



MANAGEMENT OF IATROGENIC PERFORATION IN MAXILLARY CENTRAL INCISOR: A CASE REPORT

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ABSTRACT

Introduction: Iatrogenic perforations are artificially made perforations in the root surface, penetrating the layer of dentin and cementum to the outer surface, which when left untreated acts as channel of entry to the microorganisms and pathogens. **Case report:** This case report of a 29-year-old male patient explains about the management of iatrogenically perforated right maxillary central Incisor during root canal treatment done before 5 years by the previous practitioner by using biocompatible tricalcium silicate-based cement of bio dentine using non-surgical method. **Discussion:** Perforation seems to be common at an extent of 73% in case of Maxillary Incisors. The selection of material in perforation repair remains the vital role in prognosis. Bio dentine exhibited the least micro leakage when compared to other materials. The micromechanical adhesion of bio dentine helps in creating a stable anchorage with a sealing at perforation. **Conclusion:** Although MTA has been found to be the first choice to repair perforation, advanced materials like bio dentine has made an evolution for better pushout bond strength and remineralization in perforated canals.

1. INTRODUCTION

Root perforation is defined as mechanical or pathological communication between root canal system and external tooth surface (periodontal space).^[1] They may be induced pathologically in case of resorptive process or caries or during any steps of root canal procedure between access cavity opening, root canal preparation or during post preparation.^[2] Iatrogenic perforations are artificially made perforations in the root surface, penetrating the layer of Dentin and Cementum to the outer surface. Perforations in root surface, either coronal, middle or apical, universally a main reason in failure of Endodontic therapy. The mechanical debridement in calcified canals most commonly end up in complication of perforations, at blockage and ledge formation, incompletely obturated teeth, excessive filling of root canal and perforation of root canal.

This perforation left untreated, acts as a channel for the entry of microorganisms and pathogens into the root canal surface, ending up causing root infections and settlement of debridement over the root canal interior surface around Gutta Percha point.^[3] Perforations usually worsen up the prognosis of Root Canal Treatment, urge emergency extraction of tooth for reducing risk of infection and microorganism spread.

Non-surgical treatment for perforation repair promotes lesser damage of tissues and tissue isolation, as well as reduction in loss of connective tissue during treatment.^[4]

The Management to prevent this iatrogenic or pathological perforations differs from the volume of surface that undergoes perforations. Most common management used in the earlier part of dentistry is done by Polymerized Calcium Hydroxide applications, followed by Root Canal filling. In generation by generation, the Biocompatible components, like Mineral Trioxide Aggregate, Bio-dentin, Resin Modified Glass Ionomer cement, Resin modified Zinc Oxide Eugenol, calcium phosphate, bioaggregate, endosequence, Seal-Apex, Super EBA and different group of Composite materials promote a positive prognosis to the Perforated tooth.^[4,5,6]

2. CASE HISTORY

A 29-year-old male patient, reported to our Dental clinic, Dr Uma's Dental care, Sithalapakkam, Chennai, with a chief complaint of pain in his upper front tooth region for past one month, which didn't get relieved under Medications of Analgesics. Case history examination of previous dental treatment was taken from the patient. Patient stated that he underwent Root canal treatment before 5 years in tooth 11, which left incomplete without

a Dental crown. At the time of clinical examination, there was a discoloration of the right maxillary central incisor (Tooth 11). The tooth was found sensitive to percussion, minor enamel cracks was observed. The enamel cracks were observed from the cervical third of crown portion of tooth to the incisal third of crown portion of tooth, which can be easily detected under fluorescence light. There was relatively no extensive Mobility of tooth. Gingiva appeared normal and the periodontal probing depth was within physiological limits.



Intraoral periapical radiograph of 11, 12, 21, revealed an insufficient filled radiopaque material from the apex of the root, which was estimated around 4-5 mm, with the help of RVG meter calculation, from the apex point to the gutta percha point tip, and it also revealed the poor condensation of the filling material at the coronal portion at the level of CEJ (cemento-enamel junction). Widening of the periodontal ligament space, with loss of lamina dura was observed in the radiograph, which clearly indicates that there is an infection spread in the periodontal ligament space, due to incomplete root canal treatment in the discolored Maxillary Central Incisor 11.

Based on the clinical and radiological findings, Retreatment of the tooth 11 was planned.

Patient was prepared with 2% chlorhexidine mouthwash gargling, for about 15-20 seconds. Local anesthesia, with Lignocaine 2% HCl 1:80000 epinephrine is administrated, with a 20-gauge needle syringe. 0.5ml infiltration is administrated locally and waited for a minute. Access opening, at the cingulum point of Palatal surface of 11, was regained with High-speed round bur and the gutta-percha sealed earlier in the root canal and pulp chamber was retrieved using gutta-percha solvent (Prime RC gutta percha solvent) and Hedstrom files (Dentsply Files). The retrieval was confirmed with the help of periapical radiograph.

Following the complete removal of the gutta-percha, insertion of K file into the canal to identify the gliding path of the root canal, to follow instrumentation. While

inserting the file, Patient experienced pain at the mid-root region. On clinical observation, the inserted file gets deviated from its glide path, which revealed that the labial aspect of cervical third of the root was perforated by the previous practitioner.

On observation of penetration, the patient was clearly explained about the penetration of root and advised for non-surgical perforation management. The patient was educated about different treatment modalities and the choice of management is made according to the patient which was mentioned in the consent, signed by the patient.

The root canal was carefully negotiated using K-file #10 (K Files Mani) by directing the file along the palatal wall of the root canal until the working length was achieved, thus obtaining the original glide path. The working length of the root canal was determined to be 23.5mm, with the help of E-connect Apex locator. The Original glide path was further continued using K-file #15 until the same working length. The root canal was irrigated and rinsed between each instrumentation.



The instrumentation followed till K files #20, with saline irrigation along with 3% Sodium hypochlorite for better debridement of the root canal. The root canal was continued with Endo motor (E-connect Straight Endo motor) with Pro taper files (Dentsply Gold Pro taper files), size ranging from S to F2. Following F2 Pro taper, the root canal was irrigated and 17% EDTA solution was applied to the canal for around 15 seconds and irrigated with saline for removal of smear layer from the root canal which might help in prevention of further infection. The canal was dried with the help of Paper points, .6 20% taper points to dry the root canal till the apex of the tooth.

The perforation site was sealed with Bio dentine, a biocompatible material, which has better remineralizing efficiency, at the perforating layer, using micro apical placement system.

The Calcium hydroxide (CaOH) was given as Intracanal medication. The access preparation was sealed with Cotton pellet, soaked with Normal saline and Cavi-temp

is placed at the access point. The recall appointment was fixed after a week. On recall appointment, patient didn't experience any pain between visits, and clinical examination showed negative percussion.

Access regained with high-speed round burs and root canal were irrigated with copious amount of 3% NaOCl for 15 secs, mixed with saline. Saline irrigation is continued for about a minute.



Figure 3: Master cone placed and Radiograph taken.

Final obturation was done with gutta percha point, size 20% .6 taper points (Dia-dent system) and sealed at the level of Cementoenamel junction, using Lateral condensation method. Glass Ionomer Cement Type 2 restorative filling is given at the level of entrance filling. The color shade was determined with the help of Color shade guide with A1-B3, provided by Deen Dental shade guide. The color shade was estimated as A2 shade, to match the adjacent tooth.

During the intermittent period, a Temporary crown made up of acrylic resin, A2 shade, was inserted until the final crown being prepared.



Figure 4: Root canal Treatment, with Zirconia crown placed.

After one week recall appointment, the temporary crown was removed. Zirconium plus crown, From Deen Dental Lab, Tondiarpet, was cemented with Glass Ionomer Cement, Type-1, as luting agent. The patient is advised for review after a month.

3. DISCUSSION

This case with retreatment of Maxillary Central incisor is to reduce pain and provide esthetical restoration. After regaining the access, a perforation has been detected using K-file #10, which was present at the Cervical third of the root labially at the root surface. The perforation was noted, after spotting the K-file, perforating through the gingival mucosa. Perforation seems to be common at an extent of 73% in case of Maxillary Incisors.^[7]

The treatment was planned to seal the perforation non-surgically as per the patient's consent, where the patient has been explained about the various modes of treatment.

Usually, Iatrogenic perforation on maxillary incisors take place due to improper removal of the lingual shoulder that remains as an hinderance for the straight glide path.^[7,8] Although there are certain other reasons, removal of lingual shoulder plays an important role in avoiding perforation in relative to Anterior maxillary tooth access preparations.^[7,8]

In this case, the retreatment and the perforation repair must be done simultaneously in order to achieve better prognosis.

The prognosis of Maxillary central incisor 11, totally depends on the selection of material for sealing the perforation. To minimize further contamination of the root canal system, the perforation was sealed immediately using biocompatible tricalcium silicate-based cement of bio dentine. Bio dentine calcium silicate based bioactive product which became commercially available in 2009 (Septodont, <http://www.septodontusa.com/>) And that was specifically indicated as a "dentine replacement material". Bio dentine has a wide range of applications including endodontic repair (root perforations, apexification, resorptive lesions, and retrograde filling material in endodontic surgery) and pulp capping and can be used as a dentine replacement material in restorative dentistry.^[9]

Bio dentine powder component consists of tricalcium silicate, dicalcium silicate, calcium carbonate and oxide filler, iron oxide shade, and zirconium oxide. The liquid, on the other hand, contains calcium chloride as an accelerator and a hydro soluble polymer that serves as a water reducing agent.^[9] Bio dentine has a benefit of faster setting property than that of MTA (mineral trioxide aggregate).^[10] The setting time is noted approximately around 9-12 mins.^[11] Bio dentine also comprises of certain good properties like tissue regeneration, early mineralization, antibacterial, highly biocompatible, higher push out bond strength than MTA.^[12] The micromechanical adhesion of bio dentine helps in creating a stable anchorage with a sealing at perforation.^[13] After restoration of perforation Bio dentine increases the pH to 12.5 which inhibits further growth of microorganisms and can disinfect dentin.^[13]

Mixing of bio dentine is done using an amalgamator for a period of around 30 sec.^[14]

Bio dentine exhibited the least micro leakage when compared to other materials.^[14] Also Bio dentine possess adequate handling characteristics because of its excellent viscosity.^[14]

Bio dentine does not require two-step obturation as in the case of MTA because of its faster setting time.^[15]

During the recall appointment, final obturation was done using gutta percha point and GIC as entrance filling. Temporary composite resin crown was given until the original crown to be prepared.

A zirconium crown was cemented using type-1 luting glass ionomer cement as per the patient concern of highly esthetic material since discoloration was one among the chief complaint.

Since the material is metal free, it also prevents darkening around the gingival region and they are highly biocompatible as the smooth surface helps to reduce plaque accumulation.

4. CONCLUSION

Inshort, Iatrogenic perforation are most common during the root canal treatment. Some materials have been found to repair perforation, but none of them can be ideal. MTA has been found 20 years ago and becoming a first choice to repair the perforation in past years. But advance in Materials like Bio dentine for perforation repair has made an evolution for re-mineralizing in perforated root canals. Direct restoration, with a Crown over the root canal treated tooth, to achieve a good coronal seal, recovering the function, promote esthetics and to promote better prognosis of perforation.

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