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RESEARCH ARTICLE

HEMISECTION: AN BOON FOR HOPLESS TEETH

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ABSTRACT

One of dentistry's primary objectives is the long-term maintenance of teeth. Hemisection of a molar is either removal or separation of a root along with its accompanying part of crown. Hemisection is a suitable treatment option when caries, resorption, perforation, or periodontal damage is extensive in one root while the other root is relatively healthy. Hemisection of the affected tooth helps to retain tooth structure, surrounding alveolar bone, and may also facilitate the placement of fixed prosthesis. This case report describes hemisection as a successful treatment method to save a grossly carious mandibular second molar with severe furcation involvement. Hemisection and prosthetic rehabilitation yielded a satisfactory result. Hence with careful treatment planning and precise surgical management, undesirable consequences of tooth loss were prevented.

INTRODUCTION

Due to advances in dentistry, it possible to have a healthy dentition for life.¹ Losing a posterior tooth can lead to tooth migration, loss of masticatory function, and reduction in arch length which is detrimental in long run. Hence, maintenance of posterior teeth is of utmost importance¹¹. 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 and treatment, hemisection can be a relatively simple, conservative, inexpensive treatment with good chances of success². Yuh et al. assessed the survival rates of root-resected molars retrospectively and reported interesting findings with respect to demographic variables. The overall survival rate for root-resected molars was found to be 91.1%.³ Carnevale et al. reported a survival rate of about 93% over a 10-year follow-up among patients who received hemisection as the management of furcated molars.¹⁰ The success of hemisection depends mostly on case selection and following specific endodontic, surgical, and restorative guidelines.

Weine F has listed the following indications for root resection.⁵
Periodontal indications for hemisection

- Severe vertical bone loss involving only one root of multirooted teeth
- Severe furcation destruction
- Unfavorable proximity of roots of adjacent teeth, preventing adequate hygiene maintenance in proximal areas
- Severe root exposure due to dehiscence.
- Endodontic and restorative indications
- Prosthetic failure of abutments within a splint: If a single or multirooted tooth is periodontally involved within a fixed prosthesis, instead of removing the entire prosthesis, if the remaining abutment support is sufficient, the root that is involved, is only extracted.
- Endodontic failure:
- Hemisection is useful in cases, in which there is perforation through the floor of the pulp chamber, or in the pulp canal of one of the roots of an endodontically involved tooth which cannot be instrumented.

- Vertical fracture of one root: The prognosis of vertical fracture is hopeless. If vertical fracture traverses one root which cannot be instrumented while the other roots are unaffected, the involved root may be amputated
- Severe destructive process: This may occur as a result of furcation or subgingival caries, traumatic injury, and large root perforation during endodontic therapy.

CASE REPORT

A 45-year-old male patient reported to the department with the complaint of pain in the right mandibular second molar. On examination, the tooth was tender on percussion and was grossly carious. On probing the area, there was a deep periodontal pocket around the distal root of the tooth. On radiographic examination, furcation involvement was evident, and there was a periapical radiolucency associated with the distal root. The bony support of mesial root was completely intact. It was decided that the distal root should be resected after the completion of endodontic therapy of the tooth. The patient was informed about the treatment plan, and consent was obtained before the procedure. Root canal procedure was carried out in the mesial root of mandibular molar under rubber dam, an access was created using endo access burs (Dentsply Maillefer). On obtaining straight line access, working length was determined using radiographic methods and confirmed on the apex locator (ProApex-II), (0.5 mm from the perceivable apex). Biomechanical shaping and cleaning were done, with rotary files (ProTaper Next, Dentsply Maillefer) up to file size F4, under passive mechanical irrigation with saline and 4% w/v sodium hypochlorite solution, a calcium hydroxide interappointment intracanal dressing was given for 14 days, after which obturation was completed using cold lateral compaction technique with appropriate gutta-percha points and AH Plus resin base sealer. Hemisection of the distal root and crown was carried out using the vertical cut method, in the subsequent appointment. After vertical and crevicular incision, full thickness mucoperiosteal flap was reflected. The mesial root was sectioned at the level of the furcation using long-tapered fissure diamond. The distal root was atraumatically extracted, and the socket was irrigated adequately with normal saline and subsequently filed with a bone file to remove bony chips and irregularities. The flap was replaced, and simple interrupted sutures were placed, using vicryl (3-0) suture material. The occlusion was relieved and adjusted to redirect the forces along the long axis of the mesial root. The surgical site was covered with a periodontal dressing (Coe-Pak™ GC America Inc., Alsip, IL, USA), and postoperative instructions were given to the patient. Four weeks following surgery, complete healing at the surgical site was observed, clinically and radiographically. After adequate healing of the tissue, the prosthetic phase of therapy is initiated by planning a metal fixed partial denture involving retained mesial half of mandibular second molar and the third molar. The teeth involved were prepared using diamond points, after which a putty-light body impression was made using polyvinyl siloxane impression material. Provisional restoration was fabricated using indirect technique and was cemented in place. To enhance the oral hygiene maintenance, modified sanitary pontic design was selected. Metal bridge was fabricated subsequently and cemented in place.



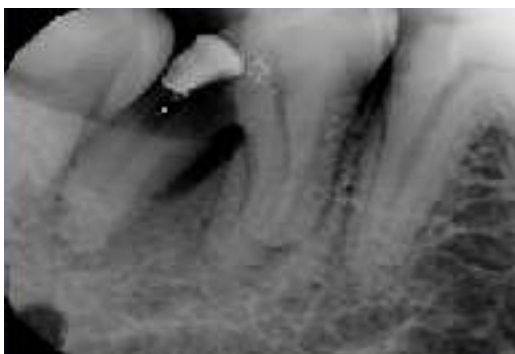
Working length radiograph



Mastercone radiograph



Intraoral photograph after obturation



Preoperative Radiograph



Post obturation radiograph after 4 weeks



Post obturation radiograph after 4 weeks



Intraoral photograph after crown preparation



Hemisectioning of distal root



Intraoral photograph after cementation of prosthesis



Photograph after hemisectioning



Post Cementation Iopa X-Ray



Resected root

DISCUSSION

Periodontal, prosthodontics, and endodontic assessment of cases is important for cases planned for hemisection. Buhler stated that hemisection should be considered before every molar extraction because it not only gives a good, absolute, and biological cost saving alternative but also good long term successful prognosis⁶. The treatment options to replace badly mutilated and un-restorable teeth include removable partial denture, fixed partial denture, and dental implant. A guiding principle to be followed is to meticulously save and preserve what is present.

The use of hemisection to retain a compromised tooth offers a favourable prognosis which is comparable to any other tooth with endodontic treatment⁶.

Endodontic Phase: Endodontic treatment is done first because if there is an endodontic failure, the case will be contraindicated for hemisection. Periodontic Phase.

Four critical factors in selecting molar for hemisection are following⁸.

- **Root Divergence:** Ideally the resected root should have generous root divergence, as close root proximity will make surgery difficult.
- **Root Form:** Roots of mandibular molars show concavity, mostly on distal root. Therefore, odontoplasty should be performed to provide a proper contour.
- **Location of Furcation:** Closer the furcation opening to the cemento-enamel junction, better the prognosis for retained root.
- **Remaining Root Attachment:** is critical to evaluate; as cylindrical, ovoid, and long root serves as an excellent abutment.

Objectives

- To facilitate maintenance of tooth.
- To prevent further loss of attachment.
- To obliterate furcation defects which serve as a periodontal maintenance problem Prosthodontic Phase.

When the tooth loses a part of its root support, it will require a restoration to permit it to function either independently or to serve as an abutment for fixed partial denture or splint. Thus, restoration is a prime requisite for function as well for a stable occlusion. Some important points to consider while fabricating the prosthesis for a tooth that has undergone hemisection can be summarised as follows. If margins are defective or if nonocclusal surfaces do not have the physiologic form, then the restoration can aggravate the existing periodontal destruction. An improperly shaped occlusal contact area can convert normally acceptable forces into destructive forces leading to ultimate failure of hemisection. Hemisected abutment are given a taper greater than 6–10 degree to have a path of insertion compatible with the anterior abutment. To compensate for this taper and increase retention buccal and lingual grooves are placed in the abutment. Occlusal table is reduced in size in order to decrease the forces on the retained hemisected root. Cuspal inclines are made less steep to reduce laterally directed forces and also to eliminate the nonworking contacts. The retained root is restored as premolar which helps to reduce decrease the masticatory load. The morphology of remaining tooth after root separation and resection has been of prime importance for subsequent maintenance of the tooth. Schmitt & Brown, suggested that the preparation of the crown must be “barreled in” to follow the profile of the root complex⁹. However with such a preparation, it is difficult for the patient to maintain good oral hygiene in this area. To overcome this problem Di Febo et al. suggest a “combined preparation” to modify the emergence profile creating convex surfaces which help in maintaining good oral hygiene¹⁰.

The key to long term success of the treatment of hemisection includes thorough diagnosis, selection of patients with good oral hygiene and careful surgical and restorative management. Hemisection may be a suitable alternative to extraction and implant therapy and should be discussed with patients during consideration of treatment options¹¹.

CONCLUSION

The strategic planning, operative sequence, and multidisciplinary approach executed in this case signify the importance of specialized knowledge and professional communication. Hemisection is a boon for teeth undergoing extraction. Careful case selection and execution determines the long term success of hemisection.

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