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Non Surgical Endodontic Management of Calcified Maxillary Central Incisor Complicated By Iatrogenic Root Perforation

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Abstract: *Endondontic treatment of calcified canal is challenging to endodontists and chances of iatrogenic perforation and treatment failure is more. Recent development in techniques and materials utilized in perforation repair has dramatically improved the prognosis of such troublesome cases.MTA is relatively new material which has shown promising results to repair such defects. The present case report illustrates the successful non-surgical management of an iatrogenic perforation at apical third of root canal using MTA*
Keywords: *calcification, root perforation, MTA*

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I. Introduction

The primary aim of endodontic treatment is to reduce or eliminate micro-organisms and their byproducts from the root canal system. This can be achieved by thorough chemo-mechanical debridement, disinfection and obturation of the root canal system. However, it may be difficult to attain if the pulpal space is obstructed, narrow or calcified. These calcifications can block the access into the root canal systems and jeopardizes endodontic treatment. Searching for calcified root canal systems carries an increased risk of perforation.[1]

Root perforation is defined as mechanical or pathological communication between root canal system and external tooth surface (periodontal space). They may be induced pathologically (resorptive process or caries) or iatrogenically at any stage of root canal treatment (access cavity opening, root canal preparation or during post preparation). Root perforation constitutes a serious problem which needs to be diagnosed promptly, repaired immediately and in proper manner. Bacterial infection either from the root canal or the periodontal tissues, or both, hampers healing and brings about inflammatory sequelae which causes exposure of the supporting tissues .It may result in development of granulomatous tissue, proliferation of the epithelium, and, subsequently, the development of a periodontal pocket. Lack of understanding of root perforations and their consequences, to the extent that would delay diagnosis and treatment, might cause future issues resulting in tooth loss.

The present case report illustrates the successful non-surgical management of an iatrogenic perforation at apical third of root canal.

II. Case Report

A 22 year old male patient reported to Department of Conservative Dentistry & Endodontics of Govt. Dental College Kottayam with severe pain in relation to upper front teeth since 3 days which was not relieved with drugs. On examination soft tissue appeared normal and maxillary left central incisors was sensitive to touch. The tooth was found to be to be non vital on electric pulp testing & thermal stimulation. There was no sign of dental caries and periodontal probing and mobility was within physiologic limits. Preoperative radiograph large periapical lesion associated with 21.And tooth showed no visible root canal space till apical third. Hence provisional diagnosis of pulpal necrosis with acute exacerbation of chronic periapical abscess was made.

Patient was informed about difficulty in managing calcified canal and different treatment options available. With informed consent nonsurgical management of calcified canal was planned.

An access preparation was initiated with high speed round and tapered diamond burs under rubber dam isolation (Hygienic dental dam, Coltene, Germany). No canal orifice was visible initially. Further exploration of canal was attempted with long shank burs(LN Burs, DENTSPLY Maillefer) and dental operating microscope(Prima DNT microscope, Labomed,USA). Further access was extended apically with the small sized long shank round bur for locating the canal. Throughout the procedure the drilling was confined to the darker tooth structure that represents the area of the calcified pulp chamber. The direction of extension was confirmed by radiographs & K file was inserted to confirm the opening of canal.

A sudden dip was noticed at the junction of middle and apical third of root canal and there was severe bleeding from the canal and suspected for perforation. IOPA was taken with initial binding file of 40 K file. IOPA confirmed perforation in relation to mesial wall of 11 at apical third. Then after few careful attempts, patency was gained with No. 10 K file. A radiograph was taken to verify the file position in the canal. The working length was measured with electronic apex locator (J Morita Root ZX mini) & confirmed radiographically.

Chemico-Mechanical Preparation was completed using the hand K-files & Rotary Protaper File System. Irrigation was carried out using 3% sodium hypochlorite and 17% EDTA . The perforation was sealed with MTA-sterile saline paste (MTA –Angelus,Londrina,PR,Brazil) mixed according to manufacturers instruction. Mineral trioxide aggregate was mixed and carried to the perforation site with the help of a carrier and packed with an appropriately fitting plugger. Lateral pressure was exerted using an custom sized gp fitting the apex of the prepared root canal .The same gp was used to obturate the apical aspect of the canal using mta as sealer. Repair of the perforation was carried out by progressive placement and packing of increments of MTA.Taking into consideration irregular canal wall remainder of the canal was obturated with the same and moist cotton pellets were placed over the MTA. Noneugenol temporary restoration (Cavit, 3MESPE) was palced for coronal seal.

The Mineral Trioxide Aggregate was allowed to set and patient was recalled next day and access sealed with GIC. Patient was recalled after 1 week and was asymptomatic. After 6 months, the tooth remained asymptomatic. Clinical examination showed absence of pain with normal periodontal probing depth. Periapical radiographies revealed healing periapical lesion.

III. Discussion

A perforation is defined as the pathological or iatrogenic communication between the root canal space and the periodontal tissue[3]. Eventhough caries evolution or resorptive processes may cause perforations, most root perforations are induced iatrogenically. According to the Washington study, endodontic failures due to root perforations accounts for approximately 10% of all failed cases [4].

Successful non-surgical endodontic procedures depend on the severity, location and size of the perforation , the contamination of the site and the material employed [5].In the present case, the perforation was present at the junction of apical and midroot area in relation to mesiolateral aspect of the upper right central incisor, which have been caused during location of root canals . Although location and timely intervention favours repair, large periapical lesion may interfere with the healing.

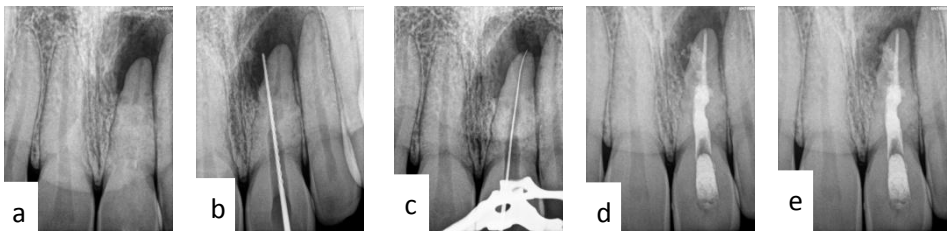

Fig a-e: a-preoperative radiograph b - perforation of root c - working length d - perforation repair e - 6 month follow up

Perforations affect the prognosis of endodontic treatments, and the immediate sealing of the perforation is a critical factor for the therapeutic success. Besides inadequate materials adversely contribute to prognosis [2,6-,9]. Therefore, the sealing of the perforation should be performed with a biocompatible material in order to provide a favorable environment for repair, and with characteristics similar to those of the dental hard tissue after setting [9-11].

In the present case, the favorable location and immediate treatment of the perforation with MTA, a regenerative material, allowed a successful outcome, which could be clinically and radiographically confirmed over follow-up period.

Various materials have been used to repair perforations such as amalgam, Cavit , Super-EBA, glass ionomer and others in the past; nowadays, MTA and Biodentine have been used for this purpose [12,13]. Studies have shown that MTA offers superior features, such as: alkaline pH, which impede bacterial activity; sealing ability, which hinder microbial infiltration; and low toxicity to the periodontal tissues[14,15].It also provides an effective seal against dentin and cementum and promotes biologic repair and regeneration of the periodontal ligament (PDL) [16-20].

Owing to its hydrophilic feature, moist environment provides favourable condition to activate the setting reaction of MTA, which is of great importance mainly for surgical procedures and perforation repair, since moisture is always present is such cases [21,22]. In addition biocompatibility of MTA was tested in perforations of dog's teeth, and its ability to induce the formation of hard tissue at the site of perforation was found to be successful [23].

MTA is a bioactive silicate cement mostly composed of calcium and phosphate ions, which are also present in the tooth structure [24]. Due to its similarity of composition with dental hard tissues, MTA is able to form hydroxyapatite releasing calcium ions, thus allowing the sealing of perforated cavities. It is nonirritating to periapical tissues and also induces the regeneration of cementum and the PDL, thus making it an excellent choice for repair of radicular perforation [25].

IV. Conclusion

Root perforation is a frustrating problem to the endodontists which jeopardizes the longevity of the teeth. Therefore prompt diagnosis and early repair of the defect is crucial in everlasting success.

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