

Case Report

Hemisection Procedure to preserve a Mandibular Second Molar with overextended gutta-percha in the mandibular canal causing lip paresthesia: A Case Report with 6-Month Follow-Up

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Abstract

Aim: This case report describes hemisection as a successful treatment modality to save mandibular second molar with over-extended gutta-percha into the mandibular canal.

Case description: A 47-year-old male patient came complaining of pain on biting on his lower left side and persistent paresthesia of his left lower lip and chin. Clinical examination revealed a large carious lesion in his mandibular left second molar. Radiographic examination revealed overextended filling material from the distal root canal towards the mandibular canal and evidence of periapical lesion. Non-surgical endodontic retreatment was done for the mesial root followed by surgical hemisection of the distal root. Hemisection and prosthetic rehabilitation allowed the healing of the periapical lesion, preserved the occlusion, and resolved lip paresthesia after 6 months of follow-up.

Conclusion: The meticulous hemisection treatment planning and accurate surgical procedures enabled symptom alleviation and prevention of the unfavorable impacts of tooth loss.

Keywords: Hemisection, root resection, overextension, nerve injury, paresthesia.

Introduction

One of the elementary objects of dentistry is the preservation of teeth. A radical treatment for posterior teeth with one hopeless root beyond repair is teeth removal and replacement by an implant-supported crown or removable prosthesis. However, hemisection can be a conservative, and affordable procedure with favorable outcomes if watchful case selection is guarded. (Khan et al. 2017)

Indications for tooth hemisection include: a) A Multirrooted tooth having one damaged root. b) Endodontic treatment is attainable for the stand root. c) Post-supported coronal filling is practicable. d) The outstanding tooth part can

provide sufficient support for the extra-coronal restoration. e) Maintenance of periodontal health is achievable. (Parmer & Vashi, 2003)

Contraindications include: a) Strong adjacent teeth can provide support for a fixed partial denture. b) Calcified and blocked root canals. c) Insoluble separation due to blended roots. d) Teeth with non-strategic relevance. (Weine, 1996)

Overextension of gutta-percha root canal filling material or calcium hydroxide canal medications may happen unintentionally enabling these materials to enter into adjacent structures. Standard treatment for overextended fillings, in symptomatic cases, may involve orthograde retreatment, or surgical curettage. (Sabir, 2005) Overextension into the inferior alveolar canal may cause

neurological issues such as paraesthesia or dysaesthesia. (Scolozzi et al. 2004)

In Some cases, orthograde removal of the overextended material or apical surgery are challenging, thus seeking an alternative treatment option in an attempt to preserve the remaining sound root. Thus, the present case report describes a condition of lip paraesthesia caused by an overextended gutta-percha root canal filling into the mandibular canal. Also, provides details of the hemisection procedure followed by appropriate restoration and follow-up.

Case description

A 47-year-old male patient was referred to the clinic of the Department of Endodontics, Faculty of Dentistry, Cairo University came complaining of pain upon biting on his mandibular left-sided tooth and lower lip paresthesia. His medical history was non-contributory. The patient had a history of non-surgical endodontic treatment in mandibular left second molar three months ago.

Extraoral examination revealed non-palpable lymph nodes, however the neurosensory evaluation of the inferior alveolar nerve using a standardized sharp/blunt discrimination test, the patient reported an inability to differentiate between the sharp pricks and the blunt pressure made by both ends of a dental explorer, and the affected area was marked using a ballpoint pen. While on intraoral clinical examination, a large mesio-occlusal carious lesion was detected in tooth #37. Cold Pulp sensitivity test (Hygenic Endo-Ice Coltene OH, USA) on the suspected tooth showed no response. The percussion test, using the back of metal mirror, was positive while on palpation no pain was felt.

A preoperative periapical radiograph showed a previous endodontic treatment with overextended filling material from the distal root canal towards the mandibular canal and a large periapical lesion (**figure1a**).

The final diagnosis based on the symptoms, clinical and radiographic findings was previously endodontically treated tooth number #37 with symptomatic apical periodontitis and mandibular nerve injury due to the overextended gutta percha.

The option of tooth extraction followed by implant placement was suggested. However, the patient was keen on saving his tooth, and a written consent from the patient was obtained. Thus, the treatment plan was non-surgical root canal retreatment of the mesial root followed by surgical hemisection and removal of the distal root.

The tooth was Anesthetized using inferior alveolar nerve block technique of 1.8 ml of 4% Articaine with 1:100,000 epinephrine (Artinibsa®; Inibsa Dental, Lliçà de Vall, Spain). then isolated using rubber dam and liqui-dam for better sealing. Under magnification of dental operating microscope DOM (Seiler, Seiler Instrument Inc, St. Louis, USA) removal of old gutta-percha was done from the mesial canals using M-Pro rotary files (IMD, China) size (25/0.6) in rotation motion with a speed of 500 rpm and torque of 1.5 Ncm followed by manual H file (25/0.2 & 30/02) (H-Files, MANI, INC., Industrial Park, Utsunomiya, Tochigi, Japan).

MG3 Gold rotary files (Perfect® Medical Instruments Co., Ltd, Shenzhen, China) were used according to the manufacturer instructions in the following sequence (20/.10) for coronal one-third of canal at 350 rpm and torque of 3 Ncm, followed by (20/.04), (25/0.6) and (35/04) to full working at 350 rpm and 2 Ncm followed by manual K file (40/0.2) (K-Files, MANI, INC., Industrial Park, Utsunomiya, Tochigi, Japan) as a master apical file. Chemical disinfection was done with 5.25% sodium hypochlorite solution and activated using an ultrasonic device, Ultra X (Changzhou Sifary Medical Technology, Changzhou City, China) for total time of 10 min.

A master cone radiograph was taken to verify the length of the gutta perch cone size (40/04) after ensuring sufficient tug-back with canal walls (**Figure 1b**). The canals were then obturated using Adseal resin sealer (Adseal, Meta Biomed, Cheongju, South Korea) and continuous wave compaction technique. To guarantee a proper coronal seal, the tooth was filled with Medifil glass ionomer filling material. (Promedica, Neumünster, Germany).

Hemisection was performed using surgical length tapered fissure carbide bur (KG Sorensen, Zenith Dental Aps, Agerskov, Denmark) to separate the tooth vertically bucco-lingually (**Figure 1c**). The bur was aligned towards the distal part of the tooth, then a probe was used to verify the complete separation of the roots. After that, the diseased distal portion was luxated with a straight surgical elevator by buccal and distal application of wedging forces and finally removed by mandibular premolar forceps (**Figure 1d**). Then, sterile saline was used to irrigate the extraction site. The final shaping of the mesial tooth section was done using a high-speed long needle, diamond-coated composite finishing bur in bucco-lingual direction to achieve an even smooth surface (**Figure 1e**).

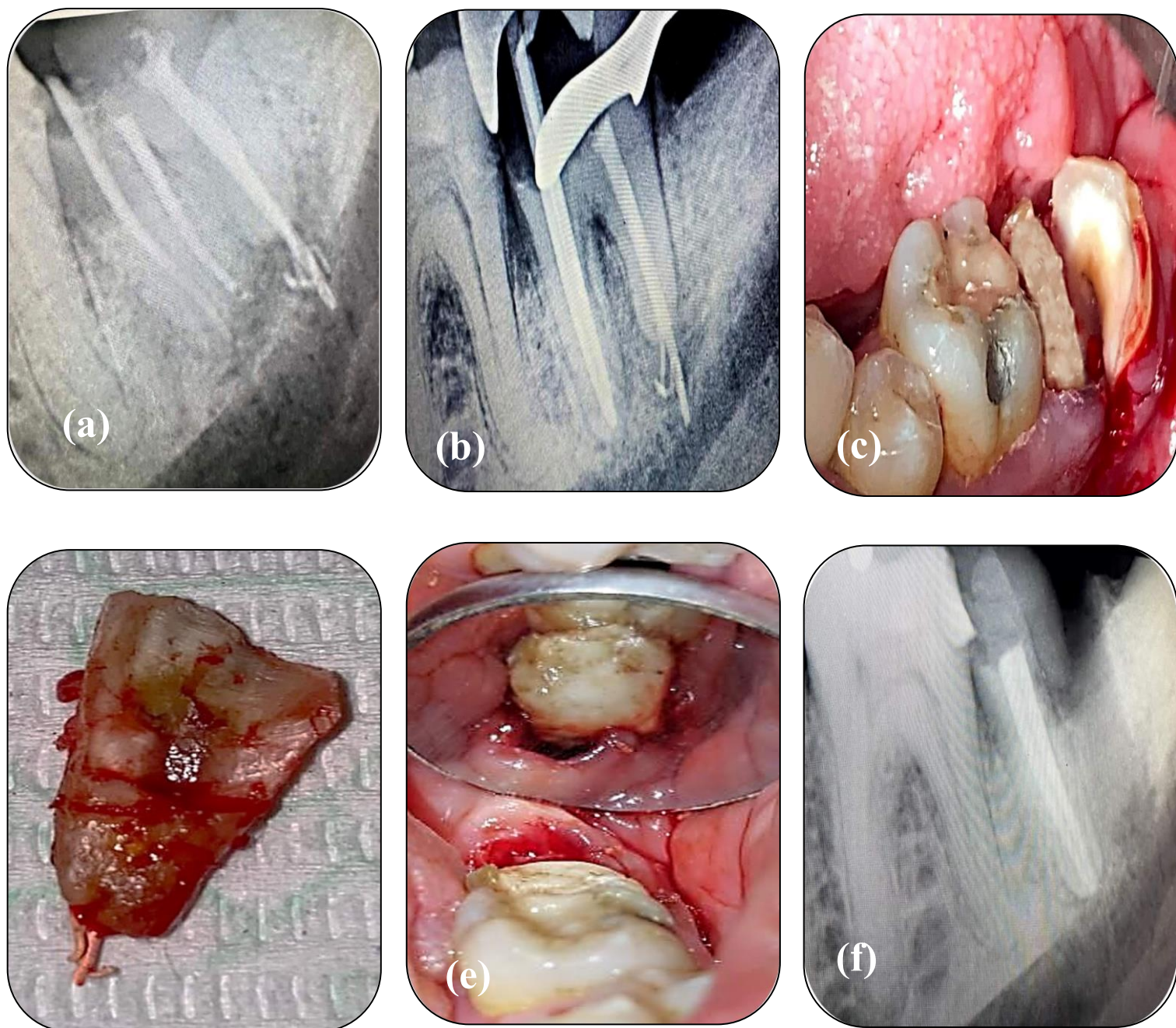


Figure (1): (a) Periapical radiograph showing preoperative status of tooth #37 (b) Radiographic Master cone confirmation (c) Photograph showing the line of resection through the crown. (d) Photograph showing distal root removed with the associated overextended gutta-percha. (e) Surgical field after removal of resected half of tooth structure and (f) Immediate postoperative radiograph.

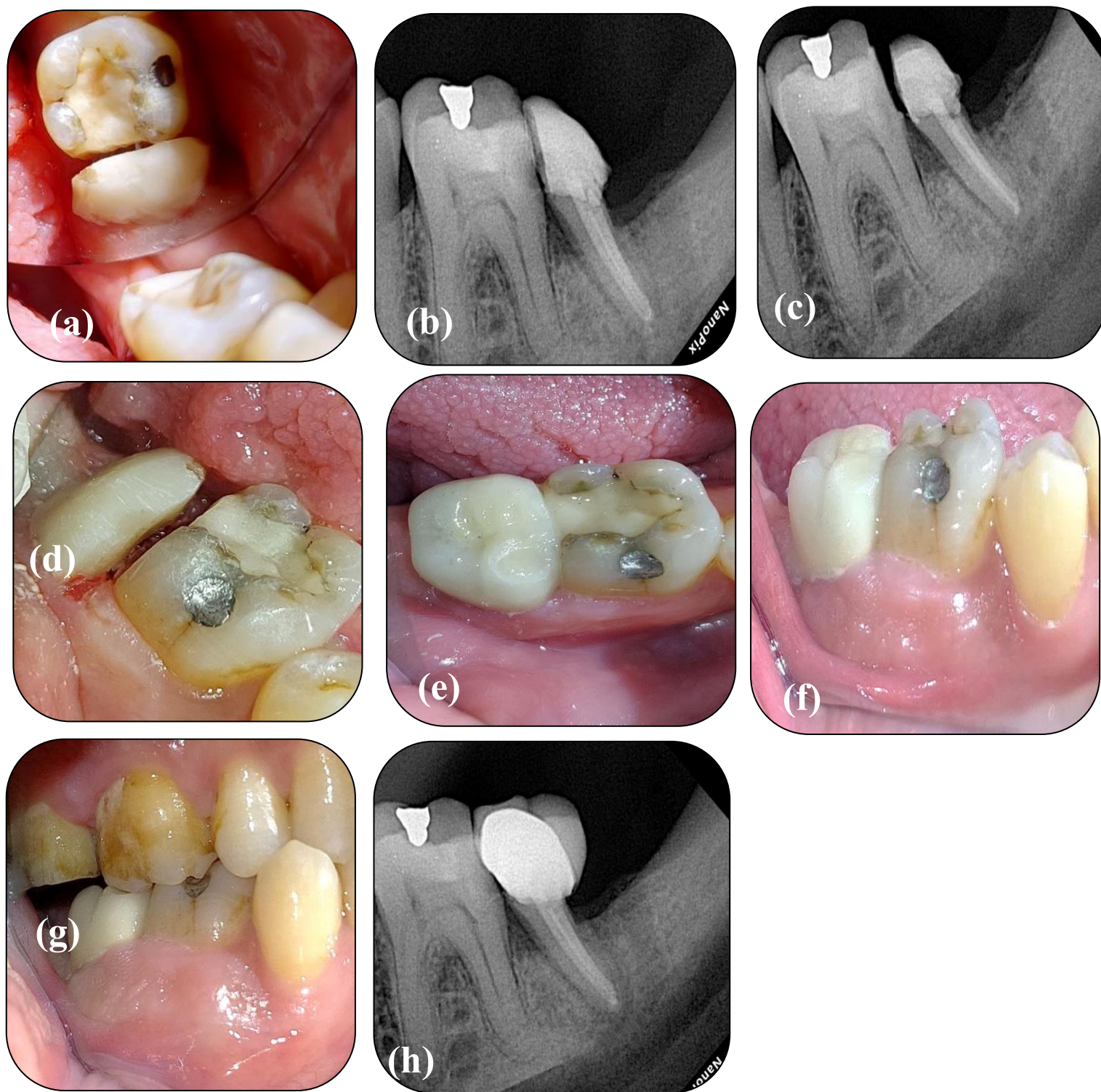


Figure (2): (a) Composite core build-up photograph (b) 3 Months follow-up radiograph. (c) 6 Months follow-up radiograph (d) Photograph of tooth preparation for fixed prosthesis (e) Occlusal view of porcelain-fused-to-metal prosthesis photograph. (f) Buccal view of porcelain-fused-to-metal prosthesis photograph. (g) Porcelain-fused-to-metal prosthesis in occlusion photograph. (h) Postoperative Crown cementation radiograph

The tooth was kept out of occlusion by 1 mm occlusal reduction using a wheel diamond-coated bur and an immediate postoperative radiograph revealed the endodontically treated mesial root safe in place (**Figure 1f**).

The patient was advised to have a soft diet for 1 week, also to take 600 mg ibuprofen every 8 hours as well as 500 mg amoxicillin every 8 hours for 5 days, and to rinse his mouth with 0.12% chlorhexidine gluconate solution twice a day for 1 week. He was also advised to take vitamin B12 oral dissolving films every 24 hours for 4 weeks (Methyltechno 1000 µg - 6th of October City, Giza, Egypt) for the reconstruction and treatment of injured nerve. (**Baltrusch 2021**)

The recall visit after 3 months revealed a satisfactory healing, the paraesthesia had gradually improved, tenderness to percussion disappeared, and no mobility of the mesial root. The tooth was then restored with composite resin (3M ESPE Filtek, SupremeXT; 3M Corp., St. Paul, MN) (**Figure 2a**). Also, radiographic examination showed resolution of the bony lesion (**Figure 2b**).

At the 6-month recall visit, the patient reported improvement in sensation as the paresthesia was restricted to a small area of his lower lip when tested with a pin, and normal clinical findings were detected. Radiographic examinations showed promising bone formation (**Figure 2c**).

Coronal tooth reduction was performed with a chamfer finish line was given lingually and buccally using TR12 diamond stone (**Figure 2d**) followed by one-step impression of the mandibular teeth using putty/light impression material "Zeta plus" ("Zhermack", Italy). Porcelain-fused-to-metal prosthesis was fabricated and cemented using Medicem glass ionomer cement (Promedica, Neumünster, Germany) (**Figure 2e, f, g**). Postoperative radiograph ensured complete seating of the extra-coronal restoration. (**Figure 2h**) The patient was advised to maintain good oral hygiene and rescheduled for 1 year follow-up.

Discussion

The present case demonstrated overextension of gutta-percha that caused inferior alveolar nerve affection, which resulted in discomfort and neurological disorders. Chong et al., stated that there is an intimate relationship between the roots of mandibular second molars and inferior alveolar nerve as the neural canal upper boundary is located

3 mm or less below the root apices of the second molars with a significant potential risk of nerve injury during endodontic procedures. (**Chong et al., 2015**) Other contributing factors to nerve injury are improper root canal preparation and excessive enlargement of the apical foramen, resulting in an elimination of the apical constriction.

Studies have demonstrated that the surgical treatment option, either apical or corrective, which results in total removal of the innocuous material is successful in the elimination of neural disorders caused by endodontic material extrusion, capable of totally relieving the symptoms. (**Scolozzi et al. 2004**)

The corrective surgical treatment plan option was considered for this case due to the high risk of gutta-percha separation/pushing beyond the apical foramen during the non-surgical removal, and also due to the natural anatomical challenges associated with periapical surgery concerning mandibular second molars. (**Setzer & Kratchman, 2022**)

To ensure the success of the hemisection procedures, variety of correlated factors were evaluated first, including dental periodontal status, root architecture, the endodontic and restorative therapy. From a periodontal perspective, the amount of adjacent bone and the quality of furcal bone are critical factors for a favorable prognosis. (**Dannewitz et al. 2006**). From endodontic and restorative standpoint, factors such as calcified root canals and poor post-design restoration cause failure of resected molars. Considering such factors, the present case had a relatively small amount of bone loss at the time of surgery and favorable prognosis for the endodontic-restorative treatment.

The hemisection procedures included preservation of the sound mesial root, hence loss of posterior teeth may lead to negative impacts on oral structure, including teeth migration, arch length discrepancies, and masticatory dysfunction. Hemisection may save multi-rooted teeth that have been indicated for extraction, if the correct cases are selected, it is a relatively straightforward, conservative, and cost-effective treatment with a high probability of success. (**Mittal et al. 2016**)

The use of a long inter-follow-up time of 3 months was chosen to allow adequate time for nerve tissue healing and to reassess the outcome of the treatment plan. In our case, the patient exhibited improved neurosensory functions over 6 months follow-up. Several studies showed that the resolution of lip paraesthesia may require several weeks, months or even years. (Ozkan et al. 2008, Ricucci et al. 2018)

At the 6 months follow-up, examinations revealed a clinically asymptomatic and functional tooth, and the radiographs showed promising bone formation. In a retrospective study the overall survival rate of a large number of hemisectioned molars reached 91.1%. (Yuh et al.2014). Also, a survival probability of nearly 80% over a 20-year follow-up was reported after root resection of Mandibular molars. (Derks, et al. 2018), however, another study found unfavorable results with hemisected molars, with an overall failure rate of 20.6% with pathologic apical factors being the main cause of failure. (Bühler, 1983)

The main limitation of our study was the absence of preoperative cone-beam computed tomography (CBCT) which would have helped in confirming the gutta-percha over-extension in the mandibular canal, and treatment planning.

According to the favorable outcome in the present case, hemisection can be considered an integrative interdisciplinary treatment modality that incorporates multiple dental operations offering added alternative for preserving hard oral structures with prime importance from the perspective of conservative dentistry.

Conclusion

Conservative management of multirooted teeth with overextended endodontic filling material into the inferior alveolar canal through hemisectioning procedures not only relieved the symptoms but also preserved the dentition, reduced the economic expenses, and masticatory malfunction associated with tooth loss.

Conflict of Interest:

The authors declare no conflict of interest.

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Ethics:

The study was conducted in accordance with the institutional ethical guidelines, and informed consent was obtained from the patient.

Data Availability:

Data will be available on request.

CRediT statement:

Author 1: Data curation, Conceptualization, Methodology, Resources, Writing-original draft, Writing - review & editing.

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