



Management of External Root Resorption Using Hemisection: A Novel Approach

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ABSTRACT

Hemisection involves the surgical separation of a multirooted tooth, especially a mandibular molar through the furcation in such a way that a root and the associated portion of the crown may be removed. Tooth resection procedures are used to preserve as much tooth structure as possible rather than sacrificing the whole tooth. Although hemisection preserves a healthy part of a tooth over a compromised and diseased part, it also forms an extraction socket which conventionally is left to heal without any intervention, as a result, post extraction changes continue leading to the dimensional loss of horizontal and vertical height of residual alveolar ridge. Socket preservation with biomaterials prevents such kind of bone loss and helps in early and predictable healing. In this case report, management of external root resorption using hemisection followed by socket preservation with platelet rich fibrin has been discussed.

Keywords: Endodontic, External root resorption, Hemisection, Platelet-rich Fibrin.

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INTRODUCTION

Loss of the posterior teeth may result in several undesirable sequelae which requires prevention and maintenance measures. The treatment options for an extensively decayed and unrestorable molar are limited. The most common treatment for such tooth may include extraction followed by a removable partial denture, fixed partial denture, or a dental implant to replace the missing tooth. However, with appropriate case selection, hemisection can be a relatively simple, conservative, inexpensive treatment with good chances of success. Hemisection is the surgical separation of a multirooted tooth, especially a mandibular molar through the furcation in such a way that a root and the associated portion of the crown may be removed. The treatment goal is the preservation of remaining tooth structure and restoration of the function [1]. Once the tooth has been judged appropriate for this treatment, it must undergo endodontic therapy first and then must be prepared for complete crown coverage because two roots are present in mandibular molars, half of the crown and associated root is removed [2]. Hence, tooth resection procedures are used to preserve as much tooth structure as possible rather than sacrificing the whole tooth. It differs from bicuspidization, in which a separation is made between two roots in the furcation area without removal of any root. The separated roots along with its crown portion are then restored as premolars [3]. Although hemisection preserves a healthy part of a tooth over a compromised and diseased part, it also forms an extraction socket which conventionally is left to heal without any intervention, as a result, post extraction changes continue leading to the dimensional loss of horizontal and vertical height of residual alveolar ridge, thus complicating further treatment, for example, implant placement. Socket preservation with biomaterials prevents such kind of bone loss and helps in early and predictable healing [4]. In this context, the Choukroun's platelet-rich fibrin (PRF), a second-generation platelet-rich concentrate has proved to be a double-edged sword in the field of dentistry, majorly focusing on the improved and early bone regeneration and soft-tissue healing, due to the presence of various growth factors and cytokines [5].

CASE REPORT

A 22-year-old male patient reported with complaints of pain and mobility of mandibular first molar. On Clinical examination, the tooth was sensitive to percussion and revealed Grade 1 mobility (Figure 1). On radiographic examination, proximal caries and external root resorption involving distal root of 36 was seen (Figure 2). It was decided that the distal root should be hemisected after completion of endodontic therapy of the tooth. Working length was determined using 10 k hand file (Dentsply Maillefer, Ballaigues, Switzerland). Biomechanical preparation was performed with Protaper gold rotary files (Dentsply, Tulsa Dental, Tulsa, OK, USA) till size F2 with the presence of irrigants. Master cone radiograph was taken. The canals were obturated with warm vertical compaction technique with gutta percha and Zinc oxide eugenol based sealer (Figure 3), and the chamber was filled with composite resin to maintain a good seal and allow interproximal area to be properly contoured during surgical separation.

Under local anaesthesia, full thickness flap was reflected after giving a crevicular incision from the second premolar to the second molar. Upon reflection of the flap (Figure 4), curettage was performed to remove chronic inflammatory tissues. The vertical cut method was used to resect the crown with distal root. A long shank, tapered fissure carbide bur was used to make a vertical cut toward the bifurcation area (Figure 5). A fine probe was passed through the cut to ensure separation. The distal half was extracted (Figure 6) and the socket was irrigated adequately with sterile saline (Figure 7).

Preparation of the platelet-rich fibrin

A volume of 10 mL of the patient's blood was collected by puncturing the antecubital vein. The blood sample obtained was transferred in a test tube and was centrifuged (REMI model R-8C with 12 mL × 15 mL swing out head) at 3000 revolutions per minute for 10 min. After centrifugation, three layers were naturally formed in the tube: platelet-poor plasma at the surface, PRF clot in the middle, and red blood cells at the bottom [4]. Sterile tweezers were used to gently grab and remove the fibrin clot out of the test tube. Using a pair of sterile scissors, the clot was cut to an appropriate size. PRF was prepared (Figure 8) and mixed with osseograft (Figure 9) and the obtained sticky bone was placed in the socket (Figure 10) followed by suturing (Figure 11). After 1-month, healing of the tissue was assessed (Figure 12) and fixed dental prosthesis involving retained mesial half of mandibular first molar, mandibular second molar, and mandibular second premolar was given.



Figure 1: Preoperative view of tooth 36



Figure 2: Preoperative radiograph of 36



Figure 3: Post obturation radiograph of 36



Figure 4: Flap reflection

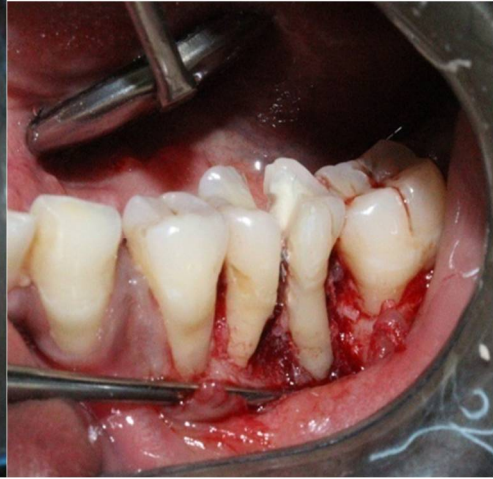


Figure 5: Tooth Sectioning



Figure 6: Extracted portion of the tooth



Figure 7: Socket Debridement

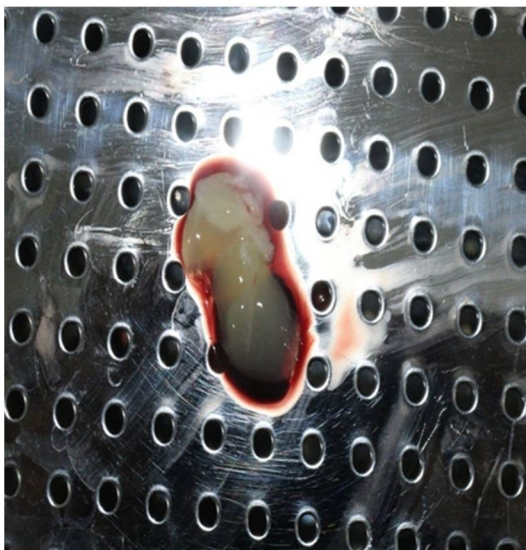


Figure 8: Preparation of PRF

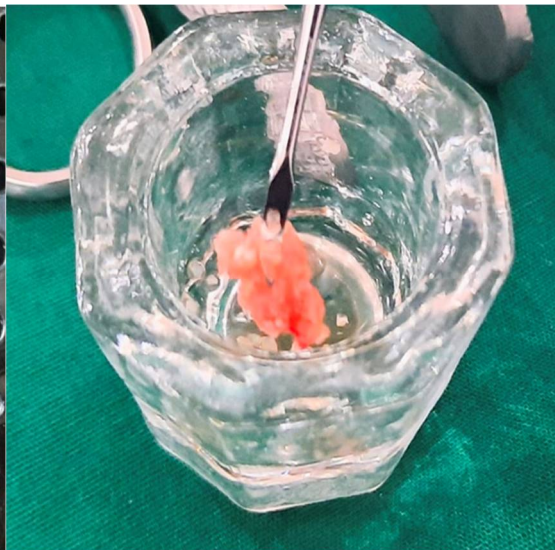


Figure 9: Preparation of Sticky Bone



Figure 10: Placement of Sticky Bone

Figure 11: Suturing done



Figure 12: Post-operative view

DISCUSSION

Resorption of the root of a permanent tooth is a pathological process that can occur inside the tooth (Internal resorption), or on the outer surface of the tooth (external root resorption) and can ultimately lead to loosening of the tooth and its early loss. External root resorption (ERR) occurs when the cementoblastic layer or other tooth tissue on the root surface are either damaged or removed [6]. ERR tends to occur more frequently in people aged between 21 and 30 years (28.40%) and is more common in females (59.04%) than males. Trauma, previous periodontal surgery, pressure from adjacent unerupted teeth and pathological conditions such as tumours as well as tooth re-implantation have all been implicated as aetiological factors [7]. Orthodontic tooth movement may also play a role in ERR, especially where the forces applied to induce tooth movement are not controlled, and in these situations the resorption usually occurs in the apical third of the root [8]. Hemisection is a useful alternative procedure to save those multirooted teeth which have been indicated for extraction. Before selecting a tooth for hemisection, patient's oral hygiene status, caries index, and medical status should be considered. The hemisection of multirooted teeth by endodontic approach includes the root canal treatment of the remaining roots and restoring them with suitable restorative material and splinting it with the adjacent tooth to decrease the risk of displacement followed by a fixed prosthodontic prosthesis to maintain the occlusal balance. The literature on distal root resection is limited as compared to mesial root in mandibular molars because of its anatomical structure. Nevertheless, hemisection is a viable option to be considered before the extraction of molars, especially in the presence of conditions such as severe vertical bone loss (one root of a multirooted tooth), furcation destruction, unfavorable proximity of roots of adjacent teeth, preventing adequate hygiene in maintenance of proximal areas, and severe root exposure due to dehiscence [9]. Recently, Park suggested that hemisection of molars with questionable prognosis can maintain the teeth without detectable bone loss for a long-term period, provided that the patient has optimal oral hygiene [10]. Shafiq *et al.* have also concluded that hemisection of a mandibular molar may be a suitable treatment option when the decay is restricted to one root, and the other root is healthy and remaining portion of the tooth can very well act as an abutment [11]. Buhler observed 32% failure rate in hemisection cases attributed to endodontic pathology and root fracture, whereas other authors have shown greater success in hemisection cases in long-term studies [12,13]. In the present case, good prognosis was observed with proper occlusion, absence of mobility, and healthy periodontal condition up to 6 months of follow-up. Concurring with previous reports, hemisection is a valid treatment option for molar teeth in young children, which otherwise have to be extracted due to extensive caries [14]. Thus, conservative management of extensive carious molar tooth in young patients can not only preserve the tooth but also

reduce the financial burden, psychological trauma, and occlusal dysfunction. Post extraction wound healing occurs through a series of complex biological processes. It takes at least 3 months to have an evident radiographic bone display. It is often associated with alveolar ridge height reduction. Hence, socket preservation with various biomaterials was proposed to minimize ridge resorption and enhance new bone formation. Zhang *et al.* in his study showed enhanced soft tissue healing, with a better quality of bone formation in PRF filled sockets [15]. A micro CT study by Jiing *et al.* showed that PRF placed socket showed better and early healing by virtue of the high concentration of functional, intact platelets enmeshed in a fibrin matrix [16]. Few case reports showed that the use of PRF following hemisection helped in faster bone healing [17,18]. Therefore, in the present case report, autologous PRF was considered as a graft material for the preservation of the socket.

CONCLUSION

Hemisection has received wide acceptance as a conservative dental treatment and teeth so treated have fulfilled the demands of function. A dentist should discuss this with his patients during consideration of treatment options so that the patient can choose best and conservative treatment available.

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Nil

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest for this study.

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