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An immediate adhesive bridge using the natural tooth - A Case Report

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Abstract
Immediate replacement of periodontally compromised tooth bears a challenging task due to poor abutment support. The use of natural tooth as pontic provides an excellent technique mainly as it helps the patient to cope up from the loss of the tooth. Replacement of missing anterior teeth due to periodontal reasons is challenging due to the poor support of abutment teeth. This prevents the use of fixed partial dentures(FPDs).Fiber reinforce composite (FRC) resins offer a conservative, fast, and cost-effective alternative for single and multiple teeth replacement and may prove to be a successful modality for aesthetic and functional replacement of missing teeth along with periodontally compromised abutments, which has always been a challenge for the dentist. This case report describes the splinting of a natural tooth pontic that was extracted due to severe periodontal disease (to adjacent teeth) using fibre‑reinforced splint and composite resin with minimal cost.

Keywords: Natural tooth pontic; Composite resins, Pontic, rehabilitation, Ribbond, Tooth mobility

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I. Introduction

The replacement of a single missing or failing tooth presents one of the greatest challenges in restorative dentistry, especially when the esthetic zone is considered [1]. Nowadays, the main available treatment options to this clinical problem include the use of traditional fixed dental prostheses (FDPs), implant-supported single crowns (SCI), and resin-bonded FDPs (RBFPDs) [2, 3].

A fixed natural self curing resin bridge has quite a few advantages over removable appliances including ease of use, enhanced aesthetics, conservative approach and escapism from the need to become accustomed to removable prosthesis [4]. This could easily allow for the patient's natural crown to be used as pontic for the immediate bridge in a direct chair side procedure without need for any laboratory procedures and additively providing psychological benefit to the patient of retaining their natural tooth.

The natural tooth pontic (NTP) is easily usable when the crown is intact and it offers benefits of exact size, shape and color to the existing dentition. Originally, the usesteel wires, pins or bars was advocated for retention and strength but as these materials had no chemical interaction with composite resin they just resulted in stress concentration and deteriorated over time [5]. 4-META/MMA-TBB Resin, a self curing dental adhesive resin cement based on acrylic resin technology is a recent material widely used for dental adhesive purposes. It was originally introduced in Japan in 1982 as "Orthomite Super-Bond" as an orthodontic bonding system. It has 4-META (4-methacryloxyethyl trimellitate anhydride) as a diffusion promoter and TBB (tri-n-butylborane) as a polymerization initiator.[6]

Numerous factors have to be considered before missing tooth is replaced. The most important factor is the time lapse after the removal of tooth.[7] Patients usually demand replacement at the earliest possible and sometimes demand immediate replacement.[8] Splinting of the extracted tooth using fibre‑reinforced splint and composite resin enables proper healing with acceptable aesthetics[2] for a time being until final prosthesis is given to the patient.[9,10]]

Indications

Indications for selecting a fiber-reinforced polymer prosthesis include the following:[7,8,9,10]

1. The demand for restoration with an excellent look that opposes denture teethplaced on a partial removable oral prosthesis.[9]
2. The requirement to reduce wear of the opposing natural dentition. [11]
3. Using conservative intra-coronal abutment tooth preparation.[8]

4. The possibility of bonding the prosthetic retainer to the abutment teeth. [12]
5. The wish for a metal-free, nonporcelain prosthesis (this is specifically important for individuals with allergic reactions to metal).[13]
6. Rapid chairside replacement of a missing tooth as a transitional fixed prosthesis.
Contraindications: [7.8.9,10]

Contraindications to selecting an FRC fixed prosthesis include the following:
1. Lack of ability to maintain good fluid control (e.g., patients with acute or chronic gingival inflammation or when the gingival margins would be positioned deeply into the sulcus)[8]
2. Long span (i.e., 3 or more pontics for anterior and 2 or more for posterior teeth). [9]
3. Parafunctional habits such as bruxism[14]
4. Individuals with unglazed porcelain/metal partial removable dental]prosthesisf ramework components would certainly oppose the restoration.[10]
5. Patients who abuse alcoholic substances.[11]

This case report describes the splinting of a natural tooth pontic that was extracted due to severe periodontal disease (to adjacent teeth) using fibre- reinforced splint and composite resin with minimal cost.

Case report

A 46 years old male patient came to our department with chief complaint of pain and discomfort while eating food due to hypermobility of tooth #21. The mesio-lingual and disto-lingual surfaces had periodontal probings of 9-10 mm. Radiograph was taken and revealed severe bone loss. There was grade 3 mobility and grade 1 mobility with regard to tooth #21 and 22. The diagnosis was severe periodontal bone loss and a periodontal abscess with respect to tooth #21. The tooth had a hopeless prognosis and was scheduled to be extracted. (Figure 1)

Figure 1 : Clinical presentation of the patient at initial examination

A general assessment of patient was made through history and routine laboratory investigations. The entire procedure was explained to the patient and the informed consent obtained. Considering the hopeless prognosis of tooth #21, it was extracted, but the patient wanted immediate replacement in that place. (Figure 2)The root of the extracted tooth was resected and the crown was given the shape of modified ridge lap pontic design which satisfied both oral hygiene locals and esthetics. The length of the NTP determined by measuring the distance from incisal edge of the central incisor to the extraction site. Some additional length was added so the pontic would be touching the gingival tissue when the extraction site healed. (Figure 3)The pulp was removed following

Figure 2: After extraction 21 healing

opening of root canal (to avoid discoloration of pontic through decomposition of organic tissue) and the same was filled with a bonded composite resin and the gingival aspect of the tooth was smoothed using flame shaped finishing bur. The extracted natural tooth is referred to as a NTP. Occlusal evaluation is carried out, so as to position the tooth in such a way that it bears minimum forces. (Figure 4)

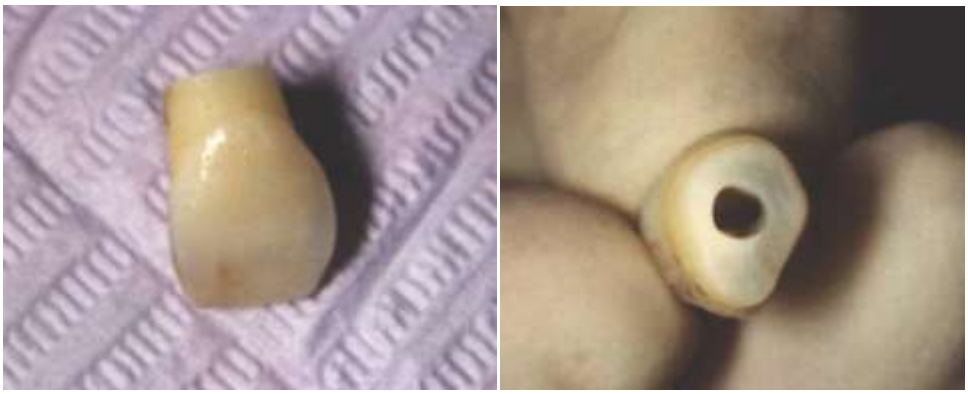

Fig. 3: Extracted left central incisor21 as natural tooth pontic

Fig. 4: Root Resection 4mm below CEJ, Impregnated fiber (Interlig, Angelus)

The NTP was held in place with the help of a temporary holding device, such as a wire, the wire was temporarily attached to the labial side of the abutment teeth and NTP with flowable composite (Figure 4), without acid etching and without Figurebonding agent, so that it can be easily removed once the definitive bonding on the palatal side has been completed. The 3mm wide recess grooves were placed into the NTP and the adjacent abutment teeth. The NTP and abutment teeth were cleaned with pumice, washed, and air-dried.

Figure 5:; Impregnated fiber (Interlig, Angelus) attachedtonatural teeth 11,22

The proximal areas (adjacent to the extraction site) and required palatal surface was acidetched and fourth generation bonding agent was applied and light cured following which the flowable composite resin was applied onto the palatal surface of both abutment teeth and NTP. The fiber reinforced ribbon (Ribbond) was taken according to predetermined length measured by using dental floss and then impregnated with adhesive resin from a fourth generation bonding system. Because of decrease surface tension created by plasma treatment, the resin flows over and completely wets the surface of Ribbond. The uncured fiber reinforced ribbon was pushed into the composite resin starting at the mid-palatal surface of tooth #13 upto mid-palatal surface of tooth #22. Cotton pliers and burnisher were used to adapt and embed the fibers into the composite resin. The lingual surfaces were then light-cured for 60 sec/

tooth. After the curing of first layer of composite resin along with Ribbond, a layer of flowable composite resin is used on the palatal surface over the bonded Ribbond, to coat it completely. This provides additional strength and a smooth polished surface after curing. A medium viscosity hybrid composite in a tube was dispersed onto the facial

Figure 7 : Post Operative Photographs

surface of interproximal areas of the teeth to be splinted, purpose of this facial surface composite resin is to seal the interproximal areas against recurrent caries and to provide for 1800 wrap of composite resin to each of the splinted tooth hence provides additional fortification in the interdental areas. After curing of all layers of composite resin, excess composite resin material was removed using fine diamond instrument. The composite resin was contoured in the interproximal area, to protect the gingival papilla and allow optimal maintenance. All occlusal interferences with respect to splint area were checked and eliminated. Following completion of procedure (Figure 6), the remaining teeth were subjected to scaling and root planning on the same day. In contrast to pre-operative view, the final outcome was esthetical pleasant postoperatively and patient was satisfied with case resolution (Figure 7).

The patient was instructed to avoid excessive chewing pressure or habits that could dislodge the natural tooth replacement. The patient was guided the way to use interdental brush to clean the embrasure areas on the same day of treatment.

II. Discussion

Immediate replacement of lost anterior teeth prevents psychological and social problem for the patient [15]. Various available treatment options include placement of natural crown or acrylic tooth in fixed prosthesis [2, 10] or removable prosthesis [16,17], bridges [18], fiberreinforced composite [14-16], and implants [19]. Dental implant is the first and the best option for such situations, but it is an expensive procedure and as a result less expensive treatment options should be considered [8,10,20].

In this regard, using natural tooth as a pontic may offer several advantages over removable appliances, including better aesthetic, ease of use, and not accustomed to a removable prosthesis [19-22]. This approach would also permit utilization of a patient's natural crown as a pontic [10,23] for an immediate bridge, with little or no need to perform complicated laboratory procedures. Besides the use of resin composite to splint the pontic to neighboring sound teeth, it is also possible to use orthodontic wire or fiber splint [9,15].

This procedure is practical, economic, requires limited laboratory support and materials, and can be accomplished in a single appointment [24]. One major advantage of retaining the patient's natural crown is that, the patient can better tolerate the effect of tooth loss. Moreover, it provides the optimal pontic in terms of shape, color, size, and alignment [6,9]. This particular design allows for exact repositioning of the coronal part of the extracted tooth in its original intraoral threedimensional position [9,23]. In this case, shape of natural tooth pontic was given as modified ridge lap pontic with a well-polished, smooth, and convex surface that results in pressure-free [25] or mild contact with the alveolar ridge over a very small area for a better preservation of the soft tissue health [26].

Interlig (angelus, dental) is a braided glass fiber impregnated with light cured composite resin. It is biocompatible, esthetic, translucent and practically colorless and disappears within the composite without show through. It is manufactured by the process called Resination where the fibers are pulled along a convoluted path through the resin bath. Pressures at roller force resin into the fabric or fiber bundles.[27]

Ribbond consists of bondable, reinforced ultra-high-strength polyethylene fibers) with a high elasticity coefficient that makes them highly resistant to stretch and distortion and a high resistance to traction that allows them to easily adapt to tooth morphology and dentalarch contours .[10,28] "Gas-plasma" treatment of Ribbond helps in reducing the surface tension which facilitates resin flow over and completely wets the surface of ribbon . Ribbond fibers are also characterized by impact strength five times higher than that of iron .[8,29] Moreover, apart from significant benefits in terms of mechanical properties, the possibility of direct chair side application and the ability to bond to tooth structure make fiber-reinforced composite an attractive choice for a variety of dental applications such as stabilizing traumatized teeth, restoring fractured teeth and for directbonded endodontic posts and cores, orthodontic fixed lingual retainers and space maintainers .[8,930]Despite this versatility, there are few reports demonstrating the replacement of a severely periodontally compromised tooth utilizing a prefabricated composite resin framework reinforced with plasma-treated woven polyethylene fiber and the existing tooth as pontic. [10,28]The described ribbond-reinforced composite technology is a conservative, esthetic, cost effective, and practical alternative to the conventional metal-ceramic fixed partial denture for the situations in which extraction of severely periodontally compromised tooth needed to be removed. However, the procedure is highly operator dependent and demands appropriate case selection and precise technique.[8,9,29,30]

III. CONCLUSION

The case presented in this article suggests an interim treatment option for the replacement of missing anterior tooth in young children. The minimal invasive approach with fiber reinforced composite have shown satisfactorily results esthetically. Although the long term follow-up is required for the longevity of the prosthesis.

Ethical Considerations Compliance with ethical guidelines

This study was performed with informed consent in operative department of Dental School of Shahid Sadoughi University of Medical Sciences.

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Conflict of interest

The authors declared no conflict of interest.

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