



**Pioneering Precision & Conservation in Endovital Treatment Using Canal Projection Technique: A Case Report**

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**Conflicts of Interest:** Nil

**Abstract**

This report describes the case of a young adult patient in whom the carious mandibular first molar was preserved by using modified Endovital treatment. Based on the clinical status of the pulp, pulpotomy was performed in one half using calcium silicate cement to preserve pulp vitality and the remainder of the pulpal space was prepared and obturated. The patient experienced resolution of symptoms, and the tooth exhibited sustained vitality without evidence of pathology on clinical and radiographic examination throughout the 24-month follow-up period. Established treatment modalities are constantly reviewed and revised to ensure a more conservative approach and better treatment outcomes and this novel modality paves the way for a

new approach to preserving dental tissues in minimally invasive endodontics.

**Keywords:** Calcium Silicate Cement, Case Report, Endovital Therapy, Minimally Invasive Endodontics, Partial Pulpotomy, Vital Pulp Therapy.

**Introduction**

Vital pulp therapy (VPT) preserves the dental pulp's function after trauma, caries, or restorative procedures. It includes indirect or direct pulp capping, in addition to partial or complete pulpotomy. Traditionally, Vital Pulp Therapy (VPT) has focused on preserving the radicular pulp in immature permanent teeth to ensure root formation (apexogenesis). VPT now offers alternative treatment options for mature teeth with inflamed pulps that were previously considered irreversible.

Histologically, due to carious pulp exposure, the pulp canal space may display both healthy and damaged pulp at varying degrees.<sup>1</sup> According to the literature, radicular pulp can be preserved after amputation of pulp that has undergone degeneration and irreversible changes.<sup>1,2</sup> Preserving an exposed pulp's vitality and health is preferable to replacing it with a root-filling material after pulp exposure. It maintains its physiological and defensive functions; removes less sound tooth structure, which results in less weakening of the tooth; and retains proprioception, nerve innervation and vascularization provided by vital pulp.<sup>3</sup> Hence, the combination of NSET and VPT is a viable treatment option for multi rooted teeth with irreversible pulpitis (IP) based on the concept of compartmentalized inflammation in pulp tissue.<sup>4</sup>

### Case report

A 23-year-old man reported to the Department of Conservative Dentistry and Endodontics with a complaint of pain while chewing food and sensitivity to cold in the lower left mandibular tooth for the past 1 week. His medical and dental histories were non-contributory. Clinical and radiographic examination revealed that his lower left mandibular tooth (#36) had deep dental caries approaching the pulp (Fig. 1a and 1b). Electric pulp test and Cold test with Endofrost resulted in an exaggerated pulpal response and the tooth was tender on percussion. Based on the clinical and radiographic findings, the diagnosis for tooth #36 was Symptomatic irreversible pulpitis (SIP) with apical periodontitis (AP). A preliminary treatment plan of NSET was proposed which could be modified based on the clinical status of the pulp after accessing the pulp chamber. Following rubber dam isolation, caries excavation was performed on the tooth under local anesthesia with 2% lidocaine and 1:80000 epinephrine

that revealed pulp exposure (Fig. 1c). The inflamed and necrotic tissues from the coronal part of the distal canal were removed with a water-cooled high-speed round diamond abrasive followed by flooding the chamber with 5.25% NaOCl for 10 minutes to control hemorrhage and obtain hemostasis (Fig. 1d). Eventually, the pulp tissue in the distal canal had to be extirpated due to unsuccessful hemostasis (Fig. 1e). Using greater taper Gutta-percha cones, the distal canal was blocked and Calcium silicate cement (Biodentine) was packed over the exposed pulp tissue with a moist cotton pellet to create a uniform layer (Fig. 1f). The Gutta-percha cones were sheared off and the tooth was restored with Glass Ionomer cement (Fig. 2a and 2c). The patient was asymptomatic when he returned after 1 week. After isolating the tooth, the distal canal was re-accessed and NSET was completed (Fig. 2b and 2d). The final restoration was done with a bonded composite restoration. At 24 months radiographic review showed normal supporting bone and the absence of pathosis (Fig. 2e). The tooth was asymptomatic and responded to cold and electric pulp tests.

### Discussion

Traditionally, the treatment for mature teeth diagnosed with IP has been NSET. However, NSET is considered a nonconservative and nonbiological treatment because it removes the entire infected and healthy pulp, losing its regenerative potential, proprioception, nerve innervations, and damping properties.<sup>3</sup> Clinical signs and symptoms of the patient do not always correspond to the actual extent of inflammation in pulp tissue. Carious degeneration starts from the coronal direction and gradually migrates in the apical direction, signifying the probability of the presence of vital pulp tissue, which has the potential to recover in the presence of an appropriate biocompatible material. The edema-preventing

mechanism supports this compartmentalization concept.<sup>5</sup> Hence, a more conservative approach of VPT has been adopted for cases with IP in which the favorable outcome depends on the healing capability of the remaining pulp as well as the biocompatibility of the pulp-capping agents. The pulp with IP comprises dental pulp stem cells with tissue regenerative potential.<sup>6,7</sup> These stem cells allow the pulp to heal after suitable treatment.<sup>8,9</sup> VPT has been shown to have a success rate of 75 – 100% when performed in cases of SIP without periapical involvement.<sup>2,9</sup> Few studies have reported VPT being performed in IP with the presence of periapical involvement, documenting a 65.7% success rate.<sup>9</sup> The site of the carious lesion (mesial or distal) and the root with AP are found on the same side in most of the cases.<sup>10</sup> Vascular events and increased permeability are usually seen adjacent to the carious site.<sup>4</sup> Hence, achieving hemostasis has been suggested as a diagnostic indicator to assess the extent of the inflammation and healing capacity of the radicular pulp tissue.<sup>11</sup> When bleeding can be controlled with a pressure pack and 5.25% NaOCl within 5–10 minutes, it suggests the presence of mild to moderately inflamed pulp, which can heal in a conducive environment.<sup>2,12</sup> A combination of NSET and VPT for the treatment of permanent mandibular molar teeth with SIP associated with AP improves the chances of healing the inflamed vital tissue and removing the diseased pulp tissue at the same time. This treatment option is known as "EndoVital" treatment for cariously exposed teeth.<sup>10</sup>

The concept of canal projection which 'projects' the canal orifices from the chamber floor to the cavosurface provides benefits such as easier orientation of files to canals, good foundation restoration, reconstruction of lost walls and floors, and hydraulic condensation of obturating materials.<sup>13</sup> This can be effectively achieved

by canal projectors suggested by Glickmann and Pileggi in which tapered plastic sleeve is used to maintain the canal patency. This technique was used in this case to place Biodentine around the healthy pulp and provide straight-line access to the distal canal for NSET.

Biodentine is a calcium silicate cement that was introduced as a "dentine replacement" material, comparable to MTA in terms of biocompatibility and induction of a calcific barrier with the improvement of several properties such as mixing, handling, shorter initial setting time (12 min) and less coronal discoloration. Pulpotomy using Biodentine has a 98% clinical and radiographic success at 1 year.<sup>14</sup>

Based on the clinical assessment of exposed pulp, treatment can be modified to take advantage of the innate healing potential of pulp in a multirooted tooth. The successful outcome of the presented case is attributed to the clinical incorporation of pulp tissue assessment, removal of necrotic tissues, NaOCl hemostasis, and placement of bioceramic materials with bonded restorations.

### Conclusion

Combining treatment approaches for multirooted teeth allows for the selection of procedures like "EndoVital" treatment that may have specific benefits, such as preserving pulp vitality where possible. Treatment that combines different modalities may ultimately benefit the patient and increase tooth survival.

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#### Legend Figures

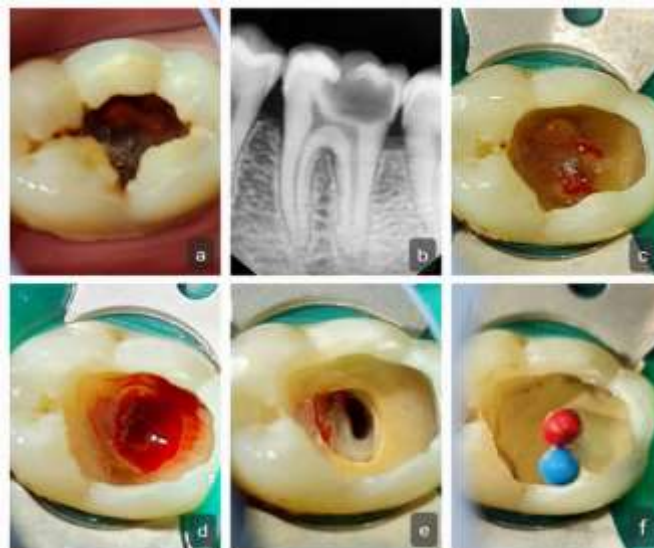


Figure 1: (a and b) Pre-operative clinical and radiographic image of 36. (c) Pulp exposure during caries excavation. (d) Continuous bleeding even after application of NaOCl (Distal Canal). (e) Pulp extirpation from the distal canal. (f) Canal projection using GP cones and Biodentine placement.



Figure 2: (a) Interim Restoration. (b and c) Re-entry to Distal canal and Radiograph in next visit. (d) Completed NSRCT in distal canal. (e) 24-month follow up radiograph.