



When Half is Whole: The Art of Tooth Hemisection, A Case Report

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ABSTRACT:

With advancements in dentistry and a growing desire among patients to preserve their teeth, treatments are now available for teeth that would have previously been extracted. To meet this modern demand, grossly carious teeth with periapical pathology can be retained by removing the decayed part of crown and root. Hemisection involves removing a root along with its associated crown portion, typically in two-rooted teeth such as mandibular molars. It is a viable treatment option when decay, resorption or periodontal bone loss is confined to one root while the other remains healthy. This article outlines a procedure for hemisection of a mandibular molar followed by its subsequent restoration to enhance the retention of the remaining tooth and address defective dental roots that cannot be preserved. The combination of hemisection and prosthetic rehabilitation resulted in an acceptable outcome.

Introduction

Hemisection is a conservative approach to tooth preservation. This procedure entails the surgical separation of a multi-rooted tooth, involving the resection and subsequent extraction of a compromised root up to the furcation level, along with the associated decayed crown¹. The treatment may integrate restorative dentistry, endodontics, periodontics and prosthetic rehabilitation to retain the teeth wholly or partially. These teeth can serve as independent units for mastication or as abutments in simple fixed bridges². According to Weine, tooth resection is indicated for periodontal disease with severe vertical bone loss, complete furcation destruction, and unfavourable root

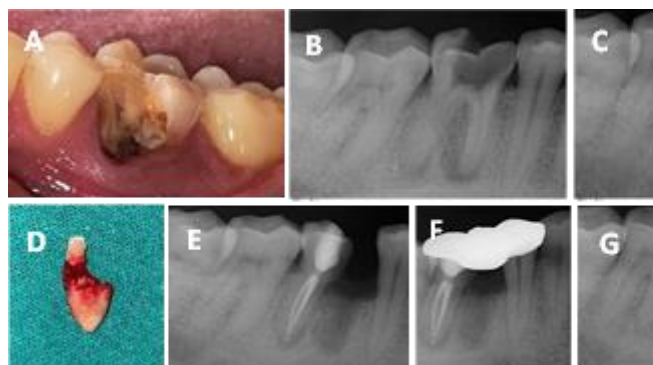
proximity involving a single root of multi-rooted teeth. Endodontic and restorative indications include prosthetic failure of abutments, endodontic failure, vertical root fractures, and severe destructive processes involving a single root of multi-rooted teeth. After determining whether the tooth is suitable for this treatment, it should undergo endodontic therapy, followed by complete crown coverage. Hemisection should be considered before tooth extraction, as it delivers effective and enduring results³. A follow-up study over 10 years showed that approximately 93% of patients who underwent hemisection for molar treatment, rather than extraction, experienced successful outcomes. The quality of dental restoration is vital in preventing periodontal damage. If the inclined planes of the cusps are not reduced in the final restoration, lateral



forces can lead to increased stress, preventing the retained segment from remaining stable. Defective margins or improper physiologic form can lead to destruction. Furthermore, an incorrectly shaped occlusal contact area can turn balanced forces into destructive ones, causing trauma from occlusion and potentially leading to the failure of hemisection².

Case report

A 43-year-old male patient reported experiencing pain and discomfort in the right mandibular first molar while chewing. He experienced persistent, throbbing pain in this area, which intensified while chewing and during sleep. The patient's medical history as well as the



A. Clinical Preoperative; **B.** Preoperative Radiograph; **C.** Root canal treatment; **D, E.** Root resection and hemisection; **F.** Zirconia crown placement; **G.** 6 months follow up

dental history did not provide any relevant information. On intra-oral examination, 46 was grossly carious and sensitive to percussion. Pulp sensibility tests (Cold test and EPT) were nonresponsive. The radiographic examination showed enamel and dentin caries involving pulp with mesial root caries in tooth 46. Additionally, a periapical lesion was observed in the mesial root of tooth 46. Consequently, the tooth was diagnosed with pulp necrosis with apical periodontitis. In order to preserve the tooth, it was decided to commence with endodontic treatment of the distal root followed by hemisection of the mesial.

The tooth was anaesthetized locally (inferior alveolar nerve block) using 2% lidocaine with 1:100000 adrenaline followed by rubber dam isolation. The access cavity was prepared using a round bur and a safe end

bur. Four orifices were located: the mesiobuccal, mesiolingual, distobuccal and distolingual. The working length was established with an electronic apex locator and validated through a radiograph. Distal canals were cleaned and shaped using rotary Ni-Ti instruments upto file size 30 and 4% taper. Canals were irrigated with 3% sodium hypochlorite throughout the preparation phase, then dried with paper points. As there was no fluid exudate and canals were completely dry it was decided to obturate the canals during the same visit. Obturation was followed by permanent restoration using composite resin with a base of resin-modified glass ionomer liner. After the endodontic procedure, hemisection of the mesial root was performed due to carious extension into the mesial root and associated periapical lesion.

The procedure was performed under local anesthesia. A full-thickness flap was raised, and the tooth was sectioned vertically using a long shank, tapered fissure carbide bur directed toward the bifurcation to resect the mesial half of the crown and root. The mesial root segment along with the crown was extracted atraumatically, followed by curettage and thorough irrigation of the socket. The flap was then repositioned and secured with sutures. An immediate intraoral radiograph confirmed the complete removal of the mesial root associated with the crown and the retention of the distal half of the crown and root. After one month, once the socket had completely healed, a 3-unit fixed prosthesis was placed involving the distal half of tooth number 46 and adjacent 45 with a sanitary pontic. The patient was recalled for a six-month follow-up, during which clinical and radiographic examinations were performed. The radiograph showed bone formation around the resected area with no signs of pathology.

Discussion

Root amputation or hemisection is a valuable alternative to preserve multi-rooted teeth that are otherwise indicated for extraction. The success rate of the procedure aligns with thorough clinical data, accurate diagnosis and prognosis, and a collaborative multidisciplinary treatment plan. Reshaping the root surface at the site of hemisection by grinding can often make it more prone to caries and eventually negate a favorable outcome⁴. Endodontic therapy failure, irrespective of the underlying cause, will inevitably lead to the overall failure of the procedure. Also, Defective restoration margins or non-physiologic surfaces can lead to periodontal destruction. Improperly shaped occlusal contact areas may convert acceptable forces into destructive ones, causing trauma from



occlusion and potential hemisection failure⁵. When a tooth has lost part of its root support, it necessitates a restoration followed by endodontic therapy to enable independent function or to serve as an abutment for a splint or bridge.

Hemisection of a mandibular molar may be an appropriate treatment option when decay is confined to one root, while the other root remains healthy, allowing the remaining portion of the tooth to effectively function as an abutment. 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 hygiene⁶. It has been concluded that hemisection of a mandibular molar may be an appropriate treatment option when decay is limited to one root, leaving the other root healthy. It has been concluded that hemisection of a mandibular molar may be an appropriate treatment option when decay is limited to one root, leaving the other root healthy, and remaining portion of the tooth can very well act as an abutment⁷. Langer et al. found that endodontic or restorative issues, such as root fractures, untreated lesions, and caries, accounted for 36% of root-extracted teeth failures within 10 years, surpassing periodontal problems⁸. Basten et al. reported that 92% of extracted teeth had a median survival time, with most failures attributed to caries, endodontic issues, or strategic factors⁹.

In this case, due to significant destruction of the mesial root from extensive caries and the adequate bone support of the remaining distal root, hemisection was performed with the removal of the mesial root and crown. The remaining tooth structure was restored with composite material and used as an abutment for a crown and bridge after minimizing and repositioning the occlusal contacts to a favorable position. Lateral forces were reduced by flattening cuspal inclines.

Conclusion:

In summary, hemisection can be deemed a viable and cost-effective alternative to extraction followed by implant and should be presented as an option to patients when discussing treatment choices. This procedure has been widely embraced as a conservative treatment of multi-rooted carious teeth in adults which preserves dentition and reduces financial, psychological, and functional issues associated with tooth loss.

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