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Case Report

# Endodontic Stabilization with Titanium Screw in Conjunction with Periapical Surgery: A Case Report

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## Abstract

Teeth with short root crown ratio due to incompletely formed root if also associated with large periapical pathology may have poor long-term prognosis. This paper reports a case of maxillary central incisor with incompletely formed root apex and large periapical pathology which was managed successfully by surgical removal of pathology followed by stabilization of the tooth with the help of a titanium screw through retrograde approach.

***Keywords:*** *Endodontic Implants; Endodontic Stabilizer; Immature Root; Root-Crown Ratio; Titanium Screw*

## Introduction

Disturbances in root development occurred due to dental trauma to immature permanent teeth can lead to short roots. Short roots of a tooth can also occur because of resorption of the originally well-developed root either due to infection or due to orthodontic tooth movement. Both the clinical conditions end up into unfavourable root crown ratio and may affect tooth long-term survival.

Management of teeth with inadequate radicular development (thin dentinal walls) and necrotic pulp tissue is a challenge. Various treatment modalities have been used to manage such cases like customized cone obturation, surgical management or apexification [1] with various materials like calcium hydroxide, MTA, biodentine, freezed dried cortical bone, dentinal shaving, bone morphogenic proteins etc but none of these techniques can change the unfavourable root crown ratio into favorable. Recently revascularization is gaining popularity to treat nonvital immature teeth and showed promising results in the form of increase in length of root and dentinal wall thickening [2]. However, predictability of revascularization is uncertain. In addition, cases with unfavourable root crown ration due to resorption cannot be treated with revascularization.

Endodontic implants/Endodontic endosseous implants/diodontic implants/endodontic stabilizer can be defined as artificial metallic extension, extending out through the apex of the tooth into sound bone [3]. It stabilizes a tooth with weakened support by increasing the root crown ratio and can increase the longevity of tooth in oral cavity. Endodontic endosseous implants has advantage of being completely intraosseous and does not communicate with the oral cavity. Almost 60 years ago, Orlay reported its use for stabilising periodontally compromised teeth [4]. Frank provide details on the improvement of the root-crown ratio by endodontic endosseous implants [5].

A tooth with grossly impaired root-crown ratio can be saved to some extent by the use of Endodontic stabilizer, but due to many failures, in contemporary dentistry extraction of tooth followed by endosseous implants has almost completely replaced it [6]. The reasons for failures include improper case selection, improper sealing of implant and root apex interface and poor implant placement [7]. In a tooth with a wide canal, sometimes it will be difficult to get such a seal with commercially available endodontic stabilizer. Placement of a customized stabilizer may be helpful in such cases to retain the tooth in a functional state.

This case report presents a maxillary central incisor with incomplete developed root and periapical pathology which was managed by root canal treatment, surgical removal of pathology and placement of a titanium screw luted with MTA Fillapex sealer to increase a root-crown ration and stabilize the tooth.

## Case Report

A 19-year-old female patient was referred to the Department of Conservative Dentistry and Endodontics with the chief complaint of pain in her upper front tooth and sulcus area since last few days and inability to chew on the tooth due to pain and mobility. Patient gave a history of trauma during her childhood and attempted root canal treatment by her referring general dentist couple of months back. No medical issues in her history was identified that may have impacted the treatment.

Clinical examination revealed discolored 21 with Ellis class II fracture, which was tender on palpation and percussion however, sensibility tests were negative. Intraoral periapical radiograph of 21 revealed an incompletely formed root with thin dentinal walls, wide root canal and associated large periapical radiolucency (Figure 1). The treatment planning options that were discussed included: (i) Apexification, root canal obturation followed by surgical removal of periapical pathology; (ii) Cyst enucleation followed by root lengthening with the help of a titanium screw through retrograde approach to improve the crown-root ratio; (iii) Extraction and placement of an endosseous implant; (iv) Extraction and placement of a bridge. The patient opted for cyst enucleation followed by root lengthening with the help of a titanium screw through retrograde approach. Treatment was explained to the patient and an informed consent was obtained.


***Figure 1:*** *(a, b) Preoperative image and radiograph demonstrating a large periapical lesion associated with tooth 21, (c) bone overlying pathology removed, cyst lining visible, (d) cyst enucleated, granulation tissue removed, labial cortical plate missing in relation to 21, (e) Leibinger titanium bone plate and screw box and mini screw, (f) titanium screw luted in root retrogradely with MTA Fillapex, (g) PRF mixed with bone graft, (h) bony cavity filled with graft material, (i) Flap secured with sutures.*

Access was modified and previous root canal filling material was removed under rubber dam. No further canal instrumentation was done to prevent further weakening of the root. Disinfection of the canal was done using calcium hydroxide as an intracanal medicament for 3 weeks.

On the day of surgery for surgical enucleation of the cyst bilateral infraorbital and nasopalatine block was given with 2% lignocaine hydrochloride with 1:80,000 adrenaline (Lignox 2% A, Indoco Remedies Ltd). A two-sided vertical flap was raised from distal margin of 12 and 31. Bone overlying the cyst was removed with round bur under copious irrigation with normal saline (NS, Swarop Pharmaceutical Pvt Ltd). Cyst was removed in toto. After cystic enucleation curettage of bony defect was conducted thoroughly along with simultaneous irrigation with normal saline. 21 had little bone support of labial cortical plate along with immature wide roots with thin dentin. A Leibinger titanium mini screw (Stryker Leibinger, Germany) corresponding to the apical canal size was selected from a bone plating system. MTA Fillapex sealer (Angelus, Londrina, Brazil) was mixed as per manufacturer directions to form a smooth paste. Selected titanium screw was coated with the MTA Fillapex sealer and the screw was luted through bony cavity so that tip was placed towards the crown and head towards the bony cavity. Bony cavity was filled with bone graft (B-OSTIN 100% synthetic bone graft substitute - HA nano) mixed with PRF to promote rapid healing. Flap was secured in position with sutures (000 braided coated silk, Silkus, Lotus Surgical Pvt Ltd) in vertical flap and marginal gingival (Figure 1). Occlusion was adjustments, particularly in protrusive excursion. Antibiotics and analgesics were prescribed.

After a week patient was recalled and evaluated. Healing was uneventful, sutures were removed. Histopathological report confirmed the diagnosis of an infected radicular cyst. Root canal was filled with thermoplasticised gutta percha and AH plus sealer. Access opening was closed with glass ionomer cement. First follow-up done after 6 months revealed that the tooth was stable and some osseous repair was also evident. Patient didn't report on further follow-ups as she got married was relocated to some other state. After 5 years she returned back for treatment of discoloration and restoration of her fractured angle of 21. Her clinical examination revealed asymptomatic 21 and IOPA radiographs and CBCT showed bone formation around the titanium screw (Figure 2).

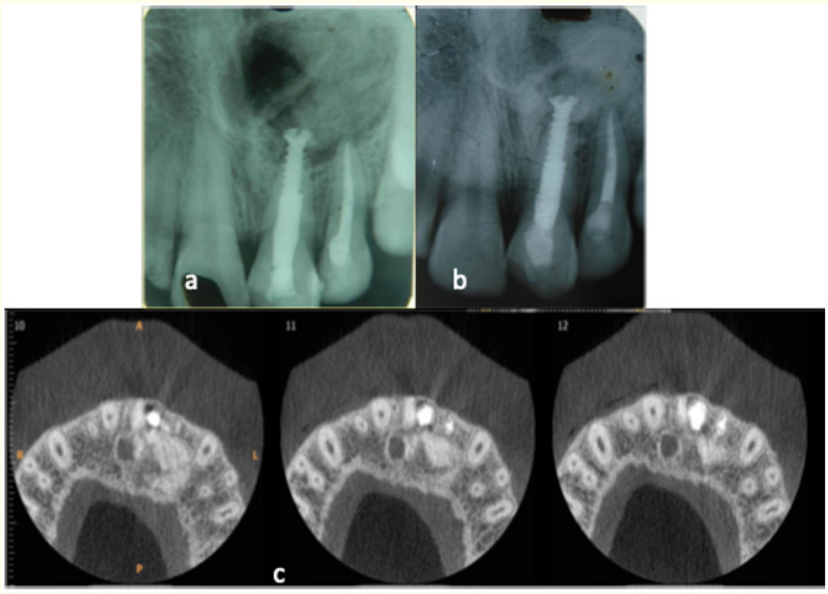


***Figure 2:*** *(a) IOPA radiograph after one week of stabilizer placement showing obturation and post endodontic restoration, (b) 5 year follow up IOPA radiograph, (c) 5 year follow up CBCT showing formation of labial cortical plate.*

## Discussion

Preservation and maintenance of the natural tooth is the prime consideration in modern dentistry. Extraction and subsequent replacement should only be considered after all other possible modalities of retaining the natural tooth have been fully explored.

The root-crown ratio has been a valuable variable for evaluation of biomechanical factor for long term prognosis of a tooth. Immature root apex along with presence of radicular cyst may jeopardize the root support ultimately altering the biomechanical response of the tooth, which may result in unfavourable stress distribution and increased tooth mobility thus ultimately affecting the long-term prognosis of the tooth.

Endodontic stabilizers can be used in a variety of situations to maintain teeth that may otherwise have to be extracted [8,9]. Studies have shown endodontic implants to be of considerable benefit in improving the crown root ratio by increasing root stability [7,8].

ADA Council on Dental Materials, Instruments, and Equipment dictates that endodontic implants are safe and effective if case selection is done carefully [10].

In the present case as the tooth support was less due to short root length and bone loss in the apical area as well as labial surface, favorable root-crown ratio was needed to be achieved for long term prognosis. Endodontic endosseous implants offer stabilization of teeth that have inadequate crown root ratio. In the present case root canal was wide enough to use endodontic stabilizer. Discrepancy existing between endodontic stabilizer and canal may lead to inadequate apical seal, thus leading to periapical breakdown and endodontic failure [7]. Adequate sealing of endodontic implant can be achieved when done in conjunction with periapical surgery and direct observation may improve the outcome of implant surgery [11].

As apex was wide open and considerable bone loss in the apical area was present, titanium screw through retrograde approach was chosen over endodontic implant through orthograde approach. Therefore, a titanium mini screw was selected corresponding to the size of apical canal dimensions. Titanium screw was used because of its high biocompatibility and low corrosion ratio as compare to Ni-Ti [12]. Sealing the apical portion between the root end and endodontic implant and its biocompatibility is likely an important factor for success so endodontic stabilizer was luted with MTA Fillapex sealer which is biocompatible and bioactive. It's one of the component MTA stimulates the healing process of periapical tissues by constantly releasing calcium hydroxide and maintaining alkaline pH and hydroxyapatite crystal nucleation [13].

Evaluation of the periapical healing is required in such cases. Clinical and radiographic (IOPA radiograph and CBCT) follow up showed that the tooth was asymptomatic and there was reduction in the tooth mobility and size of the periapical lesion. Mobility was decreased remarkably after two years. CBCT is one of the latest and most advance type of digital radiography to assess the bone healing during the follow up period. Follow up CBCT revealed bone formation in the bony crypt and around the titanium screw.

## Conclusion

Endodontic stabilizers can be used in a variety of situations to maintain teeth that may otherwise have to be extracted. Studies have shown endodontic stabilizer to be of considerable benefit in improving the root-crown ratio thus increasing root stability.

## Conflict of Interest

Nil.

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