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CASE STUDY

NON-SURGICAL TREATMENT OF LARGE PERIAPICAL LESION USING VARIOUS FORMULATIONS OF CALCIUM HYDROXIDE & ND: YAG LASER

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ABSTRACT

Large periapical lesions are always a challenge for the clinicians. Treatment planning for extensive lesions is a dilema. Literature has documented successful management of large periapical lesions using non-surgical as well as surgical treatment approach. The pros & cons of non-surgical versus surgical treatment modality should be carefully studied for individual case. This case report presents non-surgical resolution of a large periapical lesion of endodontic origin in maxillary anterior teeth using various formulations of calcium hydroxide as intracanal medicament & Nd: Yag Laser as adjuvant method of root canal disinfection.

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INTRODUCTION

Periapical lesions of endodontic origin are produced by an inflammatory response at the root apices of teeth with non-vital pulps. Periapical lesions develop as a sequelae to pulp disease. Bacterial infection of the dental pulp may lead to periapical lesions (Mφller *et al*., 1981). They are generally diagnosed either during dental radiographic examination or following acute pain in tooth (Barbakow *et al*., 1981). Periapical lesions cannot be differentiated into cystic and noncystic lesions merely based on the radiographic features (Ricucci *et al*., 2006). The ultimate goal of endodontic therapy should be to return the involved teeth to a state of health and function without surgical intervention (Salamat and Rezai, 1986).

Case Report

A 32 year old female patient reported to the department of Conservative Dentistry and Endodontics, with a chief complaint of swelling in the palate. There was a history of trauma to upper front teeth 2 years back. The swelling was first noticed ten months ago. The patient had previously been prescribed antibiotics without any dental interventional treatment. Extraoral examination revealed no abnormality. Intraoral examination detected a well circumscribed, 2 cm diameter fluctuant swelling in the palate in relation to 11&12. Radiographic examination revealed a well defined radiolucent area involving maxillary right central and lateral incisors, measuring around 7mm in diameter (Fig. 1). Electric Pulp Vitality Test for 11,12 & 13 was performed, where 11 &12 showed delayed response and 13 responded normally.

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Diagnosis

The clinical and radiographic findings were suggestive of periapical cyst in relation to 11 and 12.

Treatment Plan

Antibiotic coverage was given for 5 days. Non-surgical endodontic treatment in 11,12 was planned initially. Patient was intimated that surgical intervention may be required if desired outcome was not achieved. A written consent from patient was obtained. Emergency root canal opening was made in 11& 21 to relieve the intraoral swelling. More fluid was expressed through the root canals by compressing the

palatal swelling, till no further exudate was discharging through root canal (Fig. 2). Calcium hydroxide powder (Deepashree Products) was placed in root canal & access cavity was sealed with cavit (3M ESPE). Further appointments were scheduled for completion of endodontic treatment.

Fig 1. Periapical lesion with 11 & 12

Fig 2. Pus discharge from 11 with 21

Fig 3. Working length with 11& 12

At 1 week appointment, the size of palatal swelling was reduced. Temporary restoration was removed, root canals were irrigated & working length was determined (Fig 3). Root canals were instrumented with K & H files until an apical stop of ISO #60 for 11 and ISO #50 for12 was achieved with crown down technique of cleaning and shaping. Intermittent copious irrigation with 3% sodium hypochlorite & normal saline was done. The root canals were then dried & non-setting calcium hydroxide paste (RC CAL, Prime Dental) was placed in the canal and patient was recalled after 1 week (Fig 4). At third visit (2 weeks from initial presentation) there was no discharge from the root canals. After drying the canals, calcium hydroxide-iodoform paste [Metapex, (META BIOMED CO., LTD Korea)] was placed in the canal and was intentionally extruded into the periapical area (Fig 5).

At 8 weeks visit, the patient was asymptomatic & periapical radiolucency reduced considerably with 11 & 12. Metapex dressing was replaced after irrigation of root canals with 3% sodium hypochlorite. Interim restorative material (IRM Dentsply) was placed in access cavity. At 16 weeks, Metapex dressing was removed from 11& 12. Patient was asymptomatic and there was no discharge present. Sterilization of root canals was done by Nd:Yag laser. Fotona of 1064 wavelength with Standard settings of 15Hz at 100mj = 1.5W at pulsed mode repeated 4 cycles for 5sec each was used. A 200U optical fibre 2mm short of working length was introduced into root canal without activating laser. Then laser was activated & fibre guided in apical to coronal direction with circular movements and in contact with wet root canal walls. (Kimura *et al*., 2000) Then the prepared teeth were dried with paper-points and filled with laterally condensed gutta-percha using AH Plus root canal sealer (Dentsply) (Fig 6,7). At the following appointment permanent restoration (core) with composite resin was done to close access cavity of 11 & 12. After $1^1/_2$ year of follow up period there was no sign of periapical pathology and the periapical radiolucency had resolved completely in relation to 11&12 (Fig 8).

Fig 4. Intracanal medicament of Calcium hydroxide placed in 11 & 12

Fig 5. Intracanal medicament of Metapex placed in 11& 12

Fig 6. Master cone selection with 11 & 12

Fig 7. Obturation with 11& 12

Fig 8. After 15 months no periapical radiolucency seen with 11 & 12

Fig 9. Pre-operative view with 11 & 12

Fig 10. Post-operative view after 15 months with 11 & 12

DISCUSSION

Periapical lesions of endodontic origin may develop asymptomatically and become large over the time, particularly after traumatic injuries. The perfect mechanism involved in formation of periapical lesions is not fully understood. It is considered that if the pulp becomes necrotic the environment around the periapical area becomes condusive for microorganisms to multiply and various toxins enter into the periapical tissue initiating inflammatory reaction which leads to formation of periapical lesions. (Shear, 1963; Pulver *et al*., 1978) Most periapical lesions can be classified as dental granulomas, radicular cysts or abscesses (Bhaskar, 1966; Lalonde and Leubke, 1986). The incidence of cysts within periapical lesions varies between 6 and 55% (Nair *et al*., 1996). The occurrence of periapical granulomas ranges between 9.3 % and 87.1%, and of periapical abscesses between 28.7% and 70.07% (Schulz *et al*., 2009). There is clinical evidence that as the periapical lesions increase in size, the proportion of the radicular cysts increase. However, some large lesions have been shown to be granulomas (Natkin *et al*., 1984). Many clinicians hold the view that large periapical pathologies do not heal and thus must be removed by surgery. As a result a disproportionately large number of periapical surgeries were and are performed. All inflammatory periapical lesions should be initially treated with conservative nonsurgical procedures (Lin *et al*., 2007). Surgical intervention is recommended only after nonsurgical techniques have failed (Nicholls, 1984). Besides, surgery has many drawbacks, which limit its use in the management of periapical lesions (Neaverth and Burg, 1982; Walker and Davis, 1984). Surgical management would involve invasive procedure, longer post-operative healing period, increased chances of complications, & psychological trauma to patient. Various studies have reported a success rate of up to 85% after endodontic treatment of teeth with periapical lesions (Sjogren *et al*., 1990; HalíIkan, 1996). A high percentage of 94.4% of complete and partial healing of periapical lesions following nonsurgical endodontic therapy has also been reported. (Murphy *et al*., 1991)

Oztan MD, confirmed that large periapical lesions can respond favourably to non-surgical treatment (Oztan, 2002). Periodic follow-up examinations are essential and various assessment tools can be used to monitor the healing of periapical lesions (Nair *et al*., 1996). Various methods can be used in the nonsurgical management of periapical lesions: the conservative root canal treatment, decompression technique, active nonsurgical decompression technique, aspiration-irrigation technique, use of calcium hydroxide, Sterilization and Repair Therapy, and the Apexum procedure. Calcium hydroxide is indisputably the most appropriate intracanal medicament for teeth with periapical lesions, as it irradicates micro-organisms and promotes repair by controlling the inflammatory action (by hygroscopic action, calcium proteinate bridge formation, phosphidase inhibition), neutralizing osteoclasts acid products (acid hydrolases and lactic acid), inducing cellular differentiation (alkaline phosphatase activation and calcium dependent ATPases) and neutralization of exotoxins. (Soares *et al*., 2006) Calcium hydroxide, the "wonder drug" has been used in endodontics for many years. It is available in a variety of forms like powder, non-setting paste & combination paste. The clinical properties change depending on the vehicle. Many substances can be added to improve properties like antibacterial action, radiopacity, flow & consistency (Leonards, 1982). It can be resorbed slowly or rapidly depending upon vehicle used. The vehicle plays the most important role in overall process because it determines the velocity of ionic dissociation causing the paste to be solubilised & resorbed at various rates by the periapical tissues & from within the root canal. (Fava, 1991; Marques *et al*., 1994; Estrela and Pesce, 1996) Three types of vehicles are used – aqueous, viscous or oily. (Fava, 1991; Holland, 1994; Lopes *et al*., 1996) Lower the viscosity, higher will be the ionic dissociation. (Estrela, 1994) Water soluble substances are used to make aqueous paste; where in Calcium ions & hydroxyl ions are released & rapidly. There is high degree of solubility & rapid resorption by macrophages. From clinical standpoint, root canal may become empty in short period, delaying healing process in large lesions (Esberard 1992).

Viscous vehicles due to high molecular weights maintains paste in the desired area for longer intervals (Loupes 1998). Thus prolonging action of paste, calcium and hydroxyl ions will be released at lower velocity. Hence the paste remains in direct contact with vital tissues for extended time intervals (Fava, 1991). Oily vehicles are non-water soluble substances that promote the lowest solubility & diffusion of the paste within the tissues (Lopes 1987, Marques 1994, Lopes 1996). Thus the pH will be maintained in the area due to slow ionic release. This case report documents the use of each vehicle in specific clinical situation. A success rate of 80.8% (HalíIkan, 1996) and 73.8% (HalíIkan, 2004) has been reported with calcium hydroxide, when used for endodontic treatment of teeth with periapical lesions. Many investigators advocated that direct contact between calcium hydroxide and the periapical tissues is beneficial for the inductive action of the material. (Ghose *et al*., 1987; Rotstein *et al*., 1990) A high degree of success has been reported by intentionally extruding calcium hydroxide beyond the apex in cases with large periapical lesions. (HalíIkan, 1996; Souza *et al*., 1989) In weeping canals, calcium hydroxide powder has proved useful due to its hydroscopic action. Also locally destructive action of calcium hydroxide with its high pH (12.5-12.8) acts as a chemical cautery & might effect the breakdown of epithelium. (Crabb, 1965) Calcium hydroxide & iodine combination as an intracanal dressing in cases of non-vital teeth with associated with large periapical lesion has been documented by Costa *et al*. 1981, Souza *et al*. (1989). Metapex contains oily vehicles which are non-water soluble substance that promote the lowest solubility, adequate diffusion of the paste and slow ionic dissociation within the tissues. (Fara and Saunders; Heithersay *et al*., 1975) Hence maintaining the pH conclusive for healing over a long period of time, avoiding multiple clinical appointments for the patient. Prof.Dr.Norbert Gutnecht (2008) studied lasers & their applications in endodontics. He used different types of lasers for disinfection of root canal and found Nd:YAG laser to be most effective for endodontic procedures. Nd:YAG laser achieved an average of 99.92% bacterial reduction. In 1997, KLINKE *et al*, were able to prove a bacterial effect of Nd: YAG laser at a depth of 1,000um. (Kimura *et al*., 2000) In this case report, Laser was used as a mode of complete sterilization of the root canals. A long follow up period proved that nonsurgical endodontic therapy is successful in promoting the healing of large periapical lesions if the correct intracanal formulation is used under periodic observation.

Conclusion

Irrespective of the size of the lesion every attempt should be made to treat the periapical lesions with non–surgical

endodontic therapy. With proper diagnosis & execution of treatment, surgical intervention can be avoided and the case can be managed conservatively with a non-surgical approach.

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