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Hemisection as an Alternative Management for Mandibular First Molar With Bifurcation Lesion and Root Fracture: A Case Report

Fauziah Karimah[1,] Eva Rizki Hutami[1] Tunjung Nugraheni[2] Ema Mulyawati[2, *]

[1] *Conservative Dentistry Specialty Program, Faculty of Dentistry, Gadjah Mada University*
[2] *Department of Conservative Dentistry, Faculty of Dentistry, Gadjah Mada University*
[*]*Corresponding author. Email emamulyawati@gmail.com*

ABSTRACT
Modern advances in dentistry have provided the opportunity for patients to maintain a functional dentition for lifetime. Hemisection is a conservative way of preserving tooth. This procedure is an endodontic treatment performed by removing of the one or more roots and existing crown structure to increase retention of the remaining teeth and to correct defected dental roots that are not possible to maintain. The purpose of this study was to report a case of hemisection management in teeth with bifurcation lesion. A 24-year-old female patient complained of pain and discomfort arising from the right mandibular first molar during mastication. 2 years ago, the patient underwent endodontic treatment. Based on the clinical examination, a deep cavity and failed restoration were found in tooth 46. Radiographic view showed a radiolucency on distal root, bifurcation and fracture line in mesio-cervical region. Endodontic retreatment was performed by cementing prefabricated fiber post on distal root canal and hemisection procedure was performed in the mesial root. The tooth was restored with splinted zirconia crown. Hemisection procedure and final restoration showed a good result. Hemisection was an alternative treatment in this case. Tooth can be preserved in economical way. Case selection is essential in performing sequences of procedure for the success of treatment.

Keywords: *Endodontic Surgery, Crown, Bifurcation, Hemisection*

1. INTRODUCTION

Loss of the posterior teeth is eventful and undesirable often leading to teeth drifting, loss of masticatory function and loss of arch length, which requires prevention and maintenance measure. Advances in dentistry have provided an opportunity for patients to maintain their functional dentition for a lifetime. Nevertheless, treatment strategy to retain such teeth involves periodontal, prosthodontic and endodontic assessment for appropriate selection to allow for stronger survival.

Hemisection is a conservative way of preserving tooth. Hemisection is a surgical procedure which involves resection and subsequent extraction of a compromised root up to the level of furcation [1]. The main goal of endodontic surgery is to eliminate the disease, prevent the recurrence of the disease, and facilitate healing on the side of the involved tooth tissue so that it can be restored according to its function [2].

The success rate for endo-surgery ranges from 73% to 99%, but it is indicated only in less than 5% of all endodontic patients [3]. The success or prognosis of the surgical endo depends on diagnosis factors, case selection, the accuracy of indications, contraindications, treatment procedures, periodic evaluations, statistical analysis and criteria of success itself [4]. The indications of hemisection are loss of supporting bone around one root, broad subgingival root caries affecting only one root, root perforation caused by resorption or instrument, as well as a root canal cannot be obturated due to obstruction, bent root shape, or root fracture. Contraindications include strong abutment tooth adjacent to the proposed hemisected tooth, which could act as an abutment to a prosthesis, the remaining root may be inoperable for root canal treatment. Also, fusion or proximity of the roots may prevent their separation [5,6].

Hemisection needs a proper restoration to cover and stabilize the remaining portion of the tooth to adjacent teeth. Lateral forces can lead to augmented stresses if the inclined planes of the cusps are not reduced in the final restoration and thus preventing the mobility of the retained segment [7]. A crown maybe indicated to the final restoration that can restore masticatory function. This is a conservative procedure to preserve tooth structure as much as possible and retain at least a part of the tooth rather than extraction of the whole tooth [8].

2. CASE REPORT

A 24-year-old female patient in Prof. Soedomo Dental Hospital, UGM complained of pain and discomfort arising from right mandibular first molar during mastication. 2 years

ago, the patient underwent endodontic treatment. However, the patient was in pain for one and a half years after the treatment due to swollen gums, then she came to the clinic and had a temporary filling. The clinical examination revealed that tooth 46 had a failed restoration in buccal space and deep decay and dental fistula were found in buccogingival region (Fig. 1). The tooth 46 had no mobility and tenderness to percussion and palpation. The radiographic examination revealed that severe periapical bone loss was evident in distal root involving the furcation area with radiopaque gutta-percha on 1 distal root canal and 2 on mesial root canal (Fig. 2). The patient wanted to save her teeth.

Figure 1 Preoperative clinical view of tooth 46

Figure 2 Preoperative Radiographic View

After detailed clinical and radiographic examination, the patient was informed about the procedure. The tooth was isolated using a rubber dam then all old restorations were removed. After regaining the access, pus was drained through the distal root canal, the cavity was left open. The patient was prescribed antibiotics and analgesics and was instructed to come back after 5 days.

In the next visit, the patient was asymptomatic. The estimated working length was measured with preoperative radiography. Gutta percha was removed from distal root canal using Hfile #15, #20, #25 and #30 with the help of citrol solvents (Fig. 3a). The final measurement of working length was carried out with an electronic apex locator and then confirmed by periapical radiography. The final working length obtained was 17,5 mm (Fig. 3b). Biomechanical preparation was performed using crown down technique with ProTaper Next Rotary Files (Dentsply, Maillefer, USA) and the canal was enlarged up to X3. During cleaning and shaping procedure, root canals were irrigated with a combination of 2,5% sodium hypochlorite (NaOCl), aquades and instruments lubricated with 15% EDTA gel. The preparation was checked by K-file #30 and master apical cone was evaluated clinically and radiographically (Fig. 3c). The main gutta-percha was sterilized with NaOCl 2.5% solution then rinsed using 70% alcohol and dried. The root canal was irrigated using NaOCl 2.5%, 17% EDTA, continued with chlorhexidine diclogunate 2% and activated with endoactivator. Sterile aquades was used as the intermediate irrigation solution. The root canal was then dried with a paper point.

The tooth was obturated with *continuous wave compaction technique* using gutta percha and AH plus sealer. Glass Ionomer Cement was taken as the liner and periapical radiography was taken to evaluate obturation. The cavity was restored using temporary filling material and the patient was called after a week (Fig. 3d).

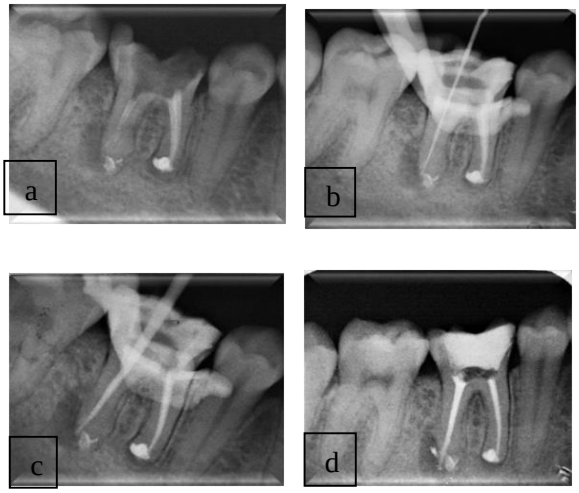

Figure 3 Periapical radiograh of tooth 46 (a) Radiographic view after removing Guttapercha, (b) Radiographic view working length, (c) Try in gutta percha, (d) After obturation

Tooth evaluation after obturation was asymptomatic. The tooth prepared for root canal post procedure used prefabricated fiber post. Gutta-percha on distal root canal was removed, leaving 4 mm GP apically using Peeso reamer. Prefabricated fiber post was tried in the root canal and was radiographically checked (Fig. 4a). The root canal was disinfected with chlorhexidine digluconate 2% then dried with paper point. The root canal etched with phospat acid 37% and the bonding agent was applied. After the fiber post was silanized, then the fiber post was cemented with dual cure resin cement with curing. Core build up material used bulkfill resin composite (SDR, Denstply) then it was evaluated using radiograph (Fig. 4b).

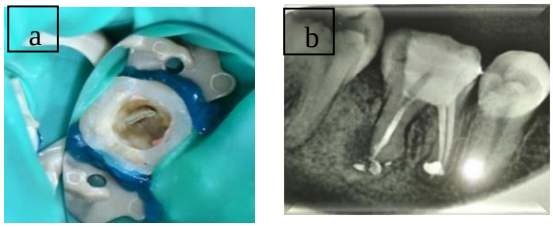

Figure 4 (a) Clinical view after cementing fiber post, (b) Periapical radiograph after cementing fiber post.

The patient was recalled after a week for hemisection of the tooth. The procedure was initiated by anaesthetizing the inferior alveolar nerve and the lingual nerve with 2 ml pehacaine. A triangular flap was performed, starting distal to tooth 46 along the gingival margin to the mesial of tooth 45, followed by an apically directed vertical incision. A tapered fissure carbide bur was used to cut the tooth bucco-lingually into two parts. Then, the mesial part along with the crown was carefully extracted, and the socket was debrided and irrigated thoroughly with saline. The sharp edges of the remaining tooth structure were rounded. Bone graft material (*GamaCHA*) was inserted in the socket, then the gingiva was sutured using 3.0 nylon thread (Fig. 5). Splinting was carried out on second premolar and first molar with orthodontic braided wire and composite resin. Afterwards, periodontal pack was given to protect the lesion and antibiotic and analgesic were prescribed.

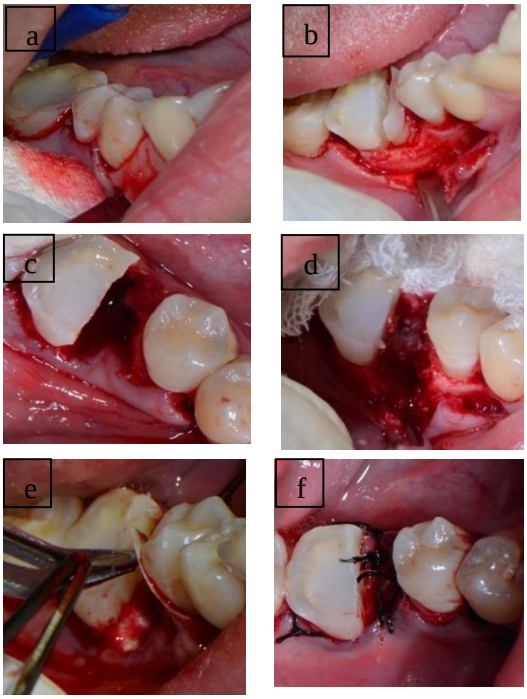

Figure 5 Hemisection procedure of tooth 46, (a) Flap incision, (b) crown separation, (c) clinical view after removing mesial root, (d) bone graft application, (e) installation of the pericardial membrane, (f) suturing.

The suture was removed after one week of observation. Preparation of tooth 46 for porcelain (zirconia) crown and preparation of occlusal rest on tooth 45 were carried out. A double impression was made for the prepared teeth followed by alginate impression for the antagonist. The shade was determined with shade guide, then temporary crown was cemented using temporary cement. The cast was sent to the dental laboratory. A zirconia splinter crown with occlusal rest was made and cemented with cement resin (Fig. 6).

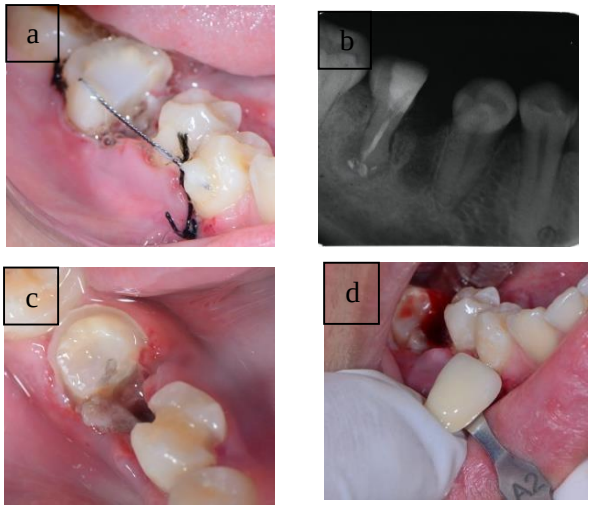

Figure 6 (a) temporary splinting, (b) radiographic view of 1 week after hemisection, (c) clinical view of core preparation of tooth 46 and 45, (d) adjusting color with shade guide.

The patient was recalled after one week with no pain and no mobility. Radiographic examination indicated no periapical lesion and bone formation at the extraction socket (Fig. 7).

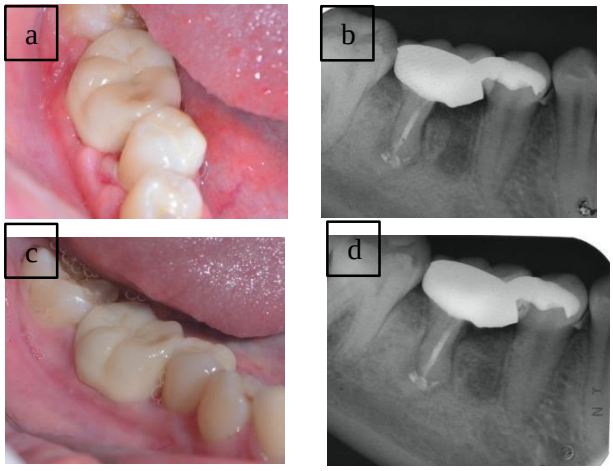

Figure 7 Clinical view of tooth 46 and 45 crowns after cementation (a) occlusal and buccal, (b) radiographic view of post crown cementation, (c) clinical view of occlusal and buccal after 1 week, (d) Radiographic view of tooth 46 and 45 crowns after 1 week

3. DISCUSSION

Nowadays, people want to keep their natural teeth for a lifetime**.** Hemisection is a useful alternative treatment to

extraction to save the multirooted teeth. The treatment procedure involves removal of compromised root structure and its associated crown portion through deliberate excision, [2] whereas root resection is surgical removal of the defect root and adherent soft tissues leaving the crown of the tooth intact and supported by remaining roots [1]. Patient's oral hygiene status, caries index, and medical status should be considered before selecting a tooth for hemisection.

A hemisection can only be performed on molars, which are the larger, flatter teeth. Hemisection cannot be performed on smaller teeth because they lack the strength and stability required to remain functional after the procedure. 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 [5]

In this case, the retreatment was carried out only on the distal root and mesial root was extracted. The extraction was carried out due to severe vertical bone loss of the mesial root with furcation destruction and root fracture whereas the distal root can still be maintained. Splint crown was chosen to increase retention, resistance, and to withstand the chewing load of the teeth. Treatment choice depends on the various factors such as amount of bone loss, furcation involvement, and cost effectiveness

The prognosis was comparable to any other tooth with endodontic treatment depending on the supporting bone, the restorative treatment plan, and the oral hygiene of the patient. In the present case, good prognosis was observed with proper occlusion, absence of mobility, and healthy periodontal condition.

4. CONCLUSION

Hemisection is an alternative treatment in this case. Tooth can be preserved in economical way. Case selection is essential in performing sequences of procedure for the success of treatment.

AUTHORS' CONTRIBUTIONS

All authors contributed equally to this case report.

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