

Effectiveness of Pulpotomy Procedures in Mature Permanent Teeth with Irreversible Pulpitis

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Abstract

The standard treatment for permanent teeth diagnosed with irreversible pulpitis is pulpectomy and root canal therapy. However, with introduction of biomaterials like calcium silicate cements which are promoters of biomineralization, and vital pulp therapy procedures for preserving and maintaining pulp tissue, this position could be relative.

Keywords: Irreversible pulpitis, Pulpotomy, Calcium silicate cements, Vital pulp therapy

Introduction

A healthy dental pulp is essential for tooth vitality and function over lifelong. Root canal treatments are radical procedures where the tooth is completely devitalized, losing immune and repair capacity therefore inducing to eventual loss or extraction due to reinfection, fracture or another multiple factors [1].

According to the American Association of Endodontists (AAE) Consensus Conference Recommended Diagnostic Terminology, the definition of irreversible pulpitis is a clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is incapable of healing and nonsurgical root canal treatment is indicated. However, previous histologic research showed that clinically diagnosed irreversible pulpitis does not include the whole pulp. Furthermore, there is limited association between clinical symptoms and pulp response to testing and the existing histological condition of the pulp [2].

In accordance with AAE Position Statement on Vital Pulp Therapy (VPT), VPT procedures comprise indirect pulp treatment, direct pulp capping and partial or complete pulpotomy. The main goal is to preserve the radicular pulp tissue in immature permanent teeth and stimulate development and formation of the root end (apexogenesis) [3]. Today, VPT approach is more extensive due to use and application of bioactive materials, providing more treatment options for teeth diagnosed with irreversible pulpitis. The term 'bioactive' apply to materials that have a biological consequence or are biologically active and form a connection between material and tissue (hydroxyapatite) [4].

Calcium silicate cements (CSC) are considered bioactive materials and have diverse properties such as setting in water, blood, dentinal fluid and saliva. They are structurally stable and expand by 0.2-6 % of the initial volume, which is favorable for sealing ability and other dental applications. The high alkalinity (ph) provided by CSC also contributes to antibacterial and antifungal results. CSC release silicate, calcium and hydroxide ions extended over 4 weeks, those ions interacts with phosphate ions present in fluid tissues facilitating biomineralization process [5-7].

By definition, pulpotomy is 'the removal of the coronal portion of a vital pulp as a means of preserving the vitality of the remaining radicular portion' [8]. Currently, with deeper comprehension of pulp biology and evolution of bioactive materials, pulpotomy has been proposed as a definitive treatment option for mature permanent teeth with irreversible pulpitis. Pulpotomy is preferred over conventional root canal treatment in terms of maintaining vitality of the tooth; therapy procedures are less difficult preventing root canal complexities, keeping structural strength thus decreasing potential fractures and saving time and cost [9]. After pulpotomy procedures, a process of biomineralization begins and pulp canal obliteration (PCO) is expected. This is defined by the apparent deficiency of the pulp space radiographically and a yellow discoloration of the clinical crown, it could be the reason for limited or invalid response to thermal and electrical pulp testing. Some studies showed substantial differences when compared partial vs. completely obliterated teeth, partial pulpal obliteration teeth were more responsive to electric pulp testing than those with full PCO.

Deficiency of a positive response to the electric pulp test does not suggest pulp necrosis [10]. Long-term clinical success in VTP includes absence of clinical symptoms, normal function, no tenderness to percussion or palpation and no swelling or sinus tract. Radiographically, should be no evidence of internal root resorption or periapical radiolucency. However, poor or negative response to sensibility test should be not be considered as failure [11].

Today, the main goal in endodontics for tooth retention is elimination of inflamed pulp (if present) and removal of productive agents such bacteria and biofilms. However, this must be followed by an appropriate obturation, coronal restoration and control of periodontal disease [12].

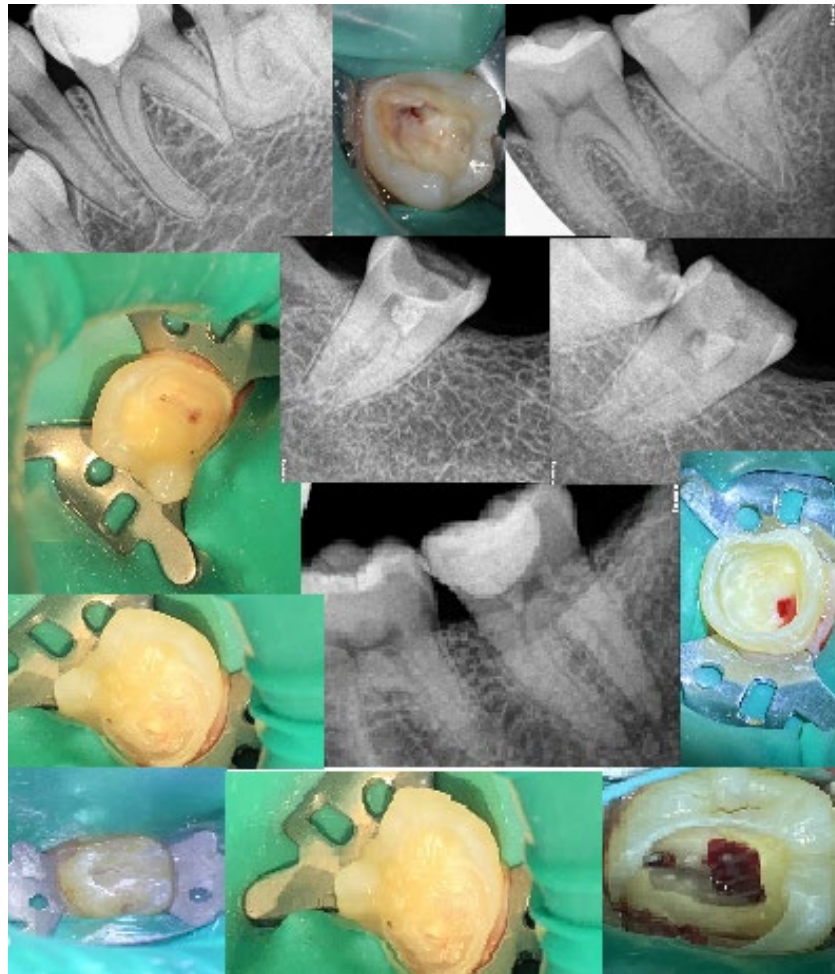


Figure 1: Several clinical cases where partial/full pulpotomy were completed with CSC. After 12-16 months follow-up, teeth reported no clinical symptoms and patients revealed no discomfort. However, thermal test were inconsistent or non-responsive

Conclusion

Pulpotomy procedures and application of calcium silicate cements in contact with pulp tissue could be an alternative resource for irreversible pulpitis treatment in permanent teeth with apical closure.

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