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Preserving Functionality: The Role of Hemisection in Contemporary Dental Practice

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Abstract

Preserving a natural tooth is always the preferred choice when feasible. When pathology is confined to a single root of a multi-rooted tooth, a strategic and minimally invasive approach can offer a predictable solution. Hemisection involves the precise removal of the compromised root and its associated crown portion while retaining the healthy root and remaining tooth structure. This technique is particularly advantageous in cases of advanced caries, periodontal disease, root resorption, or perforation, as it helps maintain alveolar bone integrity and supports long-term prosthetic rehabilitation. This case report presents the successful management of a severely compromised mandibular molar using this approach.

Keywords: Hemisection, Tooth Preservation, Molar Rehabilitation, Root Resection, Furcation Defect, Endodontic Surgery

Introduction

Preserving natural dentition is a key goal in modern dentistry, as losing posterior teeth can lead to tooth migration, reduced chewing efficiency, and compromised arch stability. Advances in treatment now allow retention of teeth once considered unsalvageable. Hemisection is a conservative surgical approach that removes a compromised root and its crown while retaining the healthy portion, maintaining bone integrity and enabling prosthetic rehabilitation. Its success depends on case selection, surgical precision, and restorative planning. Indications include severe bone

loss, root fractures, or endodontic failure; contraindications involve poor root anatomy or better abutment alternatives. This case report illustrates hemisection's clinical value and cost-effectiveness.

Case Report

A 35-year-old female presented to the Department of Endodontics with a one-week history of dull, continuous pain in the lower left posterior region, worsened by chewing. Her medical and dental histories were non-significant. Clinical examination revealed a large mesio-occlusal carious lesion with furcation involvement in tooth #18. Radiographs showed severe mesial decay and a periapical radiolucency at the mesial root (Figure 1A). Periodontal findings included normal sulcular depth, intact alveolar bone, and physiologic mobility.

A diagnosis of symptomatic apical periodontitis in tooth #18 was made. Due to extensive decay, the tooth was deemed unrestorable. Treatment options included extraction with implant placement or hemisection. The patient chose hemisection followed by fixed prosthetic rehabilitation. Informed consent was obtained.

The treatment plan included extraction of the mesial root and preservation of the distal root, which had favorable morphology for an abutment. Under rubber dam isolation, caries removal and access cavity preparation were performed on the distal root. A single canal was identified, patency established with a #10 K-file, and working length determined using an apex locator (Dentaport ZXII, Morita). Biomechanical preparation was performed using rotary files (ProTaper Gold) up to size F1 after initial apical enlargement to a #20 K-file. Irrigation was done with 3% sodium hypochlorite (HYPOSOL) and saline. Calcium hydroxide (RC Cal) was placed as intracanal medicament for one week.

At the follow-up visit, the canal was dried and obturated using lateral condensation with gutta-percha and AH Plus sealer (Dentsply) (Figure 1B). The orifice was sealed with glass ionomer (3M Ketac Molar), followed by composite restoration (NT Premium; Coltene). The patient was scheduled for hemisection in 10 days.

During surgery, a full-thickness flap was raised under local anesthesia. Tooth sectioning from buccal to lingual was performed using a tapered fissure bur. The mesial root was luxated and extracted (Figures 1C and 1D). Granulation tissue was removed, and the socket was irrigated with saline. The flap was sutured with 3-0 silk. The occlusal table was reduced to minimize forces, and final shaping of the distal segment was done.

After one week, sutures were removed, and healing was satisfactory. At one month, healing continued to progress. The retained segment was prepared for a prosthesis, and a digital 3D impression was taken using CAD-CAM (Exocad software, Aurum 5x milling) (Figures 2A and 2B). A porcelain-fused-to-metal (PFM) crown was fabricated and cemented after removing the temporary crown (Figure 2D). A six-month radiograph showed bone formation in the extraction socket (Figure 2C).

Conclusion

Hemisection offers a conservative alternative to extraction for multi-rooted teeth with localized pathology. In this case, hemisection preserved the distal root of tooth #18 in a 35-year-old patient with symptomatic apical periodontitis and severe decay of the mesial root. Due to financial and personal preference, the patient declined implant therapy. Hemisection allowed for functional preservation and rehabilitation.

Success depends on case selection, periodontal health, and proper endodontic and restorative procedures.

Studies report favorable long-term outcomes when furcation involvement is minimal and bone support is adequate. Carnevale et al. (1991) reported a 93% survival rate over 10 years for hemisected molars with good periodontal conditions. Hamp et al. (1975) and Saad et al. (2019) also support hemisection in well-selected cases.

Endodontic success is critical, as failures are often due to inadequate canal treatment. Langer et al. (1981) found that 36% of root-resected molars failed due to endodontic or restorative issues. In this case, rotary instrumentation and appropriate obturation contributed to long-term success.

Restorative planning influences longevity. Studies by Basten et al. (1996) and Shafiq et al. (2011) highlight the importance of occlusal adjustments and prosthesis design. The occlusal table was reduced in this case to limit occlusal forces. The PFM prosthesis provided strength and stability, while CAD-CAM technology ensured precision and optimal fit.

Healing of the extraction site is another positive indicator. Follow-up radiographs showed bone regeneration. Similar findings are reported by Bühler (1988) and Basten et al. (1996), who found 92% survival over 12 years, with failures mostly due to caries and endodontic issues, not periodontal disease. Zafiropoulos et al. (2009) noted that periodontal maintenance is critical, especially in patients with prior periodontitis.

Limitations of hemisection include risk of caries on the exposed root, occlusal trauma, and prosthetic challenges. Patient compliance and oral hygiene are essential. Park et al. (2009) emphasized that patient behavior directly affects long-term prognosis. Fugazzotto (2001) reported similar success rates for root-resected molars (96.8%) and implants (97.0%), reinforcing that both can be effective with proper execution.

In summary, hemisection remains a conservative and effective treatment for preserving function and aesthetics in patients unwilling or unable to opt for implant therapy. With appropriate case selection and multidisciplinary care, hemisection offers predictable, long-term success.

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Legend Figures

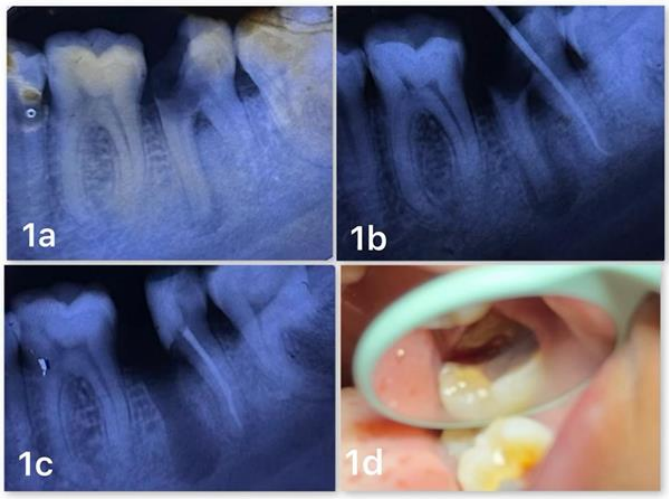

Figure 1:

(a) A preoperative periodical radiograph of tooth #18. The radiograph is showing severe decay affecting the mesial half of the tooth structure, along with a radiolucent area surrounding the apex of mesial root.

(b) Master cone IOPA taken with master apical cone gutta percha.

(c) Radiograph showing Hemisection of mesial root in relation to tooth #18 after completion of obturation.

(d) Clinical picture in relation to tooth #18 after extraction of mesial root

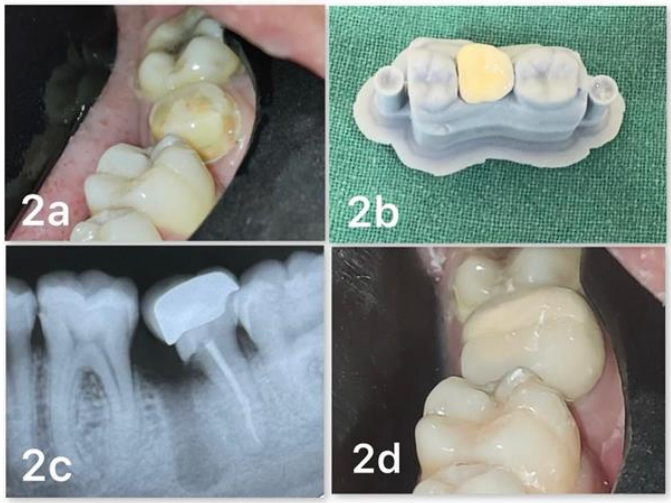

Figure 2:

(a) One-month follow-up visit showing retained tooth segment prepared for a fixed PFM prosthesis.

(b) A 3D digital impression captured using CAD-CAM technology (Exocad software with Aurum 5x milling) and the model is prepared on which the crown is seated.

(c) One-month follow-up radiograph showing healing of mesial socket wrt #18 with PFM prosthesis in place.

(d) Clinical picture of cemented PFM prosthesis.