

# Rehabilitation of surgically failed anterior teeth using bioactive material and monoblock effect

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## INTRODUCTION:

Retaining one's own tooth and more over improving its function and esthetics is what most patients coming to a dentist expects. This is what endodontic therapy followed by a good restorative treatment should provide. Extraction of the teeth is generally undesirable and should be considered as the last resort due to the limitation of alternative

prosthodontic replacement. Persistent periapical infection despite surgical procedures can be eliminated with careful endodontic intervention.

Gagliani et al in their study that compared the outcome of peri-radicular surgery in teeth that had previously undergone surgical treatment versus teeth that were undergoing a surgical procedure for the first time over a period of 5 years observed that

## ABSTRACT:

Endodontic re-surgery can be considered to manage any failure associated with previous apical surgery. Although the outcome of re-surgery is said to be lower than the first time surgery, re-surgery can be considered as a valid alternative to extraction especially when the reason for the first surgical procedure is determined and eliminated. Modern techniques and the availability of bioactive and adhesive materials have helped in resurrecting teeth that were deemed hopeless. Using these materials and techniques enable to achieve a total coronal-apical seal for promoting a predictable periapical healing and strengthen the mutilated tooth by obtaining intra-radicular reinforcement through monoblock effect when compared to conventional retreatment procedures. This article describes a case of re-surgical management and rehabilitation of surgically failed and mutilated upper anterior teeth by employing bioactive and adhesive materials instead of the conventional approach.

**Key words:** Biodentine, Glass fibre post, Monoblock effect, Rehabilitation.

complete healing was lower in periapical resurgical procedure (59%) as compared to a primary surgical approach (86%).<sup>1</sup> Nevertheless, surgical retreatment of teeth previously treated with surgery can be considered as a valid alternative to extraction especially when the reason for the first surgical procedure is determined and eliminated.<sup>2</sup> The advances in modern dental practice can aid the dental clinician to predictably achieve success for cases that were deemed impossible earlier.

Various factors insuring the success of an endodontic treatment are;

1. Disinfection of the root canal system
2. Fluid tight seal from the coronal to the apical end of the root canal
3. Reinforcement of the radicular and coronal dentin

All the above mentioned aspects have undergone dramatic changes in contemporary endodontics with the introduction of modern dental equipment and the current advances in materials, concepts and techniques. The advances in the form of availability of bioactive and adhesive materials and concepts and techniques facilitating monoblock effect can be expected to enhance the positive outcome and promote greater success in relation to retreatment or re-surgery when compared to regular retreatment procedures in endodontics. The present case report integrates all these aspects in successfully treating surgically failed and mutilated upper anterior teeth by using bioactive and adhesive materials to obtain a total seal and monoblock effect.

## CASE REPORT

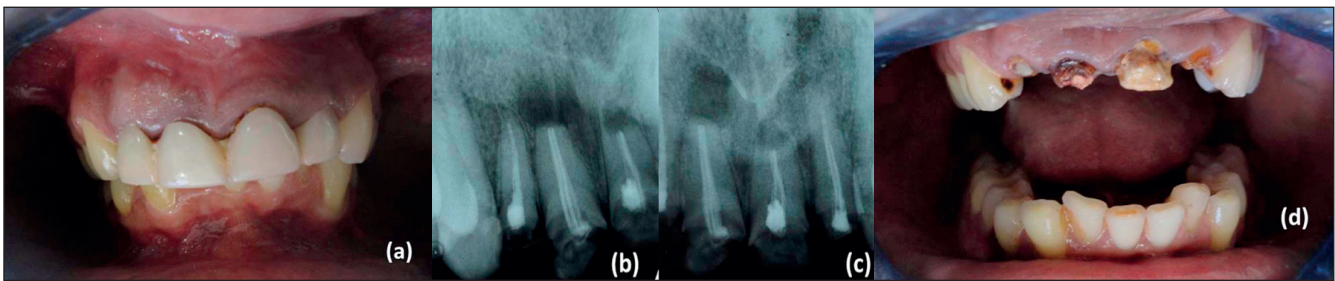
A 30 year old male patient reported to the Department of Conservative dentistry and Endodontics with a chief complaint of unaesthetic and defective crowns with respect to the upper incisors. Patient gave a history of root canal treatment with respect to the upper incisors and periapical surgery with respect to 11 and 21 approximately 2 years ago. On clinical examination joint crowns were present in relation to 12, 11, 21 and 22 (Figure 1a). Radiographic examination revealed inadequately obturated 12, 11, 21 and 22 (Figure 1b and 1c). Resected apices with periapical radiolucency with respect to 11 and 21 were also seen in the intra-oral periapical radiograph. The treatment plan was explained to the patient and

consent was obtained. Removal of joint crown revealed grossly carious 12, 11, 21 and 22 (Figure 1d). Caries were removed and remaining tooth structure was assessed. Due to the lack of remaining tooth structure to attain an adequate ferrule, a decision to extract 12 and 22 and to retain 11 and 21 was taken.

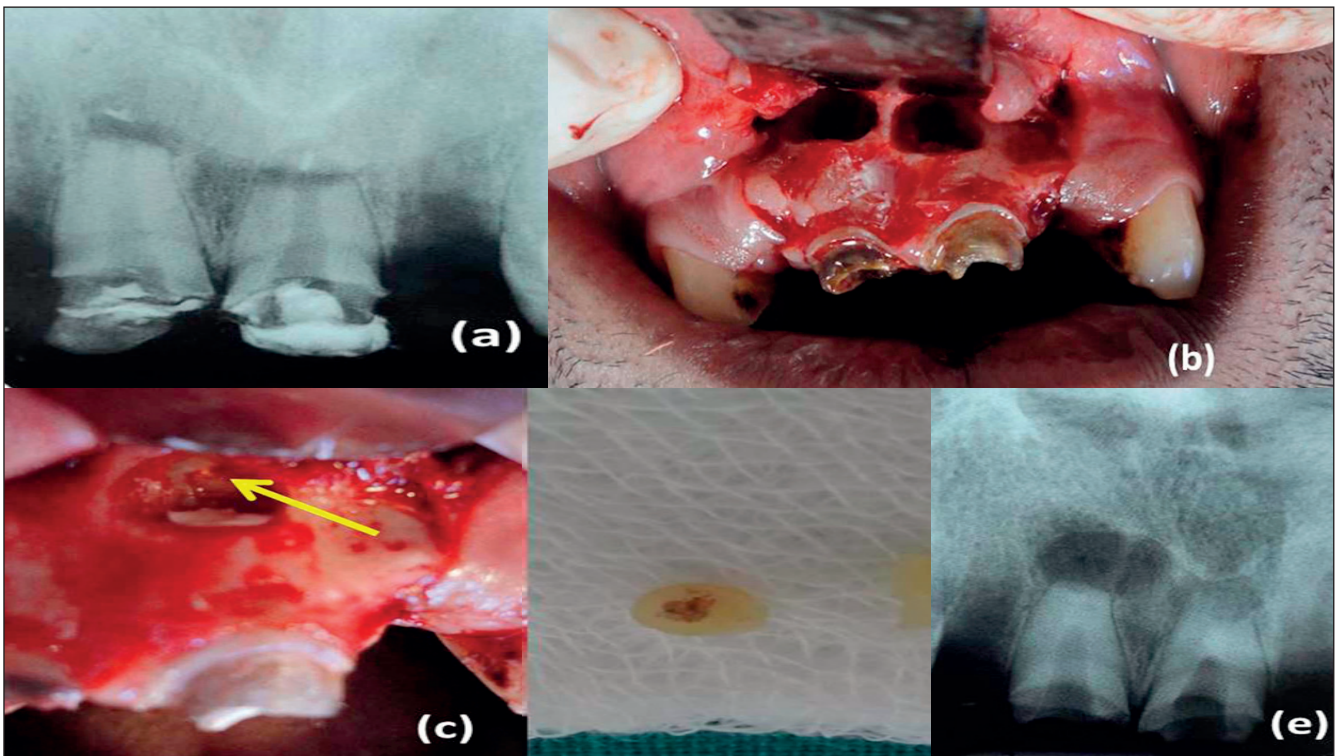
The gutta-percha with respect to the upper central incisors were removed using xylene (Merck specialties, Mumbai, India) and H-files (Dentsply Maillefer, Ballaigues, Switzerland). Once the guttapercha was removed the canals were irrigated alternately using 1% sodium hypochlorite and 17% EDTA with ultrasonic agitation. The radicular space was then disinfected with the careful placement of triple antibiotic paste (combination metronidazole, ciprofloxacin and minocycline) for 7 days.

Every radiograph taken during the treatment procedure revealed the presence of an unknown radiopacity in the periapical area of the teeth in concern. A radiograph then taken with an increased vertical angulation revealed the presence of remaining root tips of both the central incisors left out during previous apicoectomy with retained guttapercha inside (Figure 2a). This necessitated the need for surgical intervention. Once a full thickness mucoperiosteal flap was elevated and the granulation tissue was removed, the retained root apices in the periapical region of 11 and 21 were observed. Osteotomy was done by using ultrasonic tips and the root apices along with remaining guttapercha were retrieved (Figure 2b and 2c). The roots were not further resected due to the already compromised crown root ratio. Osteotomy was done to move the crestal and the marginal alveolar bone level apically by 1 mm to gain a resultant 2mm ferrule.

The canals were irrigated with chlorhexidine and dried with sterile paper points. Biodentine™ (Septodont, St. Maurdes Fosses, France) was then placed at the apical region through orthograde means. Biodentine was mixed as per the manufacturer's instructions and was condensed apically using endodontic hand pluggers. This orthograde method of biodentine placement skipped the limitation of inaccessibility of placing a retrofilling and allowed a denser compaction and easy removal of extruded material after compaction. The delivery and condensation steps were repeated until a 5 mm thickness of the plug was achieved



**Figure 1:** (a) patient with the defective crowns (b) and (c) IOPA showing inadequate obturation with faulty periapical surgery (d) mutilated incisors after the removal of the crown



**Figure 2:** (a) IOPA shows root tips of both the central incisors left out after previous apicoectomy (b) full thickness mucoperiosteal flap raised to debride the lesion (c) embedded root apex left during previous surgery (d) removed root apices from the periapical region of 11 and 21 (e) immediately after the orthograde placement of Biodentine™



**Figure 3:** (a) 3 months post-operative image after removal of temporary FPDs showing the prefabricated glass fibre post in place (b) after cementation of the final prosthesis (c) 1 year post-operative image showing resolution of the periapical lesion.



(Figure 2d). The result was confirmed radiographically. The resultant biodentineapical plug left approximately 5 mm of space for intraradicular retention and reinforcement of remaining tooth structure through fibre post. After final condensation a moist cotton pellet was placed in the canal to aid in the complete setting of material from both sides. The canal was then temporized and the flap was approximated and sutured in position.

After 4 days, sutures were removed and the glass fibre post (Reforpost, Angelus, Londrina, PR, Brazil) were placed and cemented using a self-adhesive resin cement Rely X- Unicem (3M ESPE St Paul, MN, USA) as per the manufacture guidelines. This was followed by composite resin core build up (3M ESPE St Paul, MN, USA) (Figure 3a). Tooth preparations were done and provisional fixed partial dentures were then placed to replace the missing lateral incisors using central incisor and canine as abutment. After 4 weeks, the permanent fixed prosthesis was cemented in form of two three unit porcelain fused to metal bridges (Figure 3b).

Biopsy report confirmed the periapical pathology to be a periapical granuloma. Periodic radiographic evaluation of the area of intervention showed progressive healing and 12 months follow-up radiograph (Figure 3c) showed complete bone formation and teeth were asymptomatic.

#### **DISCUSSION:**

The failure of both non-surgical and surgical endodontic therapy is mostly due to the persistence of microorganisms within the root canal system.<sup>3</sup> Hence the complete elimination of microbes from the radicular space is mandatory for successful endodontic treatment. Apicoectomy/root end resection is a procedure where the apical 3 mm of the root canal is resected during periradicular surgery to include most accessory and lateral canals and thus eliminate most residual microorganisms and irritants.<sup>4</sup> In the present case, as the resected root apices (the source of infection) were left behind from the previous periapical surgery, a surgical approach was considered to eliminate the pathology.

Presence of infection in form of periapical radiolucency and inadequate obturation of both the central incisors raised the need for the removal of old guttapercha followed by canal disinfection. *Enterococcus faecalis* has been revealed as the microorganism commonly associated with failed root

canal treatment.<sup>5</sup> These gram positive cocci are resistant to most of the conventional root canal treatment procedures and therefore require strict disinfection protocol to be followed for its elimination during endodontic retreatment.<sup>6</sup> Predictable intraradicular disinfection was achieved through copious irrigation of the root canals with antibacterial irrigants supplemented with ultrasonic activation and through the use of potent antibacterial intracanal medicament.<sup>7, 8</sup> Triple antibiotic paste (TAP) was used as an intracanal medicament as it is shown to be biocompatible and more effective against *E. faecalis* than the traditional intracanal medicament, calcium hydroxide.<sup>9</sup>

Once the root canals have been sterilized, the next objective is to achieve a reliable fluid tight seal from the apical end all the way up to the coronal aspect to prevent radicular reinfection. Since there was destruction of the apical end because of the previously attempted root resection procedure, achieving a predictable apical seal was difficult with the conventional gutta-percha obturation technique. In the current case, apical down-packing (leaving behind adequate space for the prefabricated glass fibrepost) was performed using Biodentine during the periradicular surgical procedure for more easy and predictable placement. A dense and compact apical filling was achieved as the material could be condensed without the risk of over extrusion due to complete control over the periapical area. Biodentine is a hydrophilic tri-calcium silicate-based material with almost similar chemistry to Mineral Trioxide Aggregates. This material has shown promising results with respect to its biocompatibility, mechanical properties, handling characteristics, sealing ability and bioactivity.<sup>10, 11</sup> Biodentine with its shorter setting time and potential for increased calcium (Ca) and silicate (Si) uptake in the adjacent root canal dentin similar to MTA would ensure the a monoblock effect with the achievement of an early fluid tight seal.<sup>12</sup>

When restoring root canal treated tooth, especially when the remaining root dentine is thin, it is preferable to opt for that radicular post having elastic modulus similar to that of dentin. This allows the better stress distribution and thus reduces the risk for root fractures.<sup>13</sup> Glass fibre posts have elastic moduli similar to that of dentin and have the ability to satisfactorily bond to this substrate by the use of adhesive cements.<sup>14</sup> The adhesive cement used here

was Rely X™ Unicem, a self-adhesive resin cement that has good chemical interaction with the calcium in hydroxyapatite, improving their mechanical properties.<sup>15</sup> The monoblock created is thought to reinforce the radicular dentin as well as reduce the incidence of microleakage.

## CONCLUSION

Re-surgical endodontics is necessary in cases to address any short comings or endodontic failure associated with the previous faulty apical surgery. However, when such cases are seen with weakened teeth or root use of biomimetic material such as Biodentine along with glass fibre posts and adhesive resin cements would be beneficial. Apart from providing a monoblock effect and strengthening the tooth would also ensure a predictable corono-apical seal and would be advantageous over conventional retreatment procedures.

## REFERENCES

- Gagliani MM, Gorni FG, Strohmenger L. Periapical resurgery versus periapical surgery: a 5-year longitudinal comparison. *Int Endod J*. 2005; **38**:320-327.
- Saunders WP. Considerations in the revision of previous surgical procedures. *Endod Topics* 2005; **11**:206-218.
- Nair PN, Sjogren U, Krey G, Kahnberg KE, Sundqvist G. Intraradicular bacteria and fungi in root-filled, asymptomatic human teeth with therapy-resistant periapical lesions: a long-term light and electron microscopic follow-up study. *J Endod* 1990; **16**:580-588.
- Rodriguez Martos R, Torres-Lagares D, Castellanos Cosano L, Serrera Figallo MA, Segura-Egea JJ, Gutierrez-Perez JL. Evaluation of apical preparations performed with ultrasonic diamond and stainless steel tips at different intensities using a scanning electron microscope in endodontic surgery. *Med Oral Patol Oral Cir Bucal* 2012; **17**:988-993.
- Pinheiro ET, Gomes BP, Ferraz CC, Sousa EL, Teixeira FB, Souza-Filho FJ. Microorganisms from canals of root-filled teeth with periapical lesions. *Int Endod J* 2003; **36**:1-11.
- Stuart CH, Schwartz SA, Beeson TJ, Owatz CB. Enterococcus faecalis: its role in root canal treatment failure and current concepts in retreatment. *J Endod* 2006; **32**:93-98.
- Harrison AJ, Chivatxaranukul P, Parashos P, Messer HH. The effect of ultrasonically activated irrigation on reduction of Enterococcus faecalis in experimentally infected root canals. *Int Endod* . 2010; **43**:968-977.
- Mohammadi Z. Antibiotics as intracanal medicaments: a review. *J Calif Dent Assoc* 2009; **37**:98-108.
- Adl A, Shojaee NS, Motamedifar M. A comparison between the antimicrobial effects of triple antibiotic paste and calcium hydroxide against Enterococcus Faecalis. *Iran Endod J* 2012; **7**:149-155.
- Pawar AM, Kokate SR, Shah RA. Management of a large periapical lesion using Biodentine™ as retrograde restoration with eighteen months evident follow up. *J Conserv Dent* 2013; **16**:573-575.
- Corral Nunez CM, Bosomworth HJ, Field C, Whitworth JM, Valentine RA. Biodentine and mineral trioxide aggregate induce similar cellular responses in a fibroblast cell line. *J Endod* 2014; **40**:406-411.
- Han L, Okiji T. Uptake of calcium and silicon released from calcium silicate-based endodontic materials into root canal dentine. *Int Endod J* 2011; **44**:1081-1087.
- Coelho CS, Biffi JC, Silva GR, Abrahão A, Campos RE, Soares CJ. Finite element analysis of weakened roots restored with composite resin and posts. *Dent Mater J* 2009; **28**:671-678.
- Macedo VC, Faria e Silva AL, Martins LR. Effect of cement type, relining procedure, and length of cementation on pull-out bond strength of fibre posts. *J Endod* 2010; **36**:1543-1546.
- Gerth HU, Dammaschke T, Zuchner H, Schafer E. Chemical analysis and bonding reaction of RelyXUnicem and Bifix composites-a comparative study. *Dent Mater* 2006; **22**:934-941.

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