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Salvaging Hopeless Teeth by Hemisection: Two Case Reports with 1-Year Follow-up

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ABSTRACT

Endo-periodontal lesions (EPL) present considerable diagnostic and therapeutic challenges. Hemisection, when appropriately indicated, serves as a conservative alternative to extraction in multirooted teeth. This report presents two separate cases in which mandibular molars exhibit EPL with localized root damage. Following comprehensive endodontic and periodontal evaluation, the non-salvageable distal root was resected, and the remaining mesial root was preserved. Treatment included nonsurgical root canal therapy, full-thickness flap surgery, debridement, hemisection and socket preservation using demineralized freeze-dried bone allograft (DFDBA), platelet-rich fibrin (PRF), and a collagen membrane. Both cases were rehabilitated with a fixed partial denture. 12-month postoperative follow-up of both cases demonstrated successful clinical and radiographic outcomes, including stable periodontal parameters and restored function. Hemisection remains a viable option for preserving function and natural dentition in selected cases of EPL with localized root damage.

Keywords: Endo-periodontal lesion, Furcation involvement, Hemisection, Prognosis, Pulp

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INTRODUCTION

Endo-periodontal lesions (EPL) involve pathological interactions between the dental pulp and periodontal tissues, facilitated through anatomical structures such as the apical foramen, lateral canals, and dentinal tubules [6,14] . Common etiologies include carious lesions extending to the pulp with secondary periodontal breakdown, or advanced periodontitis affecting the pulp via lateral or apical canals. Clinically, these lesions present with deep periodontal pockets, altered or negative pulp vitality, bone loss, pain, suppuration, sinus tract formation, tooth mobility, and, in some cases, structural defects such as root perforations or fractures [7] .

Simon et al. (1972) first classified EPL based on disease chronology [11] . The 2017 joint classification by the American Academy of Periodontology and the European Federation of Periodontology improved diagnostic precision by integrating symptomatology, therapeutic strategies, and prognosis [4] . The prevalence of EPL varies across populations and clinical settings and was reported to be approximately 4.9% [9] . In contrast, institutional data from a study revealed a notably higher prevalence of 17.3%, with a greater occurrence among males (12.7%) and individuals aged 31–40 years (5.3%), highlighting potential demographic and regional differences in disease distribution [8].

Periodontal evaluation is essential before treating EPL, as prognosis depends on pocket depth, disease severity, and patient factors[4]. Treatment planning should consider restorability, patient motivation, and willingness to undergo complex procedures; extraction may be preferred in poor-prognosis cases with low patient compliance. When conventional treatment is insufficient, and extraction is not preferred, hemisection offers a conservative alternative [3] . This surgical procedure involves sectioning a multi-rooted tooth, typically a mandibular molar, to remove the diseased root and associated crown portion while preserving the rest. Indications include localized bone loss, root fractures, or non-restorable endodontic failure. Success depends on careful case selection, endodontic management, and definitive prosthetic rehabilitation.

This report presents two cases of EPL in mandibular molars successfully managed through hemisection with 12-month follow-up.

Case Presentations:

Case 1: A medically fit male patient in his 30s presented with complaints of recurrent dull pain and intermittent abscess formation in the lower right posterior region for the past two years. He also reported gingival swelling and bleeding during tooth brushing. Extraoral examination was non-contributory. Intraorally, the mandibular right second molar (#47) exhibited tenderness on percussion (TOP) in both vertical and horizontal directions, a probing

pocket depth (PPD) of 13 mm distally, Grade II mobility, Grade III furcation involvement and bleeding on probing (BOP) (Figure 1A).

Case 2: A male patient in his 50s, medically fit, presented with a complaint of dull pain and food lodgement in the lower right posterior region for the past year. Clinical examination of #46 revealed TOP, BOP, a localized deep PPD measuring 10 mm distally and no mobility or furcation involvement (Figure 2A).

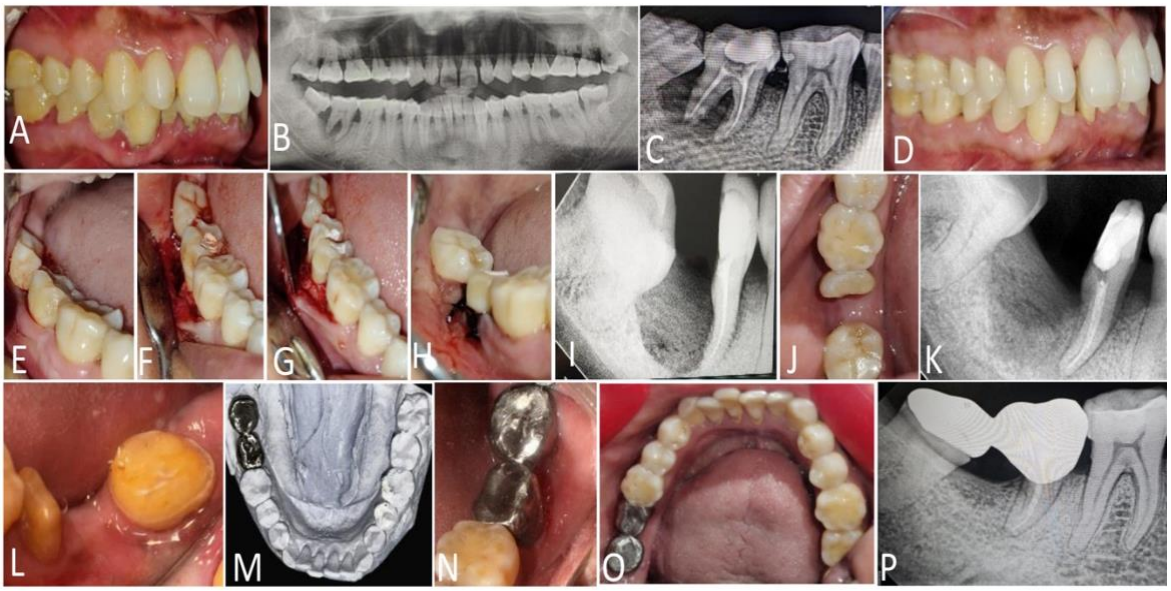

Figure 1: Case 1. (A) Generalized plaque accumulation with gingival inflammation. (B) OPG showing generalized horizontal bone loss, distal root resorption, and a radiolucency involving the distal root and furcation of tooth #47. (C) Post-endodontic radiograph. (D) One-month follow-up after nonsurgical periodontal therapy showing reduced gingival inflammation. (E) Sulcular incision. (F) Full-thickness mucoperiosteal flap elevation. (G) Faciolingual sectioning of tooth #47. (H) Primary closure with interrupted 3-0 silk sutures. (I) Immediate postoperative radiograph after hemisection. (J) One-month postoperative follow-up showing satisfactory soft tissue healing. (K) Three-month postoperative radiograph showing increased radiodensity at the surgical site. (L) Occlusal view of equigingival chamfer finish-line preparation. (M) Definitive all-metal FPD involving the mesial root of tooth #47 and tooth #48. (N) Six-month postoperative follow-up showing healthy peri-prosthetic tissues. (O) Twelve-month postoperative follow-up showing stable periodontal health and prosthetic function. (P) Twelve-month postoperative radiograph showing stable periradicular bone architecture.

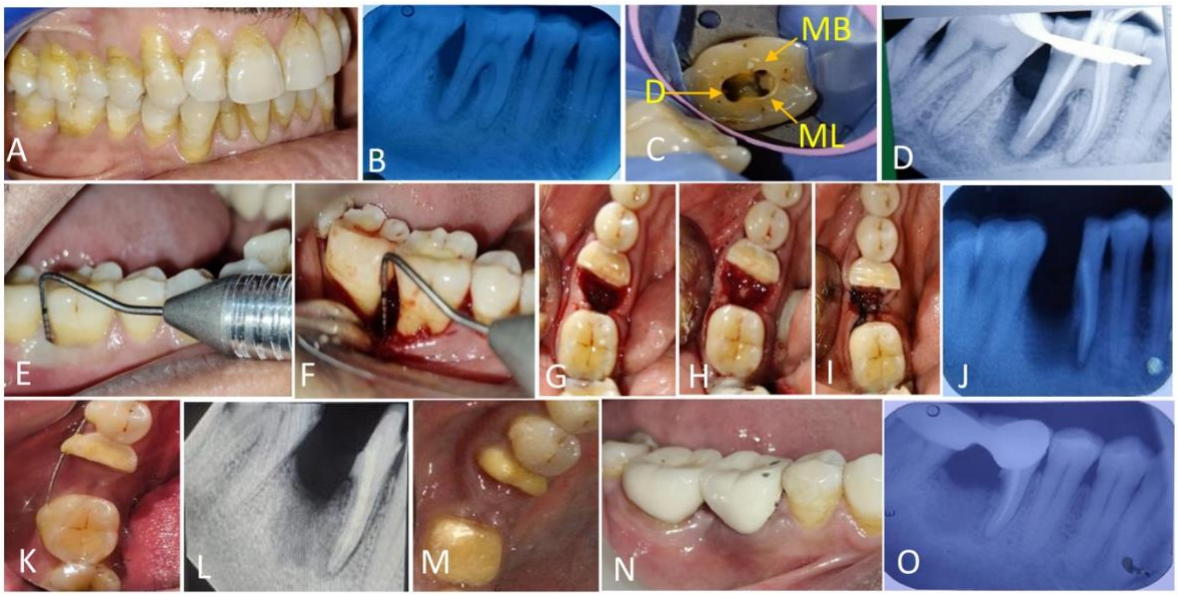

Figure 2: Case 2. (A) Fair oral hygiene status. (B) Radiograph showing a vertical radiolucency around the distal root of tooth #46. (C) Intraoperative view showing the mesiobuccal, mesiolingual, and distal canals. (D) Master cone radiograph confirming working length. (E)

One-month follow-up after nonsurgical periodontal therapy showing reduced gingival inflammation with a residual distal periodontal pocket. (F) Intraoperative view of a vertical intrabony defect on the distal aspect of tooth #46. (G) Atraumatically extracted distal root. (H) Bone graft placement covered with a resorbable collagen membrane and PRF. (I) Primary closure with interrupted 3-0 silk sutures. (J) Immediate postoperative radiograph after hemisection. (K) One-month postoperative follow-up showing preserved ridge width and extracoronal splinting. (L) Three-month postoperative radiograph showing improved trabecular bone pattern without disease progression. (M) Prosthetic phase showing tooth preparation with an equigingival shoulder finish line. (N) Six-month postoperative follow-up showing healthy peri-prosthetic tissues and satisfactory function. (O) Twelve-month postoperative radiograph showing continued bone regeneration and stable periradicular bone architecture.

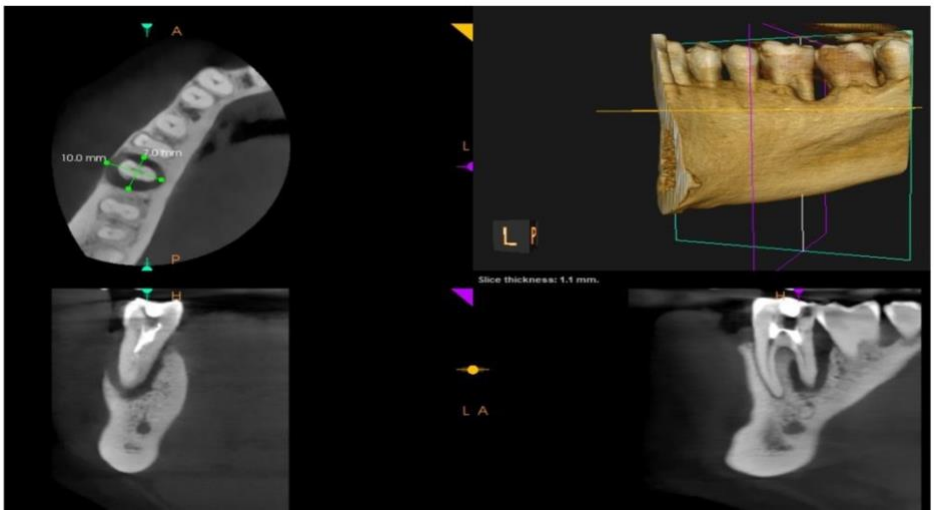

Figure 3: Case 2. CBCT images of tooth #46. Axial, sagittal, and coronal sections reveal an extensive radiolucency surrounding the distal root and extending into the furcation, with loss of the buccal and lingual cortical plates. The scans confirm a localized defect, absence of a vertical root fracture, and an intact mesial root.

Investigations:

Case 1: Tooth #47 showed no response to electric pulp vitality testing (EPT), suggesting pulpal necrosis. Orthopantomogram (OPG) (Figure 1B) revealed radiolucency on the distal aspect and in the furcation area of #47, along with external resorption of the distal root.

Case 2: Tooth #46 did not respond to EPT. Radiograph (Figure 2B) revealed localized radiolucency adjacent to the distal root, extending apically. CBCT imaging (Figure 3) confirmed the presence of a well-defined vertical bone defect of 10 mm adjacent to the distal root of #46. The defect extended apically along the root surface, with localized loss of both buccal and lingual cortical plates. The mesial root appeared intact with no signs of bone destruction.

Diagnosis:

Case 1: The diagnosis was EPL- Grade 3 in a periodontitis patient with root damage (external root resorption).5 Given the structural compromise of the distal root, the prognosis was considered guarded.

Case 2: The diagnosis was EPL-Grade 2 in a non-periodontitis patient.5 The absence of generalized periodontal breakdown supported a good overall prognosis. Tooth-specific prognosis for #46 was considered favourable.

Differential Diagnosis: Vertical root fracture

Clinical Procedures:

A comprehensive treatment plan involving combined nonsurgical periodontal therapy and nonsurgical root canal treatment, followed by surgical intervention with hemisection and

regenerative procedures, was formulated. Alternative treatment options, potential complications, prognosis, and associated costs were thoroughly discussed with each patient. Written informed consent was obtained before initiating treatment.

Initial Phase: Full-mouth scaling was completed in a single session using an ultrasonic scaler (Woodpeckers UDS-K LED). Under local anesthesia (2% lignocaine hydrochloride with 1:80,000 epinephrine), root planing and subgingival curettage were performed using a Columbia 4R/4L universal curette (SatinSteel®, Hu-Friedy) in the region of #47 (Case 1) and #46 (Case 2). Oral hygiene instructions were given, and patients were advised to use 0.2% chlorhexidine mouthwash twice daily for two weeks.

Endodontic Phase: Under local anaesthesia and rubber dam isolation, access cavities were prepared using an endo-access bur (Maillefer, Dentsply, Ballaigues, Switzerland). A conservative access was established to visualize two mesial and one distal canal in both #47 (Case 1) and #46 (Case 2). Working length was determined using an electronic apex locator (Propex Pixi, Dentsply), and confirmed radiographically. Cleaning and shaping were performed using a crown-down technique with Protaper Gold rotary files up to size F2 (Maillefer, Dentsply). Irrigation was performed using 3% sodium hypochlorite, followed by 17% EDTA and a final rinse with saline. After drying the canals, calcium hydroxide paste was placed as an intracanal medicament, and the cavity was temporized. Patients were recalled after one week.

At the follow-up visit, both patients were asymptomatic. Obturation was performed using the single cone technique with Protaper F2 gutta-percha points and zinc oxide eugenol sealer. The access cavities were permanently restored (Figure 1C, 2C, and 2D).

Surgical Phase: At 1 month, both patients showed symptomatic improvement. Case 1 depicted a 12 mm distal pocket on the day of surgery, while in Case 2, surgery was deferred to 3 months post-RCT to allow endodontic resolution, though PPD reduced on the mesial aspect only (Fig. 1D and 2E). Under local anaesthesia, a full-thickness mucoperiosteal flap was elevated in both cases following a sulcular incision. Thorough debridement was performed using a PR1/2 Prichard periodontal surgical curette and a Columbia 4R/4L universal curette to remove granulation tissue and altered cementum. Tooth sectioning was carried out in the faciolingual direction using a long-shank, tapered fissure carbide bur. A straight dental explorer was used to confirm complete separation of the roots. The diseased distal root was then atraumatically extracted using a flexible periotome (GDC PTP3). Socket preservation was performed using demineralized freeze-dried bone allograft (DFDBA) (Tata Memorial, India), platelet-rich fibrin (PRF), and Cologenesis Cologuide GTR membrane (10 × 15 mm, Type I collagen). To begin, PRF was prepared by drawing 10 mL of the patient's

venous blood into sterile tubes and immediately centrifuging it at 2700 rpm for 10 minutes. DFDBA was rehydrated with a drop of saline, graft was then condensed into the extraction socket using bone carriers and plugger instruments. The DFDBA served as an osteoconductive scaffold. A resorbable collagen membrane was trimmed to the appropriate size and adapted over the filled socket to act as a barrier. PRF membrane was placed over the collagen membrane, enhancing biological healing. The flap was then repositioned, and primary closure was achieved using interrupted 3-0 silk sutures. An immediate postoperative radiograph confirmed satisfactory removal of the distal root and placement of graft materials (Figure 1E–I and 2F–J) .

Detailed postoperative instructions were provided to both patients. Medications prescribed included amoxicillin 500 mg three times daily for five days, and aceclofenac 100 mg three times on the first day, then subsequently only as needed for pain management. Additionally, chlorhexidine gluconate 0.2% mouth rinse was advised twice daily for two weeks. Sutures were removed after one week.

Prosthetic Phase: 3 months post-surgery, prosthetic rehabilitation was done. In Case 1, a metal fixed partial denture (FPD) was planned, supported by the mesial root of #47 and #48. An equigingival chamfer finish line was prepared. In Case 2, an equigingival shoulder margin was prepared for a porcelain-fused-to-metal (PFM) prosthesis, involving the mesial half of #46 and full coverage of #47. Both the prosthesis was designed with adequate embrasure spacing and a hygienic pontic form to allow effective plaque control and long-term maintenance (Figure 1L, 1M and 2M).

Outcome and Postsurgical Follow-up (Table 1):

Table 1: Longitudinal Evaluation of Clinical Periodontal Parameters in Case 1 and Case 2 at Designated Follow-Up Visits.

Visit	Site of Probing	Clinical Measurement	Case-1(Mm)			Case-2 (Mm)		
			Mesial	Middle	Distal	Mesial	Middle	Distal
First (Before Initial Phase)	Buccal	Gingival Recession					1	2
		Probing Depth	5	4	13	2	2	10
	Lingual	Probing Depth	4	3	13	2	3	10
		Gingival Recession				1	1	2
Second (1 month post initial phase)	Buccal	Gingival Recession					1	2
		Probing Depth	3	3	11	2	2	10
	Lingual	Probing Depth	3	3	12	2	3	9
		Gingival Recession	1	1		1	1	3
Third (Presurgical)	Buccal	Gingival Recession	1				2	2
		Probing Depth	3	3	11	2	3	10
	Lingual	Probing Depth	3	3	11	2	2	9
		Gingival Recession	1	2	1	1	2	3
Fourth (1 month postsurgical)	Buccal	Gingival Recession	2	1			2	
		Probing Depth	3	2		2	2	

	Lingual	Probing Depth	2	2	2	1
		Gingival Recession	2	2		2
Fifth (3-month postsurgical)	Buccal	Gingival Recession	2	2		2
		Probing Depth	2	1	2	2
	Lingual	Probing Depth	2	2	2	1
		Gingival Recession	2	2		2
Sixth (6-month postsurgical)	Buccal	Gingival Recession				
		Probing Depth	2	2	2	1
	Lingual	Probing Depth	2	2	2	2
		Gingival Recession				
Seventh (12-month postsurgical)	Buccal	Gingival Recession				
		Probing Depth	2	2	2	1
	Lingual	Probing Depth	2	2	2	1
		Gingival Recession				

At the 1-month follow-up after surgery, both patients were asymptomatic with uneventful healing. In Case 1, the retained mesial root of #47 showed PDD of 2–3 mm and reduced inflammation. In Case 2, the mesial root of #46 exhibited PDD of 2 mm with no signs of residual disease (Figure 1J and 2K).

By 3 months, both cases exhibited clinical health on a reduced periodontium. Radiographs revealed increased bone density, improved trabecular architecture, and stable graft integration without signs of crestal or periapical bone loss (Figure 1K- M and 2L, 2M).

At the 6-month visit, biological and functional stability was seen in both cases. Case 1 showed a PDD of 2 mm with stable peri-prosthetic tissues, while Case 2 had a PDD of 1–2 mm and healthy gingival margins (Figure 1N & 2N).

At 12 months, both cases maintained periodontal and prosthetic stability, with no signs of inflammation, mobility, or pathology. Radiographs confirmed preserved bone levels and well-integrated grafts, indicating sustained regenerative and functional success (Figure 1O, 1P and 2O) .

DISCUSSION:

EPLs result from pathological communication between pulpal and periodontal tissues due to infection, trauma, or iatrogenic factors [7,12]. They present with varied clinical features and are often difficult to manage due to their complex etiology and overlapping symptoms. When complicated by root damage or resorptive defects, they can lead to rapid tissue breakdown.

Hemisection offers a conservative and prognostically favourable alternative to extraction by preserving the healthy portion of multirooted teeth when pathology is confined to one root. Reported survival rates range from 40.3% to 100%, with over half of studies showing greater than 90% survival over 5–23 years [5]. The average success rate is approximately 88%, influenced by endodontic quality, restorative design, and periodontal maintenance [10]. A nationwide study reported a 91.1% survival rate for root-resected molars, emphasizing the

impact of patient demographics on treatment outcomes [15]. The long-term success of hemisection relies on factors such as root anatomy, periodontal support, endodontic quality, prosthetic planning, and patient compliance.

In true combined EPLs, initial root canal therapy followed by a 2–3 month re-evaluation is often preferred to allow pulpal resolution and clearer periodontal assessment. However, recent trials also support simultaneous endodontic and periodontal treatment in select cases, showing favourable outcomes [2] . Cases classified as Grade 2 or 3 EPLs, as per Herrera et al., are more likely to benefit from regenerative surgical approaches [1,4,13]. Although the distal root is generally preferred for retention due to simpler canal morphology, the mesial root may offer a more favourable prognosis when supported by better bone levels and structural integrity [10].

In the present report, two distinct clinical presentations of EPL were managed using a phased, root-specific approach involving hemisection, guided tissue regeneration (GTR), and prosthetic rehabilitation, with surgical timing tailored to the severity and activity of periodontal involvement. Case 1 involved a patient with periodontitis and a Grade 3 EPL in tooth #47, complicated by Class III furcation involvement and external root resorption. Due to the extent of periodontal destruction and persistent inflammation, surgical intervention was initiated one month post-root canal therapy. In contrast, Case 2 presented a non-periodontitis patient with a localized Grade 2 EPL affecting the distal root of #46. Here, the inflammation was less severe and the endodontic lesion more dominant; thus, periodontal surgery was deferred for three months to allow resolution of the pulpal pathology before addressing the residual periodontal defect.

In both cases, the distal root was resected, and the mesial root was preserved, guided by bone support and root integrity rather than anatomical preference. Regenerative procedures using DFDBA, PRF, and a resorbable collagen membrane were employed to enhance socket preservation and promote healing. Prosthetic rehabilitation followed only after confirming periodontal stability. At the 3- to 12-month follow-up, both patients exhibited a clinically healthy periodontium on reduced support, with radiographic evidence of graft integration and no functional or aesthetic complications. These outcomes reinforce the importance of multidisciplinary planning, incorporating endodontic, periodontal, surgical, and prosthetic considerations to achieve favourable long-term results in complex EPL cases. The strength of this report lies in the comprehensive treatment sequencing, root-specific decision-making, and 12-month follow-up documenting clinical stability. However, limitations include the absence of histologic confirmation regarding bone tissue healing and lack of longer-term follow-up beyond one year. Future studies should evaluate comparative outcomes between

staged and simultaneous interventions, and assess long-term tooth survival and patient-reported outcomes to further refine evidence-based protocols for EPL management.

CONCLUSION:

Hemisection combined with regenerative therapy may serve as a cost-effective and predictable tooth-preserving alternative to extraction and implant therapy in carefully selected EPL.

Patient's Perspective:

Case 1-I had repeated pain and swelling in my lower right tooth and was afraid I would have to get it removed. The doctors explained that only part of the tooth could be saved. The treatment went step by step, and after the surgery and cap, I feel completely fine now. I can chew properly and haven't had any problems since. I'm happy my tooth was saved.

Case 2-I had food getting stuck and pain in my lower tooth. I thought it would need to be removed, but the doctors treated it in stages and saved half of it. The process took a few months, but now it feels normal. The treatment helped me avoid tooth removal.

Ethical Aspect:

This case report was conducted in accordance with the ethical standards of the Declaration of Helsinki (1975, revised in 2013). All efforts were made to ensure patient anonymity. Written informed consent was obtained from the patients for treatment and publication of the clinical details and radiographic images.

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