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Non-Surgical Re-Treatment of Failed Surgical Endodontic Therapy Using Propolis as an Intra-Canal Medicament: A Case Report

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Abstract: This study describes a case of successful nonsugical endodontic retreatment of upper left central and lateral incisors with large apical radiolucency lesion which had previously undergone endodontic therapy with surgical intervention. The teeth were treated endodontically for 2 years with an interim filling of propolis mixed with propylene glycol. After 2 years, the postoperative intraoral periapical radiograph showed good periapical healing with complete resolution of periapical radiolucency. A thorough clinical evaluation, proper diagnosis and careful nonsurgical retreatment can often bring healing even in previous endodontic and surgically failed cases.

Key words: Propolis, propylene glycol, nonsurgical retreatment, endodontic failure, surgical failure, diagnosis

INTRODUCTION

The outcome of endodontic treatment is influenced by the presence of microoraganisms within the root canal system (Moller *et al*., 1981; Shovelton, 1964). The basis of endodontic treatment depends on identifying and eliminating the causative factors in the development of apical periodontitis so that optimal healing can be achieved. The success rate of initial treatment of apical periodontitis ranges from 83-100% whereas in retreatment cases ranges from 56-84% (Eriksen, 1991; Sundqvist and Figdor, 1998; Gorni and Gagliani, 2004). Factors affecting the long term results of endodontic treatment have been investigated extinsively (Sjogren *et al*., 1990; Caliskan and Sen, 1996) and number of studies have evaluated the success rates of retreatment (Van Nieuwenhuysen *et al*., 1994; Sundqvist *et al*., 1998). When endodontic treatment fails, historically endodontic surgery has been selected as the primary approach in resolving treatment outcomes that do not heal and sometimes in situations in which root canals have been mistakenly assumed to be mineralized and not treatable (Bergenholtz *et al*., 1979). When an initial surgical intervention or surgical retreatment fails, endodontic revision must be carefully evaluated so a decision can be made among nonsurgical retreatment, surgical retreatment or extraction (Fava, 2001). Studies have shown that surgical retreatment of teeth previously treated with surgery is a valid alternative to extraction (Gagliani *et al*., 2005). However, association with post-treatment disease was found to be greater in surgical retreatment cases than a primary surgical approach (Peterson and Gutmann, 2001). Failure of periradicular surgery is generally related to improper case selection an inadequate presurgical evaluation or poor technique. Other reported causes are inadequate preparation and obturation of the root canal system, residual infection in lateral canals and apical deltas exposed dentinal tubules or a defective root-end filling (Chalfin *et al*., 1993). Nonsurgical endodontic retreatment is often preferred to surgery or extraction (Bergenholtz *et al*., 1979; Lovadahl, 1992). Root canal retreatment has advantages over periradicular surgery when an improper or defective filling is the cause of the failure. Theoretically, it is better to remove the old filling material and reprepare and refill the root canal system than to perform periradicular surgery (Chalfin *et al*., 1993). It has also been shown that the success rate for periradicular surgery is lower than that of root canal retreatment (Grung *et al*., 1990). However, there are no long term studies on how successful orthograde retreatment is on teeth with failed endodontic and periapical surgery. Only a few case reports in the literature have shown that nonsurgical endodontic retreatment of repeated endodontic and surgical failures is an alternative to reoperation or extraction (Chalfin *et al*., 1993; Kleier, 1984; Stewart, 1975; Moiseiwitch and Trope, 1998). Reports in the literature have shown successful use of

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calcium hydroxide paste as the interim medicament in nonsurgical retreatment cases (Weiger *et al*., 2000; Zerella *et al*., 2005). But there are various limitations of calcium hydroxide as an intra-canal medicament in retreatment cases (Siquerira and Lopes, 1999; Kayaoglu *et al*., 2005). Hence in this case, a natural product propolis was tried as an intra-canal medicament which has found to be very effective antimicrobial agent against *E. faecalis* and other endodontic pthogens (Oncag *et al*., 2008; Awawdeh *et al*., 2009; Ferreira *et al*., 2007). Propolis is a Greek word meaning defender of the city. This resinous yellow brown to dark brown substance is collected by honeybees (*Apis mellifera*) from growing parts of tree and shrubs or other botanical sources to seal unwanted open spaces in the hive, protecting it from outside contaminants. It is composed of resin and balsams (50-70%), essential oils and wax (30-50%), pollen (5-10%) and other constituents which are amino acids, minerals, vitamins A, B complex, E and the highly active bio-chemical substance known as bioflavenoid (Vitamin P), phenols and aromatic compounds (Almas *et al*., 2001). Flavonoids are well known plant compounds that have antioxidant, antibacterial, antifungal, antiviral and anti-inflammatory proprieties (Burdock, 1998; Al-Shaher *et al*., 2004). This article describes a successful nonsugical endodontic retreatment of upper left central and lateral incisors with large apical radiolucency lesion using propolis mixed with propylene glycol as an intra-canal medicament which had previously been treated by endodontic therapy and surgical intervention.

CASE REPORT

A 27 year old male patient reported to the Department of Conservative Dentistry and Endodontics Manipal College of Dental Sciences, Mangalore complaining of pus discharge from gums in the upper front region. Patient gave a history of root canal therapy which was performed by a general practitioner in left central and lateral incisors (21, 22) 2 years prior to the current visit. Patient also gave the history of surgical endodontic therapy which was done 6 months after the initial root canal therapy due to the persisting symptoms. Even following surgery, symptoms (dull pain and pus discharge) had never completely subsided. No relevant medical history was reported clinical examination revealed a sinus tract and some discharge of pus and exudates in relation to 21 and 22. A gutta-percha point (Size 25, Dentsply Maillefer, Ballaigues, Switzerland) was inserted through the sinus

Fig. 1: Preoperative radiograph showing bone loss in relation to 21 and 22

tract to determine the origin of the chronic abscess and found to be in relation to maxillary left incisors. Teeth were sensitive to percussion and palpation with grade I mobility in labiopalatal direction. The intraoral periapical radiograph showed the presence of poorly obturated root canals and resected root ends without root end fillings. There was a large peri-apical radiolucency with severe bone loss (Fig. 1). The adjacent teeth, the maxillary right central, lateral incisor and left canine responded positively to vitality testing with the electric pulp tester (Parkell Electronics Division, Farmingdale, NY), heat and cold tests and were within normal vital pulp range.

The reason for this failure was thought to be due to poorly done endodontic therapy and surgical endodontic treatment. The patient was given possible treatment options: retreatment and observation, retreatment and apicoectomy or extraction. After careful consideration and patient's consent it was decided to try retreatment and observation. A rubber dam was placed using split-dam technique and the access cavities were prepared. The old gutta percha was removed from both the root canals using xyelene and K files. Working lengths were determined by using the technique of Ingle and Bakland (2002). Shaping and cleaning of the root canals was done by the step-back technique. Apical enlargement of the canals was done up to International Standards Organization (ISO) size No. 50 and coronal enlargement up to ISO size no. 90 using K files (Dentsply Maillefer, Ballaigues, Switzerland). The

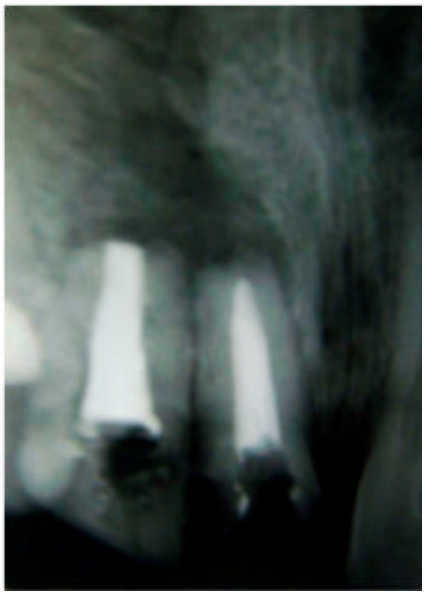

Fig. 2: Post obturation radiograph

Fig. 3: Intra-oral periapical radiograph after 1 year follow up showing periapical bone healing

canals were irrigated with 2.5% sodium hypochlorite, saline and then 0.2% w/v chlorhexidine gluconate (Vishal Dentocare PVT, LTD India) solutions using 26 gauge needles. Canals were dried with sterile paper points (Dentsply Maillefer, Ballaigues, Switzerland). As an interim medicament 100% Propolis powder (Ecuadorian Rainforest, LLC, USA) was mixed with propylene glycol, made into a paste and placed in the root canals of both left central and lateral incisors by using a lentulo spiral. The access cavity was temporarily sealed with Cavit (3M ESPE, St Paul, Minn) placed on a cotton pellet.

The teeth were relieved from occlusion by selective grinding. The patient returned every 3 weeks and old propolis dressing was removed using saline irrigation and new dressing was placed. The response of the teeth to the endodontic treatment was assessed regularly every 3 months by palpation, percussion and intraoral periapical radiographs. Patient was asymptomatic and good periapical healing with an acceptable periapical stop was evident after 1 year.

Mobility had almost reduced. The canals were then irrigated with 17% aqueous solution of EDTA and saline as a final irrigant to remove the remnants of the propolis. The canals were dried using paper points and obturated with gutta percha cones and AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) with the lateral compaction and vertical compaction technique (Fig. 2). The access cavity was cleaned with damped cotton then sealed with glass ionomer cement (Fuji II, GC Corporation, Tokyo, Japan).

The patient was advised to return every 6 months for evaluation. A follow-up radiograph taken after 1 year

Fig. 4: Intra-oral periapical radiograph after 2 years follow up showing good periapical bone

(Fig. 3) and 2 years (Fig. 4) post-treatment showed good healing. The rest of the teeth continued to respond positively to vitality testing.

DISCUSSION

Sterilization of root canal system is the primary goal to achieve successful endodontic therapy. Inspite of

thorough debridement sometimes endodontic therapy fails. The principal treatment modalities for the management of endodontic failures are orthograde retreatment and apical surgery (Friedman and Stabholz, 1986). As the majority of endodontic failures result from a proliferation of bacteria with in the previously treated canal, the rationale for orthograde retreatment that is disinfection of the root canal system is both biologically sound and consistent with basic rational for endodontic therapy. Conversely, apical surgery relies on the placement of an apical seat to contain the bacteria with in the canal (Hepworth and Friedman, 1997). Although periradicular surgery is considered an important aspect of endodontic therapy, it should never be an excuse for a poor endodontic technique. When an improper or defective root filling is the cause of the endodontic failure and the root canal is coronally accessible and negotiable, surgical treatment is not currently considered the first choice of treatment (Lovadahl, 1992; Taintor *et al*., 1983). It has been shown that the success rate for periapical surgery is lower than that of root canal retreatment (Friedman and Stabholz, 1986; Ingle *et al*., 1994; Gurung *et al*., 1990). Furthermore, any periradicular surgery will be of little value on teeth with a poorly condensed filling or untreated canals. In such cases, the surgical procedure will simply transfer the apical foramen to a more coronal position creating an open apex that will predispose to a new or recurrent infection, a periapical lesion and thus failure (Caliskan, 2005). So when endodontic and surgical failures occur, the clinician should determine the best strategy to correct the problem through a meticulous examination of the possible causes and should be aware of various indications, contra-indication of orthograde retreatment and peri-apical surgery. Indications, conta-indications of orthograde retreatment and peri-apical surgery:

Indications for orthograde retreatment:

- Teeth with inadequate root canal filling with radiological findings and/or symptoms
- Teeth with inadequate root canal filling when the coronal restoration requires replacement

Contraindication for othograde retreatment:

- Thin root canal wall leading to a risk of lateral perforation
- Posts or broken instruments which are not amenable to removal
- Severe curvature near apex, or sclerotic root canal which cannot be negotiated
- Zipping at the apical part of the canal with or without perforation
- Root fracture (horizontal or vertical)
- Tooth not saveable from periodontal or restorative viewpoint
- Other general factors such as patient's oral hygiene status and attitude towards treatment

Contraindication for periapical surgery:

- Surgical procedures of the root apex likely to damage neighbouring vital structures such as interior dental nerve or maxillary antrum
- Tooth not saveable from periodontalor restorative viewpoint
- Vertical root fracture
- Compromised crown root ratio
- Patient's attitude towards treatment

As this clinical case previously had endodontic and surgical failures, after considering all the factors it was decided to perform a endodontic orthograde retreatment keeping all the advantages of nonsurgical retreatment over surgical retreatemnt in mind. As an interim medicament, calcium hydroxide has various limiting factors in retreatment cases. The limited effectiveness of use of calcium hydroxide in disinfecting dentinal tubules is due to several factors namely due to the inhibition by dentinal protein buffering, particularly in terms of the ability of hydroxyl ions to reach the apical third and have an antibacterial effect (Siqueira and Lopes, 1999). In addition the low solubility and diffusibility of calcium hydroxide may make it difficult to gain a rapid increase in pH to reach the level necessary to eliminate or kill bacteria within the dentinal tubules and anatomical variations. Likewise calcium hydroxide promotes the adhesion of bacteria to collagen (the main organic component of dentine) which increases the extent of tubule invasion and thereby resistance to further disinfection (Kayaoglu *et al*., 2005). Also the varying alkaline potential of different formulations, dense biofilms of bacteria located within the dentinal tubules and the ability of *E. faecalis* to colonize within dentinal tubules and thus evade the hydroxyl ions also make calcium hydroxide ineffective. Therefore, in the present case report Propolis mixed with propylene glycol used as an intracanal medicament has shown excellent healing of peri-apical lesion. This successful outcome could be due to the presence of flavonoids and caffeic acid in propolis which are known to play an important role in reducing the inflammatory response by inhibiting lipoxygenase pathway of arachidonic acid. Flavonoids and caffeic acid also aid the immune system by promoting phagocytic activities and stimulating cellular immunity. The stimulation of various enzyme systems, cell metabolism, circulation and collagen formation could attribute to the hard tissue formation. These effects have been shown to be the result of the presence of arginine,

vitamin C, provitamin A, B complex and trace minerals such as copper, iron, zinc as well as bioflavonoids (Park *et al*., 2002; Khayyal *et al*., 1993). All these factors of Propolis help in faster healing of the wound. In addition to wound healing ability, Propolis is a good antimicrobial agent. It breaks down bacterial cell wall, cytoplasm and prevents bacterial cell division (Oncag *et al*., 2008; Al-Qathami and Al-Madi, 2003) Propylene glycol was used as a vehicle for the propolis because of its sustained release effect (Simon *et al*., 1995; Miller-Clere *et al*., 1987). This allows ions to release slowly enables them to remain in the periapical region for considerable time, thereby exerts a beneficial action.

The success rate of retreatment of previously endodontically and surgically treated cases has been found to be low. But in the present case long term success has been reported and propolis mixed with propylene glycol has shown very promising results when used as an intra-canal medicament.

Clinical points:

- Proper intracanal infection control with good coronal and apical seal leads to complete periapical healing
- Propolis has long-acting antimicrobial and anti-inflammatory property. It is a helpful alternate therapy which can be used in endodontic retreatment

CONCLUSION

The principal modalities available to manage endodontic treatment failures are orthograde retreatment, apical surgery or extraction. Each treatment modality has its specific advantages, clinical implications and risks. A thorough clinical evaluation, proper diagnosis and careful nonsurgical retreatment can often bring healing even in previous endodontic and surgically failed cases. Use of propolis as an intra-canal medicament in this case has found to be very effective which gives a new direction in the management of retreatment cases.

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