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Management of teeth with trauma induced crown fractures and large periapical lesions following apical surgery (Apicoectomy) with retrograde filling

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Abstract

Dental traumatic injuries, usually affecting anterior teeth, causes pulp necrosis, chronic and cystic apical periodontitis if left untreated. most of the signs and symptoms for the failure are pain and discomfort, swelling and sinus formation at the surrounding soft tissue, and discoloration of the subjected tooth. Despite these serious complications, root canal treatment followed by apical surgery is considered a valid treatment option. This case report discusses the surgical approach of a discolored and infected upper central incisor which was previously root canal treated and crown fracture of teeth followed by trauma and the clinical outcomes of long standing crown fractured teeth with large periapical lesions.

Keywords: retrograde filling, root canal treatment, apicoectomy, traumhijk

Introduction

Dental traumatic injuries are one of the serious unanticipated events that can cause pulp necrosis, chronic and apical periodontitis if left untreated. The complication that may arise following the loss of pulp vitality is the development of apical periodontitis (AP) in the involved teeth [1]. AP is highly prevalent in the general population, and is defined as an inflammatory disease involving the periapical tissues, caused by the host immune response to microorganisms in the infected root canal system [2]. When AP develops, the prognosis for healing, following a correct endodontic treatment, is reduced by 15–20% [3], when compared to a regular root canal treatment, thus complicating the delicate situation of traumatized teeth [4]. moreover the ultimate biological aim endodontic therapy is to either prevent or heal apical periodontitis [5]. It is well established that microbial infection of the root canal is the main cause of apical periodontitis. The successful outcome of root canal treatment is highly dependent on the elimination of persistent infection and reinfection of the root canal space. While, Root canal treatment can fail for various reasons, such as missing canals, ledges, canal transportation, instrument separation, and perforation [6]. In such cases, periapical surgery is an alternative treatment approach when retreatment becomes impractical or unfavorable. periapical surgery (Apicoectomy) is accomplished by gaining access to the root end or any part of it and sealing the portals of exit with a biocompatible material that allows complete regeneration of periapical tissues [7]. The objective of periapical surgery is to obtain tissue regeneration which is usually achieved by the removal of periapical pathologic tissue and by exclusion of any irritants within the physical confines of the affected root. In a review, Friedman demonstrated that the mean success rates from published studies for endodontic surgery are as high as 58.9% without and 79.6% with pre-surgical retreatment of the root canal filling [8]. In a systematic review, Torabinejad *et al.* reported a success rate for apical surgery of 77.8% 2–4 years postoperatively and of 71.8% after 4–6years [9].

The aim of this case report was to discuss a case where the sequelae of a traumatic injury were diagnosed and management of the endodontic consequences of traumatic injuries by visualizing the features of the periapical area.

Case Reports

Case no-1

A 12-year-old female patient reported to department of pediatric and preventive dentistry, h.p govt dental college, Shimla with the chief complaint of discoloration of upper front teeth (figure 1). The patient had root canal treatment on tooth #11 approximately two years ago, owing to a history of dental trauma with coronal fracture of teeth. The tooth had multiple episodes of pain and swelling. The lesion healed after the completion of root canal treatment. However, for the last few months, the tooth started to cause discomfort with a slight pain during biting or chewing. she also noticed that it became darker and blackish in color.

There was no significant medical history. on intra- oral examination, there was no swelling, sinus tract, mobility, or deep probing depth detected around the tooth. Tooth #11 was tender to percussion and palpation. No abnormal clinical signs or symptoms were observed in the adjacent or opposing teeth. # 21–12 were tested by the pulp vitality test (the cold test) and relative isolation using cotton rolls and a dental saliva ejector. # 21 and 12 presented positive responses with characteristics of healthy pulp tissue. However, tooth # 11 had a negative response. periapical radiographic examination showed that tooth #11 had a well condensed root canal filling; however, the gutta percha was overextended and there was radiolucent circumscribed lesion around the periapical region of tooth #11 presenting features of periapical periodontitis. (Figure 2). The tooth had been poorly treated, where the extruded root canal filling had caused a continuous and persistent periapical lesion. At the same time, poorly obturated material had contributed to the tooth discoloration.

The provisional diagnosis was a failure root canal-treated tooth with chronic apical periodontitis and discolored tooth. the treatment plan was to retreat the root canal and to perform an endodontic surgery (apicoectomy).

Firstly, the root canal of tooth #11 was retreated to disinfect the contaminated system to remove the infection and extruded gutta percha was removed with the use of a chloroform solvent. Access cavity preparation was performed and working length was determined using the apex locator and was confirmed by the periapical radiograph. Then the canals were instrumented with hand K files and irrigated with 5.25% sodium hypochlorite. The root canals were obturated in the same session with gutta-percha and Ah Plus sealer. During periapical surgery, the operating site was anesthetized with 2% lignocaine containing 1: 100,000 adrenaline. The full thickness flap was designed, and once flap was reflected, we can appreciate the buccal cortical bone thinned by the periapical pathosis. Then the root-end was located, uncovered and bone removal was carried out using a round surgical bur in a slow-speed handpiece with sterile saline irrigation. Removal of granulation tissue was done using curettes during which biopsy specimens were taken for histopathologic examination (Figure 3 a). Once the lesion was excised, the retro cavity preparation was done using micromotor contra angle handpiece and round bur and filled with Mineral Trioxide Aggregate (ProRoot® MTA, Dentsply Sirona, Canada). DM BONE silicon ion containing 60% HA, 40% B-TCP was placed at the bony defect to encourage the growth of surrounding tissue (Figure 3 b). The flap is gently eased back into place and gentle pressure applied using saline-moistened gauze to aid close approximation for flap re-attachment. Pressure is again applied for five to ten minutes after suturing to prevent hemorrhage occurring and to reduce the coagulum, a potential nidus for infection. Flap closure was carried out

with 3-0 VICRYL suture and the surgical procedure was completed (Figure 4 a, b). Postoperative periapical radiography was performed immediately after suturing (Figure 5). Histopathological examination revealed fragments of densely collagenous tissue with mature fibroblasts, patchy chronic inflammatory cells, scanty vascular channels, and nerve bundles. A focal area shows a loosely edematous background with admixed hemorrhage, numerous capillaries, and intense inflammatory cells comprising lymphoplasmic cells, macrophages, and neutrophils. No epithelial cell lining was observed. The definitive diagnosis was periapical granuloma.

Follow-Up and Outcomes

14 days later, the patient had no postoperative interurrences and an intraoral evaluation was performed to investigate any hematoma or edema (figure -6). The patient related a slight edema in the first two days following the surgery that disappeared posteriorly. No exudate was observed or related.

Case no. 2

A 14 year old female patient was referred to department of pediatric and preventive dentistry, h.p govt dental college, Shimla. she complained of pain on biting and palpation in the area. There was history of trauma 2 years back and coronal fracture of tooth. At that time patient was not having pain and swelling associated with tooth, undergone with composite restoration. since 2 to 3 months , she has started with pain on biting and palpation. she also noticed that it became darker and blackish in color (figure- 7).

Medical history was non-contributory. Clinical examination revealed that tooth #11 had composite restorations with intact margins. There was no intra swelling, sinus tract, while there was grade 2 mobility and It showed a slightly increased probing depth circularly around the tooth. Tooth #11 was tender to percussion and palpation. The periapical radiographic examination revealed periapical radiolucency 7 - 8 mm in diameter along apex of the root (Figure 8). On the basis of the history and clinical and radiographic examination, a diagnosis of tooth #11 with symptomatic apical periodontitis was established.

First all the non surgical methods were tries but the patient was still symptomatic. So it was decided to go for the surgical method. The absence of adequate root canal filling led to the decision to perform nonsurgical root canal retreatment on tooth #11, and the patient agreed to participate and signed the consent form. First of all , root canal treatment of tooth #11 was completed, post operative iopa was taken. (figure 9)

This was followed by endodontic surgery (apicoectomy). During periapical surgery, the operating site was anesthetized with 2% lignocaine containing 1 : 100,000 adrenaline. The full thickness flap was designed, and Once the flap is reflected, the root-end was located and uncovered. There was pus discharge at the root end and buccal cortical bone was thinned by the periapical pathosis. while bone removal was carried out using a round surgical bur in a slow-speed handpiece with sterile saline irrigation. Removal of granulation tissue was done using curettes during which biopsy specimens were taken for histopathologic examination (figure 10) and then all surgical procedures were done as same in case no.1.

Discussion

Teeth with inadequate root canal treatments and asymptomatic periapical (PA) lesions usually harbor obligate

anaerobic microorganisms; such teeth might even have sound coronal restorations [10, 11]. Many studies have shown that the inadequate root canal and its failures were related to the presence of extraradicular biofilms, root fracture, mechanical perforations, residual necrotic pulp tissue, broken instruments, periodontal disease, root canal overfilling, root canal underfilling, missed canals or unfilled canals, and insufficient coronal restoration after completion of root canal treatment [12-14]. When primary root canal therapy fails, the treatment decision becomes more challenging to both the patient and the clinician. However, teeth with posttreatment apical periodontitis can be preserved and managed by either nonsurgical retreatment or endodontic surgery if the tooth is restorable and periodontally sound [15]. In this cases, treatment plan was to retreat the infected tooth and associate this retreatment with surgical intervention, as the conventional endodontic retreatment alone is ineffective. Surgical intervention (Apicoectomy) involves the surgical removal of tooth root apex or root end resection which can be done alone or in combination with placing a retrograde filling in order to seal the apical part of the root [16].

In the present clinical case no 1, the quality of the coronal seal and root canal filling was not achieved to a satisfactory standard. The extruded gutta percha and the presence of bacterial colonies in the periapical area could be major contribution factors to the inflammatory periapical lesion. Even though the gutta percha for the root canal filling proved to be least toxic and compatible with connective tissue, the studies also revealed that it might cause an early short-term inflammatory tissue reaction [17, 18]. In addition, case no 2 apical periodontitis could be the fate of untreated trauma-induced crown fractures. Nonsurgical root canal retreatment is always the first line approach to deal with a failure root canal-treated tooth. So, in the present clinical cases, nonsurgical retreatment was performed to clean and disinfect the defective canal and to retract the overfilling gutta percha beyond the apical end of the root. Since the patient had suffered for a very long time from the inflammatory lesion and there was still no sign of healing after foreign body removal, we decided to proceed with periapical surgery with the main objective of removing the disease of periapical tissues, it is also aimed at sealing the apical root canal system with biocompatible materials in order to facilitate the regeneration of hard and soft tissues, including the formation of new attachment cells [19].

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form of the patients(s) has/have given their consent for her images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due reports will be made to conceal their identity, but anonymity can not be guaranteed.



Fig 1: Pre- treatment photograph (frontal view)



Fig 2: Initial periapical radiograph of the patient with over extruded GP points



a



b

Fig 3: Periapical surgery procedure of tooth #11: (a) flap preparation and defect exposed , enucleation of lesion, (b) bone graft placed.



Fig 4: a) suturing



Fig 4: b) application of coe pak



Fig 5: Postoperative periapical radiograph



Fig 6: follow up- frontal view



Fig 7: Pre- operative front view



Fig 8: Initial periapical radiograph



Fig 9: Postoperative periapical radiograph



a)



b)

Fig 10: Periapical surgery procedure of tooth #11: (a) flap preparation and defect exposed b) enucleation of lesion

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