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Restoring the dignity: Case reports of root perforation management

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Abstract

Perforation is an artificial communication between the root canal system and the supporting tissues of the tooth. Root perforations are common complications in endodontic treatment. These root perforations complicate the treatment and if not properly addressed result in poor prognosis. Successful outcomes of perforation management influenced by various factors like early diagnosis, size, site, time and level of perforation. This report presents successful management of two cases of iatrogenic root perforation, treated and sealed with biodentine.

Keywords: Iatrogenic root perforation, non-surgical management, surgical management, consequences of perforation, biodentine

Introduction

Perforation is an opening in the tooth or its root, created by the clinician during entry to the canal system or by a biologic event such as pathologic resorption or caries that results in a communication between root canal and periodontal tissue. Perforations can be pathological, resulting from caries or resorptive defects, but most commonly occur iatrogenically (during or after root canal treatment) [1].

According to Arens & Torabinejad iatrogenic perforation occurs due to lack of knowledge in dental anatomy, atypical tooth position in the arch, endodontic procedure through prosthetic crowns, calcified pulp chamber and inappropriate use of endodontic instruments [2].

Critical factors that are contributing to successful management of perforation are size, time of repair, level and location, periodontal status of the tooth, access and visibility of the perforation and biocompatibility of perforation repair material [3].

The diagnosis of root perforation is mostly based on the symptoms and radiographic examinations. The classic symptoms are the sensitivity of the instrument introduction into the root canal and bleeding. Diagnosis of perforation can be assessed by direct observation of bleeding, indirect assessment of bleeding using a paper point, radiography, apex locator, symptomatic findings, and by using dental operating microscope, CBCT [4].

Case report - 1

A 15 year old female patient reported to the department of Conservative dentistry and Endodontics, with the chief complaint of pain and discomfort in upper right front tooth for the past one week. She gave history of trauma with avulsion of 11 three months earlier and attempted root canal procedure one week prior to reporting to us. On clinical Examination extrusion of 11 was evident with localised gingival inflammation pertaining to 11 and with signs of tenderness on percussion and palpation. There was no probing depth (fig 1).

An intraoral periapical radiograph revealed attempted root canal procedure and perforation in 11, that led to the diagnosis of iatrogenic perforation in 11 (fig 1). The treatment plan was non surgical management of perforation site using Biodentine and subsequent esthetic management of cosmetic contouring of 11.

Under rubber dam isolation, root canal of 11 was negotiated fully and working length was determined. Cleaning and shaping was carried out using step back method with irrigation of 3% sodium hypochlorite (NaOCl). Apical preparation was performed upto size #70. Obturation was done by lateral compaction method with gutta percha (Dentsply) using AH

plus sealer (fig 2). Gutta percha was condensed below the level of perforation. The perforation site was well appreciated through the access cavity; the site was completely debrided and sealed with Biodentine (manipulated according to manufactures instructions) (Septodont, St. Maur-des-Fossés, France). Immediate post-operative x-ray was taken (fig 3). Clinical evaluation two weeks later showed normal gingival appearance. Access cavity was sealed with composite and the necessary esthetic management of cosmetic contouring was done (fig 4). One year follow up X-ray and clinical photograph showed satisfactory healing (fig 5)

Case report - 2

A 15 year old male patient reported to the department with the chief complaint of pain and swelling in upper front tooth region for past one month and history of dislodged crown in 11 and 21 (crown dislodged 4 months back). Past history revealed trauma and root canal treatment in 11 and 21 before one year.

On clinical Examination localized gingival swelling in relation to labial aspect of 11 was observed, which was soft in consistency and painful on palpation, with signs of tenderness on percussion was present. Further examination revealed increased probing depth of 5 mm in relation to 11 (labially). An intraoral periapical radiograph revealed root canal treated 11 and 21 with satisfactory obturation. So the case was provisionally diagnosed as Symptomatic root canal treated 11 with associated gingival abscess. Hence re-treatment of 11 was planned (fig 6).

Upon retrieval of gutta percha using Endosolv-E solvent (Septodont, Paris, France) and H-files (Dentsply, Maillefer, Tulsa, USA), and by further tactile exploration and visual examination of the access cavity two openings were perceived. One was the canal orifice and other was the perforation site (labially), that finally led to a diagnosis of Symptomatic root canal treated 11 with iatrogenic perforation (fig 7). Since there was increased probing depth and compromised periodontal tissue, surgical correction of perforation site using Biodentine with concomitant gingival contouring and shaping was planned.

Under rubber dam isolation, root canal procedure was carried out in 11 and working length was determined. Biomechanical preparation was carried out by step back method with irrigation of 3% sodium hypochlorite (NaOCl). Apical preparation was performed upto size #70. Obturation was done using gutta percha (Dentsply) by lateral compaction method with AH plus sealer (fig 8). A written informed consent was obtained from the patient.

Under LA (2% Lignocaine with 1:100,000 epinephrine solution) full thickness mucoperiosteal flap was raised. Perforation site was identified, granulomatous tissue within the defect area and the epithelium from the inner surface of the flap were carefully removed using curette. The site was thoroughly debrided and cleaned. Biodentine (Septodont, St. Maurdes Fossés, France) was mixed according to manufacturer instruction and the perforation site was sealed (fig 9). Gingiva was contoured, shaped and flap was repositioned and sutured carefully using 3-0 silk sutures (fig 10).

Two weeks review showed satisfactory healing and the access cavity was sealed with composite. The crown preparation was modified and impression was taken. Post endodontic restoration was given in 11 and 21 (fig 11). Nine month follow up X ray and clinical photograph showed satisfactory healing (fig 12).

Discussion

Maintaining the integrity of the natural dentition is essential for function and esthetics. Endodontic therapy plays a vital role in achieving this goal. Perforations during endodontic procedures are cited as the second greatest cause of treatment failures^[5]

Depending upon the size and location of the perforation, repair may be achieved either through a conservative, non-surgical technique or by employing surgical intervention. In all cases of perforation, these defects must be sealed to prevent the entry of noxious elements from within the tooth that will further irritate the associated periodontal tissues^[6].

Non-surgical repair of perforation is done when the site of perforation is small, easily accessible, with no infection and healthy periodontium. Surgical intervention is reserved for cases not amenable to, or that which have failed to respond to non-surgical retreatment, or in which the concomitant management of the periodontium is required^[7].

The prognosis of endodontically treated teeth with perforations is dependent on the prevention of bacterial infection of the perforation site. The time between perforation and its repair is one of the most critical factors for success. Early treatment will significantly enhance success. The location of the perforation along the root will also greatly influence the overall tooth prognosis^[8]. Depending upon the tooth being affected and the localization of the perforation defect along the root surface, an esthetic defect can arise, especially in maxillary front teeth^[9].

Wide variety of materials had been used to repair the perforation such as tin foil, paraffin, gutta percha, gold foil, ZnPO₄ cement, formulations of Ca(OH)₂, amalgam, iodoform, ZnOE, cavit, dentin chips, indium foil, EBA cements, gelfoam. Recently newer materials like MTA, Biodentine, Endo-sequence, Bio-aggregate, New Endodontic Cement have been tried for perforation repair. Different materials have been used for endodontic perforation repair and the search for an ideal perforation repair material is a challenge. As repair material has to be placed in intimate contact with hard tissues of the tooth and soft tissues of the periodontium^[10].

Biodentine was used in these two cases was introduced in 2010. Biodentine shows superior tissue biocompatibility and bioactivity, promoting root repair and bone healing. This calcium silicate cements have been reported to be the material of choice for root perforation repair^[11]. Main advantages of biodentine have been reported as, its ability to create a firm anchoring to dentine, its bioactivity which leads to the formation of reparative dentine, and improved mechanical properties, which are similar to dentine^[12].

Biodentin is easy to handle, has high alkaline pH, setting time of 12 mins and is a biocompatible material and additionally has non-pigmentation property making it favourable for perforation repair^[13]. In a study by Gunesser *et al*, Biodentine showed considerable performance as a perforation repair material even after being exposed to various endodontic irrigants as compared to MTA^[14]. Biodentine possess a significantly higher Vickers microhardness compared to ProRoot MTA. Hence, concerning all the above properties this cement often being called as a Dentine substitute^[15].

The first case was managed non-surgically with biodentine because there was no concomitant periodontal involvement. This was contrary to our second case which was managed surgically because there was a need to address the periodontium.

Case 1



Fig 1: preoperative photo and IOPA

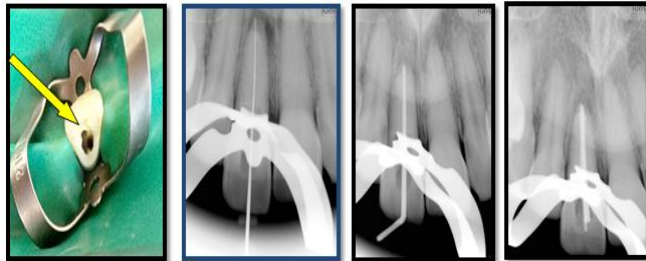


Fig 2: access cavity and perforation site and root canal procedure in 11



Fig 3: canal obturated and perforation site identified and repaired with biodentine



Fig 4: two week review healthy gingiva cosmetic contouring in 11



Fig 5: one year follow up

Case 2



Fig 6: preoperative photograph and IOPA

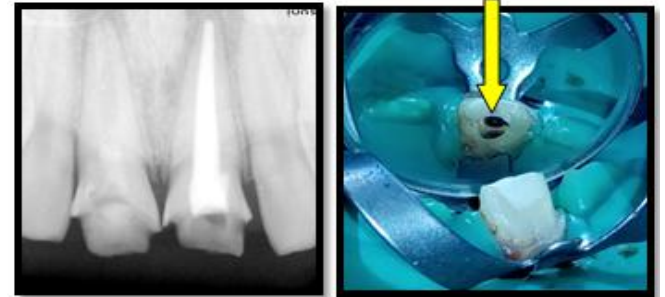


Fig 7: retrieval of GP and perforation site identified



Fig 8: RCT in 11



Fig 9: surgical procedure



Fig 10: suturing and immediate post op IOPA and two weeks review



Fig 11: post endodontic restoration



Fig 12: nine month follow up

Conclusion

The complications like iatrogenic perforation may occur during endodontic procedures. Even in cases with questionable prognosis, when tooth is considered to be doomed, attempt shall be made to repair. With the introduction of newer materials like Biodentine, in the near future these materials can become the gold standard for perforation repair.

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