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Research Paper

Aesthetic Tooth Transplantation - a case report

Medical Science

KEYWORDS : surgical extrusion, cervical crown root fractures, crown lengthening, intra-alveolar transplantation

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ABSTRACT

Teeth associated with fracture at the cervical margin on the gingival level, that were earlier planned for extraction, now have the likelihood of being saved and restored either by crown lengthening, orthodontic extrusion or surgical extrusion. Some of these treatments require an extended period of treatment, some are expensive and some do not offer a good aesthetic outcome. Intra-alveolar transplantation is an alternative treatment option in the management of teeth fractured at the gingival level. This clinical report describes an atraumatic surgical extrusion in which the tooth was carefully extracted using a periotome, inspected carefully for any fractures, rotated 180°, replanted back in the socket and fixed with sutures. After 4 weeks the tooth was root-canal treated, post and core fabricated and was restored with a crown. A 10-month follow up was done to check for optimal functioning of the tooth. This treatment option proved to be cost and time effective with good aesthetic results.

Introduction

Crown lengthening is usually required for exposing subgingival caries or fractures and to increase the ferrule on a short clinical crown by providing more amount of sound tooth structure above the alveolar crest, thus avoiding impingement on the biological width [1]. This biological width invasion leads to trauma to the periodontium, which leads to decreased marginal hemostasis, thus compromising recovery.

This recovery can be enhanced either by crown lengthening (apical positioning of the flap in conjunction with ostectomy) or Orthodontic tooth extrusion.

Treatment time for crown lengthening is short, but the crown-root ratio decreases and so does the esthetic result [2]. Orthodontic treatment on the other hand is less invasive, improves esthetics, does not interfere with periodontal ligament support of neighboring teeth, is the only method to preserve pulp vitality in teeth fractured at the gingival level, but is expensive and time consuming [3].

Surgical extrusion or intra-alveolar transplantation

Grossman [4] defined replantation as "The purposeful removal of a tooth and its almost immediate replacement with the object of obturating the canals apically while the tooth is out of its socket." Intra-alveolar dental transplantation was first developed by Tegsjo et al [5] on teeth fractured by trauma in youngsters. His surgical technique included full thickness flaps both buccally and lingually with relieving incisions only buccally, after which the root apex was exposed by ostectomy and the root apex was pushed carefully out of the socket to the desired position; for providing tooth stability and to prevent tooth relapse, bone grafts were placed apical to the root and splinting was not recommended [5].

In another technique by Khanberg [6] careful and gentle root luxation was advocated until the desired extrusion of the tooth was achieved followed by interdental sutures and a surgical dressing as an aid for retention in the new position; eliminating the need for both ostectomy and bone graft.

In a follow up study on surgical extrusion Khanberg [7] compared the two techniques in 58 single rooted teeth in 53 patients. He divided them into group I (surgical flap raise with apical exposure and a graft after extruding the tooth) and group II (careful luxation of tooth, interdental sutures, and surgical dressing) and concluded that apical resorption though seen in both the approaches was seen more frequently in group I.

According to Andreasen [8], surgical extrusion may be prognostically compared to extrusive luxation, having low incidence of root resorption as the root never leaves the socket and the periodontal cell death due to drying. This technique also has results in agreement with the favorable results seen with autotransplantaion of teeth.

The biological behaviour of socket after careful surgical extraction helps the replanted tooth integrate with the socket. A coagulum forms in the periodontal ligament space immediately after replantation and after 3 to 4 days the space gets obliterated by connective tissue; after 1 week epithelium gets reattached at the cemento-enamel junction [8]. This helps in keeping the tooth in position with optimum health and function.

This article presents a case report where the patient was subjected to an atraumatic surgical luxation followed by its careful extraction using a periotome, inspected carefully for any fractures, rotated 180°, replanted back in the socket and fixed with sutures. After 4 weeks the tooth was root-canal treated, post and core fabricated and was restored with a crown.

Clinical Report

A 30-year-old female patient was referred to the Department of Prosthodontics, Bharati Vidyapeeth Dental College and Hospital for crown-root fracture of the maxillary left central incisor as a result of cervical root caries.

Clinical examination revealed that the tooth margin was subgingival and extended apically to the alveolar crest on the mesial aspect with the lingual wall more exposed supragingivally than the buccal wall (**Fig.1**).

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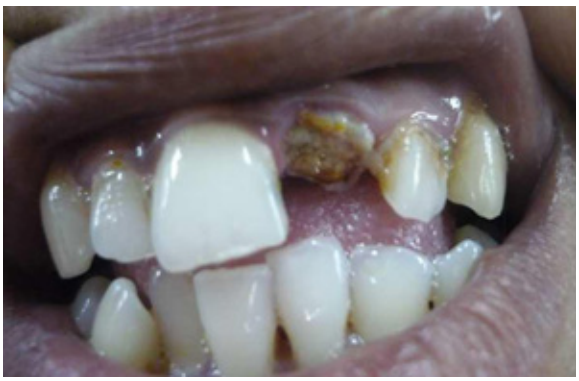

Fig. 1: Pre-operative intra-oral view

The radiograph comfirmed the picture (Fig.2).

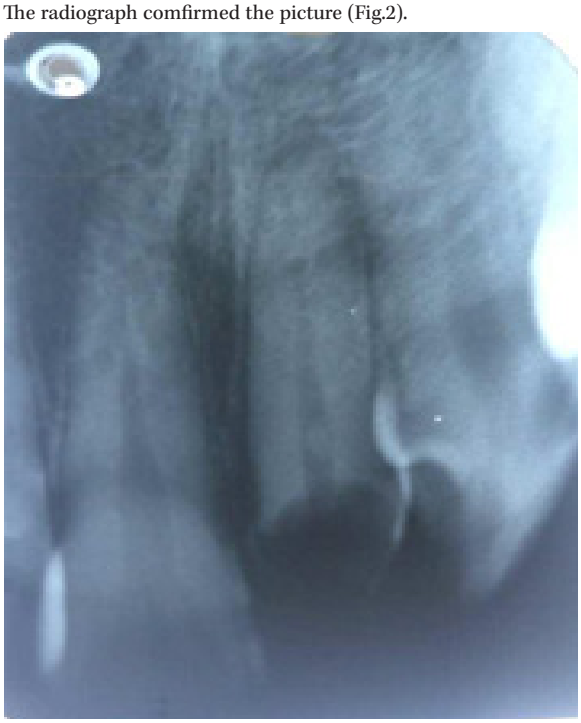

Fig. 2: Pre-operative radiographic view

The patient was suggested various treatment options including extraction followed by a bridge or an implant, but the patient insisted on saving her original tooth. The procedure for intra-alveolar transplantation was explained to the patient and her consent was taken for the same.

After administration of local anesthesia, the tooth was carefully luxated and extracted with the help of a periotome (**Fig.3**).

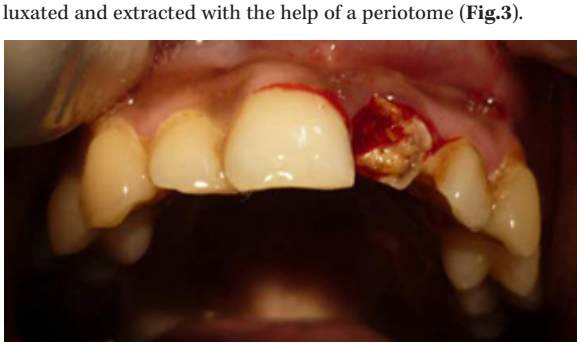

Fig. 3: Atraumatic tooth luxation

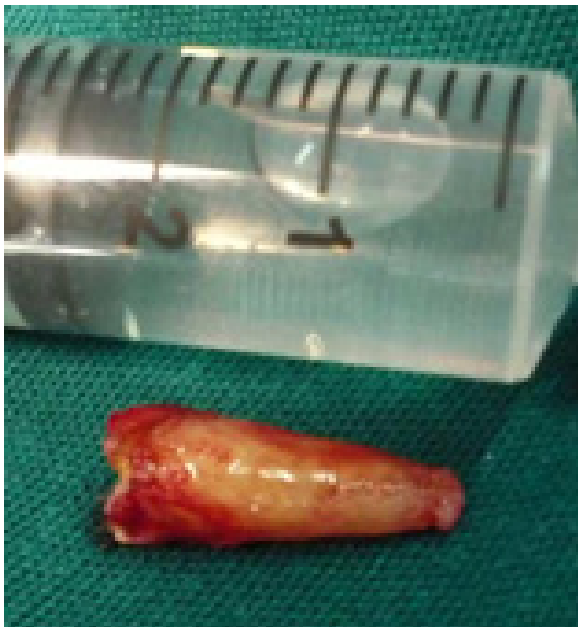

Fig. 4: Extracted tooth examined for fracture(s)

The extracted root was examined visually for suspected fracture(s) (**Fig.4**),

and was gently placed into the socket with 180° rotation to prevent it from seating back in the socket and maximizing the contact of the root with the bone [9]. The lingual aspect now became the buccal aspect exposing the buccal wall more (**Fig. 5**). The replanted tooth was stabilized with 3-0 silk suture in a box type fashion (**Fig.6**).

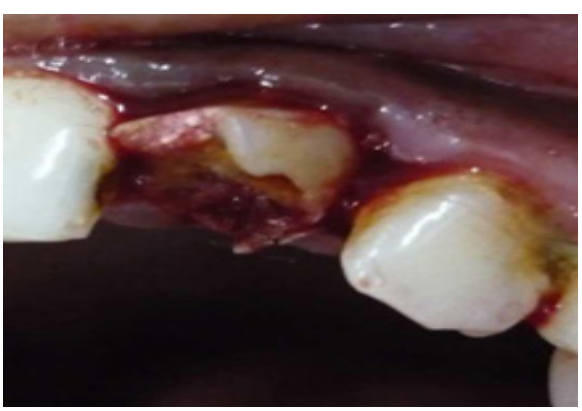

Fig. 5: Tooth replanted at the desired level

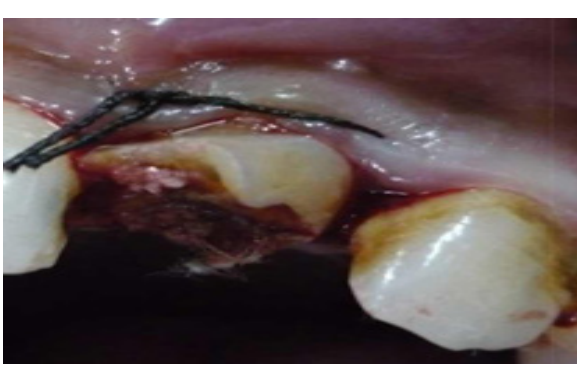

Fig. 6: Box type sutures for functional splinting

The patient was given regular post extraction instructions and antibiotics, analgesics and chlorhexidine 0.2% rinse were prescribed to prevent infection.

Seven days after replantation, the suture was removed. Mild mobility was detected which reduced in the subsequent week (**Fig. 7**).

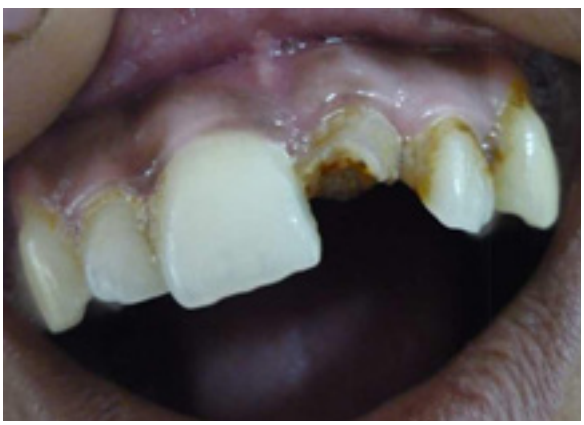

Fig. 7: Post-operative view one week later

Root canal therapy was initiated 4 weeks later after the tooth was sound both clinically and radiographically. A sectional root canal filling was performed and a temporary filling given.

After 2 weeks the patient was called in for post space preparation (**Fig. 8**). The impression was made using pattern resin (**Fig. 9**). It was milled in zirconia using CAD/CAM technology (**Fig. 10 & 11**), followed by a zirconia crown (**Fig. 12**).

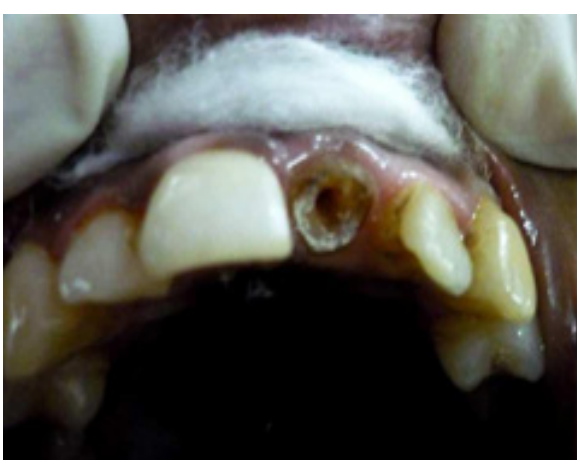

Fig. 8: Post space preparation

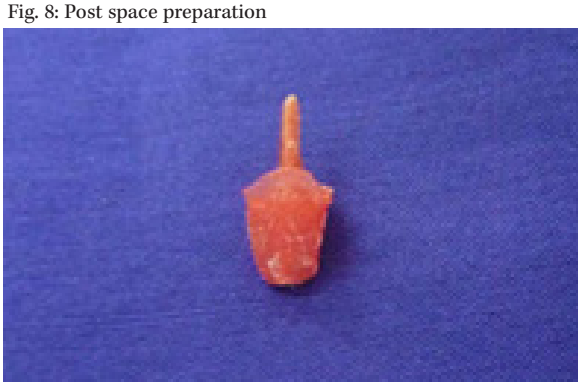

Fig. 9: Pattern resin post

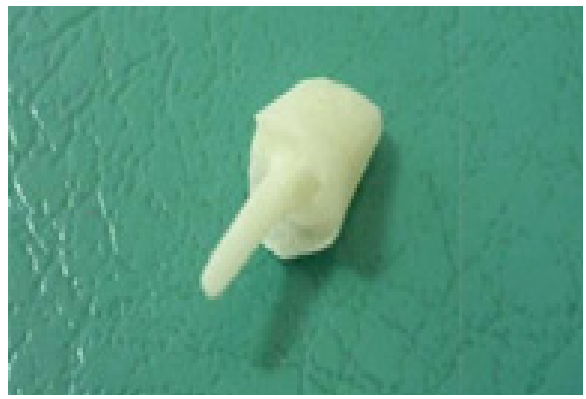

Fig. 10: Zirconia post milled using CAD-CAM technology

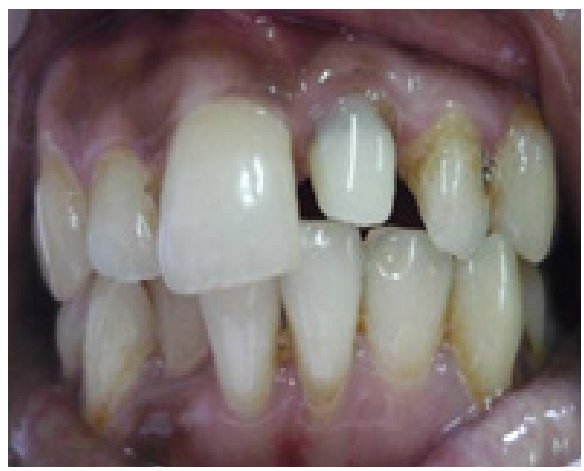

Fig. 11: Zirconia post cemented

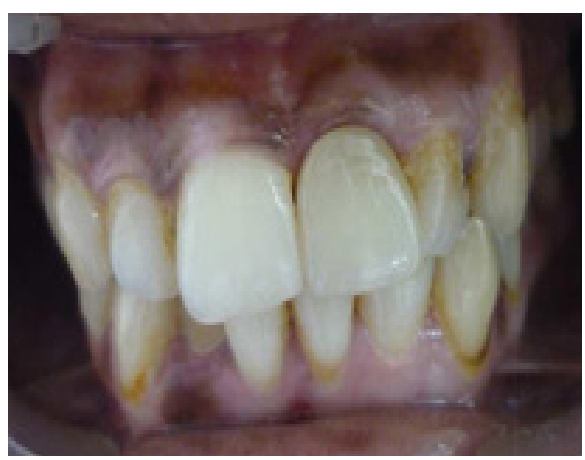

Fig. 12: Zirconia crown cemented

The patient was instructed not to bite with her anterior teeth and was given instructions about oral hygiene. The patient was recalled the following week. No mobility or pain was observed. The same was observed every month for 3 months after the final restoration was given.

After 3 months slight apical root resorption was observed by slight shortening of the root on the radiograph but in no case was it progressive in nature. The patient complained of no pain on percussion or mobility or any difficulty in function. The patient was again reviewed 6 months and 10 months after cementation (**Fig. 13**), she had no complaints and was satisfied.

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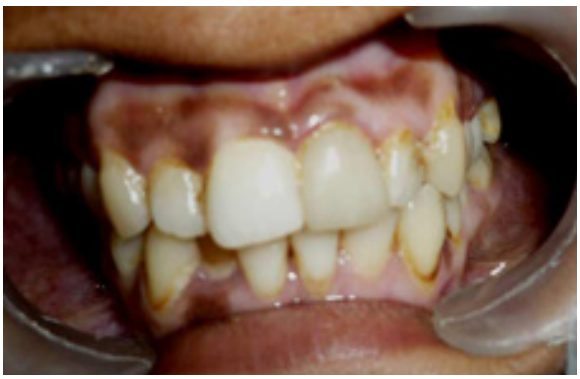
Fig. 13: Ten months later intra-oral view



Discussion

Even though dental implant therapy has become popular, the decision to conserve the natural tooth with a functional and healthy periodontium is an effective alternative treatment option for crown-root fractures. This treatment modality was chosen to prevent extraction of the tooth and its eventual replacement with artificial substitutes like removable or fixed partial dentures or implant prosthesis. It also avoids the unesthetic crown lengthening procedure and the time consuming orthodontic treatment.

The *principle* is to expose the tooth above the alveolar crest by moving it in a supragingival position thereby providing room for the re-establishment of the biological width.

Rotating the root 180˚ provides primary stability as it gives a better root to socket adaptation and helps reattachment of periodontal ligament fibers [9]. Also since the root does not seat completely in its original position, crown lengthening and ferrule effect is achieved without the risk of the root slipping back into its original position. Additional surgery for ostectomy and bone grafting is not required.

Splinting of replanted tooth was traditionally thought to be essential for periodontal repair [10]. However, no significant difference in periodontal healing was reported with rigidly, physiologically or non-splinted replanted

teeth in a study by Berude et al [11]. Functional splinting was provided as it maintains some degree of tooth mobility, which appears beneficial to periodontal healing and prevents ankylosis and root resorption [12, 13].

This technique is *indicated* for teeth with complete root formation. The remaining intra-alveolar root portion should also be long enough to support a core-retained crown.

It should however not be carried out when the tooth fracture is too apical within the alveolus and when remnant root remains structurally weak, enhancing the risk of root fracture.

This technique has many *advantages*. It enables a reduction of operative and overall treatment time, it is extremely conservative, allows complete maintenance of gingival and bone architecture, and gives better esthetics. Preservation of periodontal ligament fibers provides proprioception.

It however has some *limitations* too. It is not always possible to attain a crown root ratio of a minimum of 1:1. It may result in cervical root resorption. Most replanted teeth often show root resorption approximately 2 weeks after replantation on radiographic examination. The prognosis of replanted teeth depends on periodontal healing. Damaged cementum and persisting root canal infection can cause external inflammatory root resorption [14]. Appropriate endodontic therapy is a key factor in arresting the resorptive process [15]. It has been shown that using Ca(OH)2 which has antibacterial properties [16], may retard the action of resorptive cells and promote healing [14].

Surgical trauma during root luxation may induce marginal bone resorption. Extra-alveolar period of the tooth to be replanted also affects the prognosis as it affects the viability of periodontal ligament cells [17]. It is recommended to minimize extraoral time (less than 15 minutes) to preserve periodontal ligament viability [9].

Conclusion

Intra-alveolar transplantation with functional splinting is an efficient treatment option for teeth fractured at the cervical margin. Meticulous planning is very important for the success of the replanted tooth. The replanted tooth should not have advanced periodontal disease. The tooth should be carefully extracted avoiding root damage and replanted with minimizing extra-oral time followed by systematic antibiotic prescription. Suture fixation should be enough to prevent the replanted tooth from extruding. This should be followed by an appropriate endodontic therapy to completely eliminate any root canal infection.

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