

CASE REPORT



Root submergence technique for bone preservation to restore badly broken tooth – A case report

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Abstract

Root submergence is a minimally invasive surgical technique introduced to preserve alveolar ridge volume in comparison to other partial extraction therapies that are currently mentioned in literature. This case report describes a conservative method of restoring non-restorable anteriorly fractured tooth in growing patient. The aim of this treatment method is to maintain hard tissue and soft tissue in anterior zone for future implant placement. A 13-year-old female patient presented to our primary care dental clinic with dental trauma that occurred 3 years ago. The chief complaint was to restore the badly broken teeth for esthetic purposes. The tooth was restored with a resin-bonded bridge and root submergence was done considering the need for future implant placement. Root submergence in the upper left central incisor (21) has been done to prevent buccopalatal collapse of the post-extraction bone. The root submergence technique helps in retaining the bone, thus reducing bone resorption. Considerable success has also been demonstrated in maintaining the periodontal tissues at the pontic site with this technique. This enables future dental implant placement without the need for bone augmentation. The treatment was successful and the patient is under follow-up and review visits. We did not notice any signs and symptoms of failure. This technique is minimally invasive and very successful in young patients for whom implant treatment is considered in the future.

Keywords: Bone preservation, endodontic treatment, minimally invasive dentistry

Introduction

About 25% of children and 33% of adults have been reported to have experienced some form of trauma to their permanent dentition. Majority of injuries occur before the age of 19 causing significant esthetic concern.^[1] There has been greater concern regarding esthetics and overall appearance among schoolchildren and teenagers in the recent years.^[2,3] Children can turn unkind and hostile to those with the above-mentioned visible differences, with teasing and bullying as overt consequences.^[2,3] A total of 75% of children reported that considerable distress was caused due to teasing or bullying about their appearance.^[2] According to Newton *et al.* in the absence of other information, people are judgmental based on their appearances.^[4]

Resin-bonded bridges (RBBs) are the most common non-invasive and adhesive technology used for the replacement of missing natural teeth. They are minimally invasive compared to conventional bridgework and require very minimal tooth reduction. Recent advances in the adhesive technology and

materials have led to RBBs being considered the first choice of treatment for missing anterior teeth.^[4]

Successful root submergence is one of the partial extraction therapy techniques that prevent ridge resorption after tooth loss, which is well reported in the literature.^[5] This loss of alveolar bone and change in ridge contour is the result of the resorption and shrinkage of bundle bone and loss of the associated periodontal ligament.^[6,7] Ridge preservation techniques used in conjunction with minimally invasive tooth replacement strategies in young patient help to preserve the necessary bone and architecture for future implant consideration.^[7] This clinical report describes the fabrication of RBB after root submergence technique and root canal therapy retreatment in a young female patient.

Case Report

History, complaint, and examination findings

A 13-year-old female patient accompanied by her father reported to the primary care dental health center clinic, Ministry

of Health in Bahrain with the chief complaint of badly broken 21 due to trauma. History of the chief complaint revealed that the fracture occurred 3 years ago. The tooth was asymptomatic. The patient had undergone root canal therapy for the tooth 21 and a inadequately restored composite resin restoration was given, which fractured multiple times due to insufficient tooth structure to retain the composite core.

On examination, 21 showed complicated crown root fracture extending 4 mm subgingivally [Figure 1]. The tooth was deemed to be non-restorable as the crown measured 9.5 mm, the root length was 13 mm, and the fracture line was 4 mm subgingivally. The aim now was to provide an esthetic tooth replacement option for the patient. Since the patient was 13 years old, the option of implant was suggested after a couple of years, once the growth spurt is completed. Hence, the aim was to use a technique that will preserve the available bone for future implant patient and provide a solution for tooth loss esthetically as well.

Treatment plan and clinical procedure

Considering the age of the patient and aesthetic demand, it was planned to do root canal retreatment and root submergence followed by RBB. The root canal treatment was repeated considering that there was no coronal seal and the canal was open for almost 3 years. The objective of the treatment was to preserve the bone in highly esthetic demand area for future implant placement and to replace the missing space. After thorough oral hygiene instructions and increase patient motivation toward the dental care, treatment was commenced in three phases:

Endodontic phase

Slip dam technique was used to isolate upper left central incisor. Old gutta-percha was removed by mechanical method with adjuvant chemical solution. Retreatment was completed using cold lateral condensation obturation technique [Figure 2].

Periodontal phase

Partial extraction therapy (root submergence) was performed. In this technique, the first step was decoronation of the tooth at the level of the crestal bone. The coronal portion of the root was hollowed out. This provided the necessary soft-tissue profile for an ovate pontic. Soft-tissue closure was then achieved to ensure healing by primary intention. The attached gingiva was released, advanced, and sutured without any soft-tissue graft. The site was left to heal for a period of up to 3 months before pontic placement [Figures 3 and 4].^[7]



Figure 1: Pre-operative photographs

Prosthetic phase [Figure 5]

After a 3-month healing period, complete soft-tissue healing was achieved. A cantilever RBB was planned for the missing tooth with 11 as pontic. The cantilever design was chosen because of the evidence on the superiority of cantilever design compared with a fixed-fixed design.^[8] Metal retainer wings were used with porcelain fused to metal pontic. Metal was chosen considering the advantage of extremely minimal tooth preparation and burnishability of the metal. The incisal edges were not included considering the metal display and there was sufficient tooth structure available for bonding in tooth 11. Consent was taken for all the steps [Figure 5].

Discussion

This case report aims to provide the best possible bone preservation technique to restore badly broken teeth that necessitate future implant placement. In this case, root submergence was attempted and a cantilever RBB was fabricated to restore badly broken non-restorable tooth 21.



Figure 2: Endodontic retreatment for tooth 21



Figure 3: Root submergence procedure



Figure 4: Three months' post-operative photograph after root submergence



Figure 5: Final restoration using resin-bonded bridge

Orthodontic extrusion and crown lengthening have been attempted in the past for tooth presenting with similar presentation. In this case, orthodontic extrusion cannot be performed as there is no surface area on the fractured tooth to bond a button plus extrusion will compromise the crown:root. Crown lengthening is practiced by many dentists to gain sufficient tooth structure to maintain the composite core. A post is then placed followed by a composite core and a full coverage extra-coronal restoration. If crown lengthening was attempted in this case, the crown:root would be turn negative or <1 . Hence, crown lengthening was not considered as a treatment option for this patient. The maximum vertical growth in maxilla is attained at 17–18 years in females.^[6,7] Hence, implant placement at or before this age is not recommended. Post-extraction ridge collapse with varying degrees of alveolar resorption has been the immediate effect following extraction, and this has been reported in literature.^[9,10] The hard- and soft-tissue defects that are caused due to resorption affect both the quality and quantity of available bone and compromise the ideal implant treatment planning. This can lead to esthetic failure of the final restoration.^[10] A ridge defect that is formed following tooth extraction and subsequent loss and collapse of bundle bone may require extensive surgical intervention before a definitive restorative treatment plan is made. Techniques such as guided bone regeneration (GBR), bone block GBR procedures, and ridge split techniques provide replacement of lost hard tissue. However, these techniques limited by the fact that there is associated increased morbidity, technique sensitivity, and increased costs.^[6,8] The clinician should be aware of the pros of cons of the above-mentioned ridge augmentation techniques that may only provide limited gains, in spite of the surgical intervention.

Root canal therapy retreatment was performed in this patient. This is because coronal leakage has been suggested as one of the possible causes for post-treatment endodontic disease leading to endodontic failures.^[9] *In vitro* laboratory studies indicated that adequate and proper coronal seal is an important factor that determines the prognosis of endodontically treated teeth.^[9]

Preventing ridge collapse before it occurs or limiting collapse as far as possible is beneficial to both patient and clinician.^[8] Root submergence was originally introduced as a technique to preserve alveolar ridge volume beneath more than 3 decades ago compared to other partial extraction therapies which are supported poorly by the literature.^[8] RBB was chosen because it is a minimal invasive way of replacing missing teeth compared to conventional fixed prosthodontic treatment using fixed bridges and a systematic review by Pjetursson *et al.* reported a survival rate of 87.7% at 5 years.^[8]

Conclusion

Root submergence is considered a more conservative ridge preservation strategy for teeth slated for extraction. This technique has demonstrated promising results. Resin-bonded bridges are a conservative and potentially non-invasive treatment modality used to replace missing teeth. The case report showed promising results and the patient was satisfied with the treatment that was provided.

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