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Hemisection for Preserving Function and Structure: A Case Report with Long-term Follow-up

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ABSTRACT: Hemisection is a conservative dental procedure that strategically removes diseased portions of a multirooted tooth while retaining healthy structure. In this case, a 19-year-old male presented with symptomatic irreversible pulpitis and asymptomatic apical periodontitis in mandibular first molars (#36). Following root canal treatment, hemisection was performed to preserve functional tooth structure, with subsequent restorative measures. Radiographic assessments up to 3 years post-treatment showed favorable outcomes, highlighting the efficacy of hemisection in managing complex dental conditions while ensuring long-term oral health.

KEYWORDS: Apical periodontitis, Irreversible Pulpitis, Oral Health, Root Canal.

I. INTRODUCTION

In contemporary dentistry, preserving natural dentition is paramount for long-term oral health and function (1). The advent of modern techniques allows for the maintenance of a healthy dentition throughout one's life. However, challenges such as periodontal disease and dental caries necessitate careful consideration of treatment options (2).

Root resection procedures, such as hemisection and root amputation, emerge as valuable alternatives to extraction, particularly in cases where preserving natural tooth structure is crucial (3). These procedures involve the strategic removal of diseased portions while retaining healthy tooth structure and alveolar bone. By sparing as much of the tooth as possible, hemisection facilitates the integration of fixed prosthetic appliances and maintains masticatory function (4).

Indications for hemisection encompass a range of periodontal, endodontic, and restorative scenarios, including severe bone loss, root fractures, and prosthetic failures. However, certain contraindications, such as fused roots or untreatable root conditions, necessitate careful patient selection and assessment (5).

Through interdisciplinary collaboration and meticulous treatment planning, hemisection emerges as a cost-effective and conservative option compared to extraction and replacement with artificial prosthetics. By addressing specific dental pathologies while preserving natural tooth structure, hemisection exemplifies the modern approach to sustainable dental care (6).

This case report detailing the hemisection procedure for mandibular first molars with subgingival caries extension offers a practical demonstration of the effectiveness and utility of this treatment approach.

II. CASE REPORT:

A 19-year-old male patient visited to the Department of Conservative Dentistry and Endodontics, reporting decay and persistent pain in the lower right posterior tooth region for the past two weeks. Describing the pain as constant and dull, exacerbated by biting, the patient had no notable medical or family history. During the clinical examination, the patient demonstrated cooperation and orientation. Findings revealed a mesio-occlusal carious lesion on tooth 37 and significant disto-occlusal caries with sub-gingival extension on tooth 36. Periodontal probing indicated normal alveolar bone architecture, sulcular depth, absence of pockets, and physiological mobility. Cold and electric pulp testing showed heightened responses in teeth 36 and 37 compared to control teeth (#16, #17). Intraoral periapical radiograph (IOPAR) using radiovisiograph for tooth 36 displayed coronal radiolucency affecting enamel, dentin, and pulp, along with loss of lamina dura and widening of the periodontal ligament (PDL) in the distal root extending to the furcation area (Figure 1A). Likewise, IOPAR for tooth 46 revealed coronal radiolucency involving enamel, dentin, and pulp.

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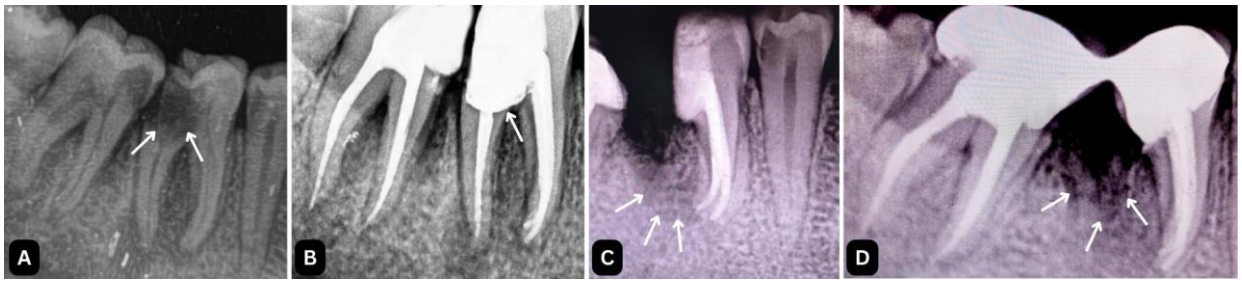

Figure 1-(A) Intra oral periapical radiograph (IOPAR) evaluation using Radiovisiograph (Kodak Carestream, Atlanta, USA) with respect to #36, #37 revealed coronal radiolucency involving enamel, dentin, and pulp (Figure 1A) with loss of lamina dura, and PDL widening in the distal root extending till the furcation area w.r.t #36. (B)Intra oral periapical radiograph showing obturation of #36 and #37 carried out using a resin-based sealer (Dia- Proseal, Diadent, South Korea) and gutta-percha. Access cavity was restored with composite resin (Tetric N Ceram, Ivoclar, Switzerland). (C)Intra oral periapical radiograph after extraction of distal root of the tooth. (D)Intra oral periapical radiograph showing fixed partial denture (FPD)cemented in #36 and #37 using luting glass ionomer cement (GC Fuji 1, GC, Japan)

The final diagnosis comprised symptomatic irreversible pulpitis with asymptomatic apical periodontitis in teeth 36 and 37.

Prior to the procedure, the patient informed consent was obtained. During the initial visit, under local anesthetic solution containing 2% lignocaine and 1:200,000 adrenaline (Themicaine AD, Themis Medicare Ltd., Mumbai, Maharashtra, India) access opening was performed on tooth 36 using an Endo Access Bur. A #10 K file (Mani, Tochigi, Japan) was used to establish the initial glide path, and the working length was determined radiographically and was confirmed using an apex locator (E-pex pro, Eighteeth, Changzhou, Jiangsu, China). Root canal instrumentation was performed using neoendo flex rotary files (Orikam, Gurugram, Haryana, India), followed by irrigation with sodium hypochlorite (Prime Dental, Thane, India), EDTA (Prime Dental, Thane, India), and 0.9% normal saline. The access cavity was sealed with a cotton pellet and temporary restorative material (Cavit, 3M ESPE, Seefeld, Germany). On the second visit, access opening was done on tooth 37 following the same protocol. Rubber dam isolation was employed, and irrigation was carried out with saline and sodium hypochlorite (Prime Dental, Thane, India). Final irrigation included saline, sodium hypochlorite (Prime Dental, Thane, India), and EDTA (Prime Dental, Thane, India), followed by drying of the canals. Both teeth were obturated with a resin-based sealer (Dia-Proseal, Diadent, South Korea) and gutta-percha. The access cavity was restored with composite resin (Tetric N Ceram, Ivoclar, Switzerland) (Figure 1B).

Under local anesthetic solution containing 2% lignocaine and 1:200,000 adrenaline (Themicaine AD, Themis Medicare Ltd., Mumbai, Maharashtra, India), interdental papilla and gingival margins were gently retracted using a periosteal elevator extending from the first right mandibular molar to the second

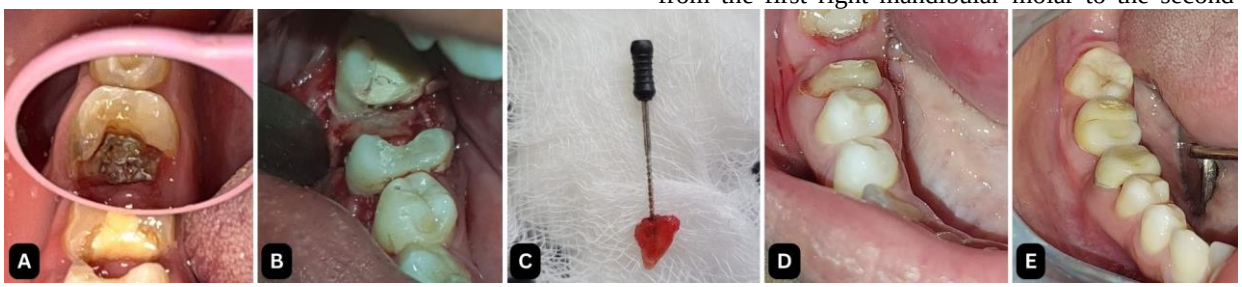

Figure 2-(A) Intraoral image of #36 showing deep distoproximal carious lesion extending till furcation. **(B)**Intraoral image after removal ofdistal section of the tooth. **(C)**Image showing the extracted distal root using H-file **(D)** Intraoral image showing fixed prosthesis tooth preparations performed in #36 and #37, and the shoulder finish line of 1 mm width was given using TF30 bur (Mani, Tochigi, Japan), and an overall reduction of 2mm was done. **(E)**A3 shade was selected and fixed partial denture (FPD) was cemented in #36 and #37 using luting glass ionomercement (GC Fuji 1, GC, Japan).

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molar (#36, #37). A tapered fissure carbide bur was employed vertically for resection, extending from the buccal to the lingual wall with a distal orientation. Following this, the distal segment of the tooth was extracted (Figure 1C, 2B, 2C), and the extraction socket was irrigated with 0.9% saline. The remaining segment was contoured to ensure a smooth surface, and the tooth was carefully kept out of occlusion. Preparations for fixed prostheses were carried out on teeth #36 and #37, where a shoulder finish line with a width of 1 mm was created using a TF30 bur (Mani, Tochigi, Japan), along with an overall reduction of 2 mm (Figure 2D). Subsequently, a dual-stage putty impression was taken using putty impression material combined with light body impression material (Aquasil Soft Putty, Dentsply, and Reprosil Light Body Dentsply). Shade A3 was selected, and a fixed partial denture (FPD) (Figure 1D, 2E) was cemented to teeth #36 and #37 using luting glass ionomer cement (GC Fuji 1, GC, Japan) (Figure 2E, 3). Currently, the patient remains asymptomatic, with the tooth functioning well, and a three-year follow-up indicates no discomfort.

Figure 3-Inraoral image showing occlusion after cementation of fixed partial denture w.r.t #36, #37.

III. DISCUSSION:

Regenerative therapy holds significant importance in contemporary dental care, aiming to facilitate the regeneration of both hard and soft tissues, including thedevelopment of new attachment housing (7). This approach is especiallypertinent in addressing periodontal-endodontic defects, involving a combination of non-surgical root canal debridement and surgical interventions to access and cleanse root surfaces and apical lesions. It's noteworthy that while bone loss resulting from pulpal disease may be reversible, advanced bone loss arising from periodontal disease is generally irreversible,emphasizing the significance of implementing effective management approaches (7). Hemisection arises as valuable therapeutic option for conserving multirootedmolars afflicted by periodontalproblems, particularly in instances of substantial bone loss. Selecting suitable cases is crucial for achieving favorable results, with hemisection offering a feasible alternative to extraction for managingdiverse dental issues such as periodontal, endodontic, restorative, or prosthetic concerns (8). This procedure becomes particularly advantageous when one root exhibits a poor prognosis while the other remains healthy enough to serve as a stable abutment. Considerations such as tooth anatomy, mobility, attachment loss, and root morphology heavily influence the decision-making process regarding hemisection (9).

The objectives of hemisection are multifaceted, aiming to facilitate the long-term maintenance of the affected tooth, prevent further attachment loss, and address furcation defects as part of ongoing periodontal maintenance. By strategically removing diseased portions while preserving healthy tooth structure and supporting bone, hemisection offers a conservative yet effective approach to dental treatment (10). However, the success of hemisection hinges on meticulous case selection and thorough evaluation of clinical factors, including root morphology and accessibility.

Studies have shown promising long-term success rates for hemisection procedures,with survival rates ranging from 91% to 94.8% after several years of follow-up (11,12). Nevertheless, restoration following hemisection must be carefully executed to avoid exacerbating periodontal issues. Inadequate margins or physiologic form in occlusal surfaces, as well as improper occlusal contacts, can compromise the success of hemisection and lead to treatment failure. Therefore, attention to detail in both the surgical and restorative phases of hemisection is essential for achieving optimal outcomes and ensuring the preservation of natural dentition (13).

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