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Cross wing Maryland bridge: An innovative approach – case report

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Abstract
Maryland bridge is a minimally invasive treatment which is an alternative approach for replacing missing teeth when conservation of the abutment tooth structure is required. Missing anterior teeth results in aesthetic, functional & psychosocial well-being of patients. Maryland bridges have certain advantages such as minimal removal of tooth structure, the minimal potential for pulpal trauma & supra gingival margin. The innovative concept in this case is to give a cross wings for the abutments in a Maryland bridge.

Keywords: Maryland bridge, minimally invasive, tooth preparation, case report

Introduction
Restoration of missing anterior teeth is important because it causes a psychological impact on patients. Various treatment options are available for the replacement of the missing anterior such as the implant, removable partial denture and fixed partial denture [1]. Conventional bridge requires an adequate amount of tooth preparation of all the surfaces of the abutment tooth [12]. Therefore alternative treatment option for missing anteriors is the more conservative & minimally invasive resin-bonded FPD (Below Figure 1).

Fig 1: Demonstrates the resin-bonded bridge design, highlighting the minimal preparation and conservation of tooth structure.

Resin-bonded bridges are introduced by Rochette in the year 1973, where porcelain is used to fuse the pontic & the metal wings thereby minimising the prepration and conservation of the tooth structure [2]. These bridges were attached to teeth with a resin cement which forms a micro-mechanical adhesion with the acid-etched enamel & a gross mechanical bond with the perforated metal structure of the bridge [2]. The Maryland Bridge was developed at the University of Maryland, in which the retention is enhanced by the development of resin cement which bonds chemically to both the tooth surfaces & the etched metal alloy [1].
It provides micromechanical retention. The geometry & design of the Maryland bridge is an important factors for better retention. However, the major reasons for the failure of the Maryland bridge are debonding, tooth discolouration, caries & soft tissue irritation [11]. Maryland bridges are alloy specific and is done with non-precious alloys [1].

Case Report
A 25 years old male patient visited the department of Prosthodontics with the chief complaint

of a missing tooth in the lower right front tooth region for the past 2 years & need for aesthetic restoration of the same with a fixed dental prosthesis. The patient gave a history of trauma 2 years back. Intra-oral examination reveals a missing canine in the right mandibular region (figure 2, 3) with an edentulous space of 4mm and distally tilted 42. CBCT revealed a submerged root in relation to the edentulous space of 43 (Figure 4).

Fig 2: Depicts the intra-oral condition of a missing canine in the right mandibular region.

Fig 3: Shows the edentulous space in the lower right front tooth region

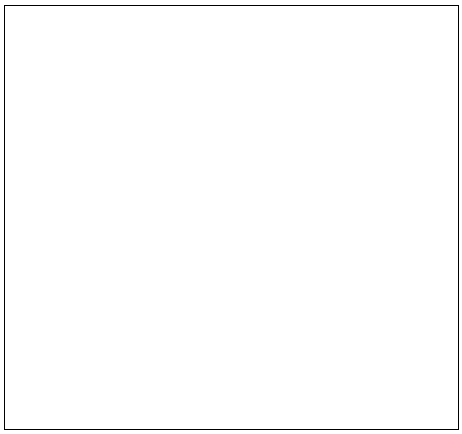

Fig 4: Displays CBCT revealing the submerged root in relation to the edentulous space of 43.

Diagnostic impressions were made with alginate (Zhermack - tropicalgin) & diagnostic casts was fabricated using dental stone (type III gypsum product – Goldstone). Different treatment options were planed with implant placement in the edentulous space of 43 as one of the option. After the radiographic interpretation and CBCT evaluation, implant placement was ruled out due to the submerged root in the path of implant placement.

Extraction of the retained 43 root followed by fixed partial denture was planed as treatment option. As patient was not willing for extraction of the submerged root, the treatment plan was changed to resin bonded bridge with opposing wings on buccal aspect of 44 and lingual aspect 42.

Diagnostic mock-wax-up was done prior to tooth preparation.

As the canine has the rotational movement and 42 is distally tilted, providing wings for 42 bucally results in failure of the treatment. Therefore we are providing the crosswings.

During the next appointment, tooth preparation was done for partial veneer crown on 44 (Below figure 5, 6) involving the buccal and occlusal surface with vertical stops at the mesial & distal sides. (Below figure 7, 8).

Fig 5: Illustrates the tooth preparation for a partial veneer crown on tooth 44.

Fig 6: Further illustrates the buccal and occlusal surface preparation of the crown.

Fig 7: Displays the vertical stops at the mesial and distal sides during the tooth preparation process.

Fig 8: Shows the preparation of the lateral incisor's distal and lingual surfaces.

The lateral incisor was prepared on the distal and lingual surface in order to correct the inclination, with both the

prepration having shoulder finish line to enhance the aesthetics (figure 9).

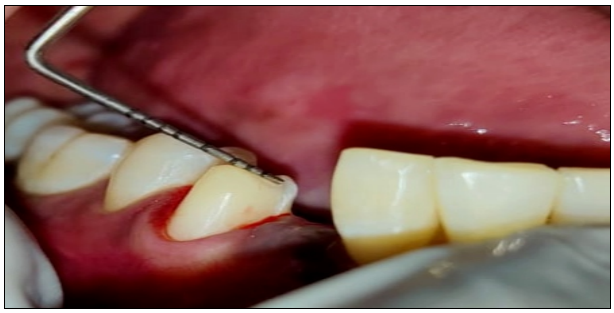

Fig 9: Depicts the prepared lateral incisor with a shoulder finish line to enhance aesthetics.

After the tooth preparation, gingival retraction was done using size '0' single gingival retraction cord (SURE-Cord Knitted Retraction Cord). The final impressions were made using elastomeric impression material with two step putty wash technique (Flexceed Light Body, Putty Type), the impressions were disinfected with 2% glutaraldehyde & the master casts were made with die stone (type IV gypsum – GJ Fujirock) (figure 10).

Fig 10: Illustrates the final impressions made with elastomeric impression material.

In the laboratory, metal coping was fabricated with opposing wings & the patient was called for a metal try-in. Later final PFM prosthesis were prepared. The patient was recalled for cementation of the restoration. The crown was cemented using resin cement (G- CEM LinkAce self-adhesive resin cement) by applying sufficient cement on the internal surface of the restoration (figure 11, shown below) & seated immediately.

Fig 11: Shows the cementation of the final PFM prosthesis

Tac curing was done, excess cement was removed and checked for high points. Shown below in (fig 12, 13).

Fig 12: Displays the tac curing process with the removal of excess cement.

Fig 13: Shows the completed prosthesis with all high points checked.

Post-operative instructions were given & patient has been recalled for review after 1 week.

Discussion

The submerged root after observation of 1 month doesn't show any infection, therefore that has been left as it is. Replacement of the missing canine should be done with almost care to prevent the frequent dislodgment of the prosthesis, as the canine tooth is considered unique as it connects the anterior and posterior segment of the arch, where the forces concentrate resulting in movement of the prosthesis [3]. In this case, the cross wings for Maryland bridge was considered to counter the rotational forces generated in the canine. Initially, minimal edentulous space was present i.e., 4mm because of the distal tilt of the lateral incisor hence while preparation distal surface of the lateral incisors has been prepared along with its lingual surface, therefore the space has been increased to 7mm (the mesiodistal width of canine is 7mm) [4].

For the minimally invasive approach, the lateral incisor has been prepared only in distolingual & in the 1st premolar, only the buccal & occlusal surface has been prepared.

The complication, in this case, is if there is any infection in the submerged root in future the bridge has to be removed. Reasons for the failure of the Maryland bridge are debonding (21%), discolouration (18%), caries (7%) & periodontal disease [5]. To prevent complications oral hygiene instructions have to be given, as advice regarding diet & to use of fluoride. Indeed, it is reasonable to view the Maryland bridge as a bonded retainer. Livaditis [6] even referred to the resin-bonded fixed partial denture as a "retainer" throughout his original paper. As the Maryland bridge retainer is a "prepless"

technique, it should be considered as an adjunctive bonded retainer within the scope of orthodontics.

After all, even for those patients undergoing orthodontic treatment have been placing semi-permanent restorations as retainers for as long as Maryland bridges have existed.

For example, in 1981 Fields [7] reported on the placement of interproximal resin restorations to address tooth size discrepancies. He referred to this solution as an "orthodontic-restorative technique" to avoid potential retention problems.

In 1984, Artun and Zachrisson [8] studied the efficacy of anterior bridge retainers made from an acrylic tooth and orthodontic wire.

Maryland bridges fell out of favor over time because of their high failure rate. In a 10-year retrospective study by Williams *et al*., [9] the authors reported a failure rate of 32%. Kerschbaum *et al*. [10] likewise reported a failure rate of 34% after 5 years, and Creugers *et al*. [11] reported a failure rate of 25% for anterior Maryland bridges after 7.5 years.

These failure rates are similar to what has been reported for orthodontic bonded lingual retainers [12-15].

Conclusion

The basic principle for tooth preparation in fixed prosthodontics is the conservation of tooth structure. The primary advantage of the Maryland bridge is the minimally invasive approach. The modification of the Maryland bridge in this case is cross wings on either side of the canine for better retention as the canine has the rotational movement and the lateral inciasor is distally tilted, providing wings for 42 bucally results in failure of the treatment. Therefore the crosswings have been provided.

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