(International Print/Online Journal)

SJIF IMPACT FACTOR: 6.829
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 9, Issue 2 , Page No: 355-360
March-April 2026

IJMSCR

Half the Tooth, Whole the Function: Management of Advanced Furcation Involvement in a multirooted tooth via Hemisection: A Case Report

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Type of Publication: Case Report
Conflicts of Interest: Nil

Abstract

Background: Hemisection is a conservative dental procedure that enables preservation of a multirooted tooth by removing the diseased root while retaining the healthy portion. It serves as a viable alternative to extraction and implant placement in cases of localized periodontal or endodontic pathology.

Case Presentation: A 33-year-old female patient presented with pain and difficulty in mastication in relation to the mandibular left first molar (36). Clinical and radiographic examination revealed advanced furcation involvement with significant bone loss affecting the distal root, while the mesial root exhibited adequate periodontal support. Following thorough endodontic therapy of the mesial root, hemisection was performed with surgical removal of the distal root. The retained root was subsequently rehabilitated with a full-coverage prosthesis involving adjacent tooth support.

Results: Post-operative healing was uneventful, and follow-up of 12 months demonstrated satisfactory periodontal health, functional stability, and absence of clinical symptoms. Radiographic evaluation confirmed maintenance of bone support and successful adaptation of the prosthesis.

Conclusion: Hemisection represents a predictable, cost-effective, and biologically sound treatment modality for managing furcation-involved mandibular molars. With appropriate case selection and interdisciplinary management, it can provide long-term functional and clinical success.

Keywords: Endodontic therapy; Furcation involvement; Hemisection; Mandibular first molar; Root resection; Tooth preservation

Introduction

Preservation of natural dentition remains a fundamental goal in modern dentistry. Multirooted teeth with furcation involvement present a significant clinical challenge due to compromised periodontal support and complex root anatomy. Traditionally, such teeth were extracted and replaced with implants; however, conservative approaches such as hemisection have gained renewed interest [1].

Hemisection involves the surgical removal of one root along with its associated coronal portion, allowing the remaining tooth structure to function independently [2]. It is particularly indicated in cases of vertical bone loss affecting a single root, advanced furcation involvement, root fractures, or localized endodontic failures [3]. Successful outcomes depend on accurate diagnosis, meticulous endodontic therapy, atraumatic surgical technique, and appropriate prosthetic rehabilitation [4].

The present case report describes the successful management of a mandibular first molar with advanced furcation involvement using hemisection, highlighting the importance of an interdisciplinary approach.

Case Report

A **33-year-old female patient** reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain and difficulty in mastication in the lower left posterior region for the past 12 months. The patient's medical and dental history was non-contributory.

Clinical Findings

Intraoral examination revealed a grossly compromised mandibular left first molar (36). The tooth was tender on percussion and exhibited signs of periodontal involvement. Furcation involvement was clinically evident, although no mobility was observed.

Radiographic examination revealed significant bone loss in the furcation region with severe destruction associated with the distal root, while the mesial root demonstrated comparatively better bone support. Based on clinical and radiographic findings, a diagnosis of chronic apical periodontitis associated with advanced furcation involvement was established with respect to tooth 36.

Treatment Plan

The patient was informed about the prognosis and various treatment options, including extraction followed by implant placement. Considering the strategic importance of the tooth and the favourable condition of the mesial root, a conservative approach involving hemisection followed by fixed prosthetic rehabilitation was planned. The patient consented to this treatment.

Treatment Procedure

After obtaining informed consent, access opening was performed under local anesthesia. Two canals (mesiobuccal and mesiolingual) were identified in the mesial root. Canal negotiation was carried out using a size 10 K-file, and glide path was established.

Working length was determined using an electronic apex locator and confirmed radiographically (19 mm). Biomechanical preparation was completed up to size 25/04 using standard protocols. Irrigation was performed using sodium hypochlorite and saline.

Master cone selection was carried out, followed by obturation using gutta-percha and a bioceramic sealer, ensuring a three-dimensional seal of the canal system (Figure 1).

Following completion of endodontic therapy, hemisection was performed. The distal root was sectioned and atraumatically extracted while preserving the mesial root. The extraction socket was thoroughly debrided and irrigated.

After adequate healing, tooth preparation was carried out with respect to teeth 36 and 37. A full-coverage prosthesis was fabricated and cemented to restore function and occlusion (Figure 2).

Follow-Up

The patient was evaluated at 3, 6, 9 & 12 months post-operatively. Healing was uneventful, with no signs of infection or discomfort. Clinical and radiographic examination demonstrated good periodontal health, functional stability, and satisfactory prosthetic outcome (Figure 3).

Discussion

According to American Association of Endodontics, hemisection is defined as: "*The surgical separation of a multirooted tooth, usually a mandibular molar, through the furcation in such a way that a root and the associated portion of the crown may be removed or retained."* This procedure provides a conservative alternative to extraction in cases of localized periodontal or endodontic pathology.

Root morphology and periodontal support are critical determinants of prognosis. Teeth with adequate bone support around the retained root demonstrate favorable long-term outcomes [5]. Carnevale et al. reported high survival rates of root-resected molars when appropriate periodontal and prosthetic protocols were followed [6], supporting retention of the mesial root in this case.

Endodontic therapy is essential, as complete disinfection and obturation prevent reinfection [7]. Inadequate treatment is a major cause of failure [8]. In the present case, meticulous biomechanical preparation and obturation ensured optimal canal sealing prior to surgery.

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The surgical phase requires atraumatic removal of the diseased root with preservation of surrounding bone. Proper debridement enhances periodontal healing and prognosis [9]. Preservation of alveolar bone is crucial for maintaining stability of the retained root [10].

Prosthetic rehabilitation redistributes occlusal forces along the long axis of the retained root [11]. Improper load distribution can lead to mobility and failure [12]. In this case, full-coverage restoration provided functional stability and favourable stress distribution.

Hemisection offers advantages over implant therapy, including preservation of natural tooth structure, proprioception, and reduced cost [13]. Comparable success rates between root-resected teeth and implants have been reported with proper case selection and maintenance [14].

Long-term success depends on oral hygiene and regular follow-up. Failures are associated with periodontal breakdown or recurrent caries [15,16]. The favourable outcome observed supports previous studies demonstrating that hemisection is a predictable treatment modality in selected cases [17]. Recent literature supports its role in managing complex endodontic-periodontal lesions [18], and contemporary evidence validates hemisection as a reliable alternative when interdisciplinary principles are followed [19].

Conclusion

Hemisection is a biologically sound and conservative treatment modality for managing multirooted teeth with localized periodontal or endodontic involvement. Its success depends on careful case selection, precise endodontic therapy, atraumatic surgical technique, and well-planned prosthetic rehabilitation.

The present case demonstrates that preservation of the healthy root portion can effectively restore function, maintain alveolar bone integrity, and avoid more invasive procedures such as extraction and implant placement. With proper maintenance and follow-up, hemisection can provide predictable long-term clinical success and should be considered a valuable option in contemporary dental practice.

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Figure Legends

Figure 1: A - pre-operative image, B - pre-operative radiograph, C-working length determination, D- mastercone selection, E- post obturation & restoration radiograph, F- post-endodontic restoration image.

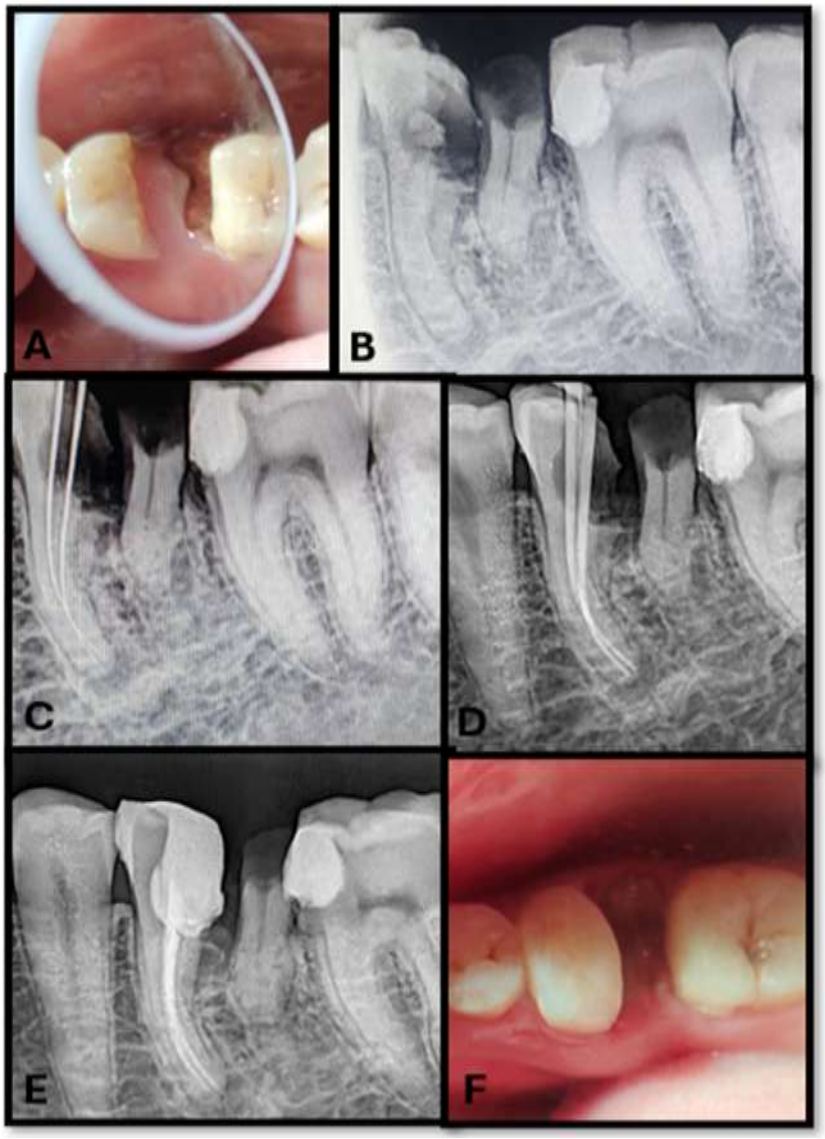

Figure 2: A-extracted distal root, B- post extraction radiograph, C- 10 days post extraction image showing satisfactory healing, D- teeth preparation in 36 & 37, E – cementation of prosthesis in relation to 36 & 37

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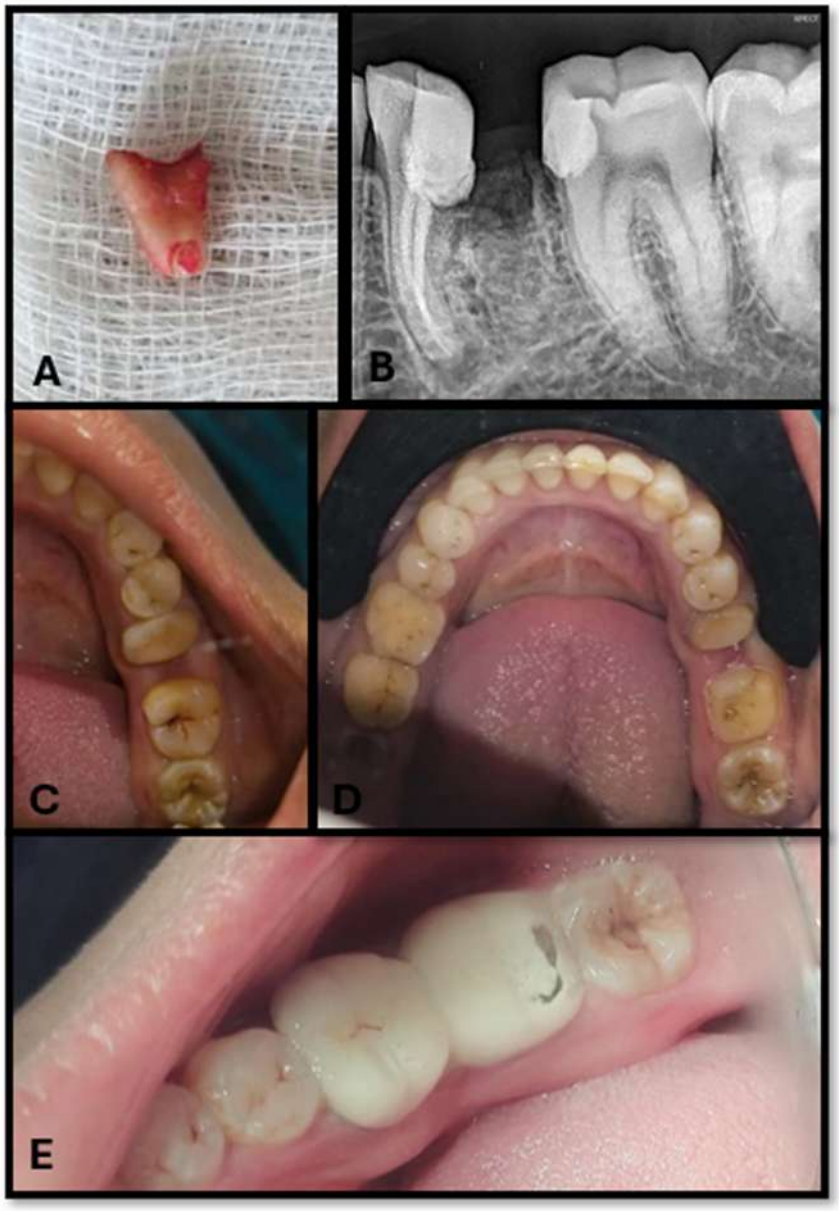

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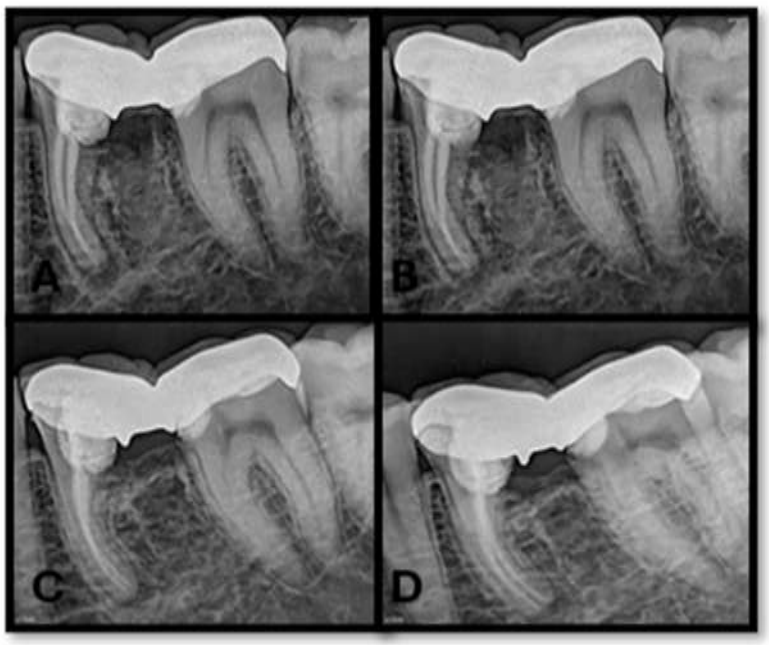
Figure 3: A-3-month follow-up, B-6-month follow-up, C-9-month follow-up, D-12-month follow-up



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