



NOVEL APPROACH IN THE TREATMENT OF PARTIALLY NECROSED TOOTH DEPLOYING AUTOLOGOUS CHEMICALLY TREATED DENTINAL CHIPS

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ABSTRACT

Root canal therapy (RCT) is commonly administered for successful treatment of irreversible pulpitis and necrosis due to carious pulpal exposure in mature permanent teeth. In spite of its documented success it has certain shortcomings such as, it's an expensive procedure, may require multiple appointments, and requires a high level of training and clinical skill. Patients belonging to uninsured, low income group demography with limited access to specialist care often opt for extraction. This case report explores a novel economical and less technique sensitive approach for treating a molar with partial necrosis and apical pathology utilizing activation of latent growth factors in patient's healthy dentinal tissue. After nine months, the patient was asymptomatic with periradicular radiolucency was gradually reducing in size.

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INTRODUCTION

A 29 year old female reported to our outpatient department with chief complaint being loss of tooth structure in lower right back teeth causing chewing impediment with food lodgement, patient was asymptomatic. Patient's medical history was non contributory dental history comprised of continuous gnawing pain three days before patient's arrival. On clinical examination patient's mandibular right first and second molar teeth were affected with extensive caries along with loss of more than half of coronal tooth structure (treatment of first molar is not included as it's not the focus of this case report), subject tooth was asymptomatic to percussion, thermal/electrical pulp testing was not conducted due to lack of feasibility pertaining to loss of tooth structure, no presence of sinus tracts. Pre-treatment radiographic analysis revealed presence of periapical radiolucency ($\approx 1\text{mm}$) surrounding the distal root apex as noted in (Figure 1). Mobility was within physiologic limits and probing depths at all sites were 2-3mm suggestive of fair periodontal health, a provisional diagnosis of tooth necrosis was ascertained and root canal treatment following pulpectomy and debridement of necrotic pulp was planned. Mouth rinse with 0.2% chlorhexidine was followed by tooth isolation with cotton rolls (insufficient tooth structure for rubber dam placement) caries was excavated using stainless steel round bur, with subsequent access cavity preparation, serendipitous fresh bleeding was found in the distal root orifice opening at pulp chamber while both mesial canals were necrosed, bleeding was controlled

applying sterile saline soaked cotton pellet, treatment plan was modified patient was briefed about possible risks and provisional verbal consent was obtained for pulpotomy. At first operating field was disinfected with sequential 0.12% of chlorhexidine (13) and saline irrigation, field was dried using sterile cotton pellet. Ethylenediaminetetraacetic acid (EDTA) conditioning was done on freshly exposed sound dentinal walls for 10 minutes followed by saline irrigation, operating field was kept dry using sterile cotton pellets. With haemorrhage under control and absence of clot formation distal orifice opening was temporarily isolated with sterile saline soaked cotton pellet, EDTA treated dentinal wall was scraped with spoon excavator the scrapings were carefully placed over distal canal orifice opening and adapted using endopluggers and the entire preparation was sealed from rest of the cavity using Glass ionomer cement liner. Necrotic pulp from mesial canals was extirpated and root canal treatment was continued till obturation followed by permanent composite resin restoration, patient was recalled after a week for review she had no subjective or objective symptoms of pain. At sixth and ninth month recall patient reported no symptoms of pain or discomfort intraoral clinical examination showed no signs of swelling with mobility within physiologic limits and normal probing depth radiographic examination revealed normal periodontium with evidence of resolution in periapical radiolucency can be noted respectively (Figure 2,3).

DISCUSSION

This case report presents a novel approach in pulpotomy procedure in which selective preservation of healthy pulp is performed by activating latent innate growth factors present in healthy dentinal tissue.

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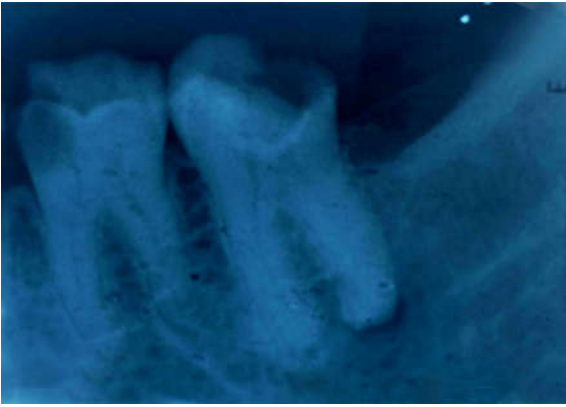


Figure 1 Pre-treatment radiograph with radiolucency surrounding distal root.



Figure 2 Six months follow-up.



Figure 3 Nine months follow up.

Traditionally principle sequela behind pulpal necrosis was attributed to pulpal inflammation, as it increases interstitial blood pressure leading to localised ischemia and necrosis (14). Present concept of pulpal pathophysiology dictates overall pulpal volume remains relatively constant during pulpitis (15) and pulpal pressure increment is a localised phenomenon (16). Hence, it can be syllogised that entire pulp might not undergo instant necrosis under inflammatory conditions and can be revived with timely intervention. Regeneration or reparative process following pulpal insult follows a complex sequence of stem cell chemotaxis, cytodifferentiation, activation and upregulation of secretory activity of differentiated cells (17). Such complex process is orchestrated by growth factors which are peptide molecules responsible for signalling a variety of cellular processes during tooth development and injury (18). These growth factors are released during primary dentinogenesis by odontoblasts become fossilised and sequestered within dentinal extracellular matrix (19) their

activity is preserved by their binding with protein precursors, this makes dentine a rich latent reservoir of several growth factors (20) which can be harnessed for regeneration. EDTA is being a potent calcium ion chelator breaks down the mineralised hydroxyapatite extracellular crystal lattice releasing growth factors initiating a cascade of processes leading to wound healing and tissue regeneration (21). Several growth factors have been reported in demineralised dentine extracellular matrix (DDEM) with specific functionality such as transforming growth factor β , insulin like growth factor 1, fibroblast growth factor 2 bone morphogenic protein 2 which help in stimulating odontoblastic differentiation and mineral matrix deposition respectively (22). Another important requisite for vital pulp therapy is maintenance of adequate blood supply (23) angiogenic growth factors such as platelet derived growth factor, vascular endothelial growth factor, placental growth factor and epidermal growth factor available in DDEM initiate capillary ramification, neovascularisation and angiogenesis (24, 22) improving blood supply and treatment outcome. Presence of proinflammatory cytokines including interleukin (IL - 2, 6 and 8) along with anti-inflammatory cytokines (IL- 4, 10 and 12) in dentinal matrix further supports DDEM's role in initiation of tissue regeneration (25). In clinical practice the most definitive approach for symptomatic or asymptomatic irreversible pulpitis secondary to deep carious pulp involvement, is root canal treatment, which consists of pulpectomy, followed by root canal therapy and a permanent restoration (26). Other alternative which patient opts in case of economical infeasibility is extraction (27, 26). The current school of thought in pulpal therapy dictates recuperation of diseased pulp and its preservation rather than intervention with complex root canal therapy (28). Supporting the this notion presented case report takes leverage from patient's innate regenerative ability without any foreign material involvement which renders this procedure non invasive compared to theorised dental stem cells transplantation which faces both economical and translational hurdles (29). Though 6 months of follow up is justified for pulpotomy (30) still several longitudinal studies need to be carried out for understanding long term consequences and further refinement of this procedure. This report is a genuine effort to test the extends of tooth vitality preservation and regeneration within the limits of basic clinical armamentarium and technical skill which could prove to be a formidable tool in oral health care especially, in third world countries where resources are limited.

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