of Funding

None.

6. Conflict of Interest

None.

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