

A Remarkable rare case of fractured endodontic instrument in periradicular region compressing inferior alveolar nerve

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ABSTRACT

This study aims to present the management of a rare case of a separated endodontic instrument in the periradicular area. The broken instrument had penetrated within and along the mandibular canal from the periapical zone of mandibular second molar after endodontic treatment, leading to acute neurological symptoms. These subsided completely following surgical removal of the separated instrument. Because of the close anatomic relation between the second molars and the inferior alveolar nerve, careful clinical and radiographic examinations should always be performed before endodontic treatment of these teeth, so as to prevent iatrogenic injuries of the type described here. Dentists should also be aware of the anatomic characteristics of the mandibular canal (i.e., cribriform rather than solid), as well as the consequences of overinstrumentation.

Key Words: Paresthesia, separated, mandibular canal, inferior alveolar nerve, overinstrumentation

Introduction

Almost every clinician who performs endodontics has experienced the procedural accident of breaking an instrument. Although instrument separation might be common, fracture of an endodontic instrument beyond the apical foramen is rare. Moreover, displacement of a separated instrument in the inferior alveolar canal is a very rare entity with scarce reporting in the literature.

For the practitioner embarking on therapy for a molar or bicuspid, it is important to take into account the

anatomical vicinity of the maxillary sinus, mental foramen or inferior alveolar nerve. The proximity of roots to these important structures must be acknowledged through accurate radiographic imaging. ^[1] Clinicians should be aware of the fact that endodontic instruments and filling materials (solid or liquid) can be extended in such a degree that can lead to neurological or sinus complications, due to the proximity of the apices of the mandibular molars and premolars to the inferior alveolar canal and the maxillary posterior teeth to the sinus floor

membrane. ^[2] Sealers, broken file, gutta-percha extruded in the periapical area causes a foreign reaction of the connective tissue. ^[3] Depending on the organism's immune response, the connective tissue tends to absorb the foreign body or more frequently, surround it with a fibrous capsule.

A number of reports have been published concerning neuralgia and other complications of the inferior alveolar nerve following a penetration of root canal filling or endodontic file into or close to the mandibular canal. ^{[4,}

^{5]} According to the IASP (International Association for the Study of Pain) pain terminology, paresthesia has been defined as "an abnormal sensation, whether spontaneous or evoked" such as burning, tingling, prickling, itching, or formication, which is not unpleasant. On the other hand, dysesthesia is preferentially used for an abnormal sensation that is considered unpleasant. ^[6]

Also, hypoaesthesia is the most frequently encountered complication of over-extension endodontic treatment instrument ^[7] and/or filling material if these are in contact or close to the inferior alveolar canal, such as they can cause injury of the inferior alveolar nerve. In such cases of injury of the inferior alveolar nerve or presence of filling material in soft tissues or sinus spaces a surgical approach is necessary. ^[8]

This case report presents the surgical management of an interesting and unusual case of inferior alveolar nerve paresthesia occurring due to fanatical endodontic therapy.

Case report

A 28 year old female patient was referred to the department of oral and maxillofacial surgery for the management of severe pain in the right mandibular region. The patient complained of continuous burning sensation in the right lower jaw with recurrent severe pain along the lower border of the jaw radiating to the ears and side of the neck for 6 months. The pain was severe, continuous, lancinating and not controlled by non steroidal anti inflammatory drugs or opioids. History revealed that the patient had undergone root canal therapy for the lower molar for intermittent pain possibly irreversible pulpitis two years back. The pain persisted even after the treatment and the patient was subsequently put on analgesics. After a span of one week, the patient was prescribed carbamazepine (mazelol) by the general practitioner. As the symptoms remained the same after long course of various medications, the practitioner subsequently extracted the tooth. But unfortunately, the agony of the patient remained the same and finally the patient was referred for management.

Digital orthopantogram revealed the presence of a broken endodontic instrument in the vicinity of the mandibular canal. (Fig. 1)



Fig. 1 Pre-operative orthopantogram

After thorough clinical and radiological investigations, it was decided to surgically retrieve the broken instrument from the canal. The procedure was carried out under local anaesthesia, using 2% lignocaine with 1:200,000 adrenaline. Buccal triangular trapezoidal flap was raised, taking care not to damage the mental neurovascular bundle. The instrument was seen lodged in the roof of the mandibular canal. A window was made in the buccal cortex, taking care not to damage the contents of the mandibular canal. (Fig. 2)



Fig. 2 Surgical site

The broken instrument was visualized under magnifying loupes and was retrieved using a non-toothed micro tissue forceps. (Fig. 3) Thorough cavity lavage was done.



Fig. 3 Surgically retrieved endodontic instrument

After the surgery, to avoid swelling and pain, an antibiotic (amoxicillin 1 g, 1 tablet twice daily for 8 days), corticosteroid (methylprednisolone 16 mg, decreasing dose from 4 tablets on the first day to 1 tablet on the fourth day), analgesic (paracetamol 1 g, 1 tablet twice daily for 3 days) and a vitamin B complex (Neurobion [Merck KGaA, Darmstadt, Germany], 1 tablet daily for 2 months) were prescribed. Post-operative orthopantogram revealed clear mandibular canal. (Fig. 4)



Fig. 4 Post-operative orthopantogram

The patient was advised to rinse her mouth with chlorhexidine gluconate 0.2% 3 times daily for 15 days. Eight days after surgery the patient reported that the sensation of numbness had disappeared completely indicating the success of the surgical therapy rendered. The patient was absolutely fine with no recurrence of any symptoms 1 year after surgery

Discussion

A separated endodontic instrument can cause nerve compression that can lead to acute neurological symptoms, in form of severe pain, as happened in this case. If mechanical damage to the inferior alveolar nerve caused by an endodontic instrument does occur, it may be repaired by a process of scarring, which will result in immediate but temporary

paresthesia.^[9] In the present case, dysesthesia of the inferior alveolar nerve manifested itself as burning sensation in the lower jaw and pain extending to the neck and pain on chewing with the remaining teeth on the affected side of the mandible. This dysesthesia was due to the stimulus of a foreign body, i.e. the broken endodontic file.

The proximity of the mandibular canal to the apices of the premolar and molar teeth requires a careful radiographic diagnosis when endodontic treatment of these teeth is planned. During endodontic treatment, a radiograph taken with the files in position will not only ensure the correct working length but also prevent perforation of the canal and possible subsequent damage to the inferior alveolar nerve resulting from the endodontic treatment. Although the mandibular canal is surrounded by dense hypermineralized bone, it can be perforated by a rotating file on a hand-piece or sometimes even with hand files. During instrumentation with files, the nerve or blood vessels can be damaged directly.^[10]

Oral paresthesia is associated with four main causative factors. The first, mechanical trauma is due mainly to overinstrumentation beyond the apex resulting in damage to the inferior alveolar nerve, which is normally associated with the second molars.^[11] The second, a pressure phenomenon, may occur when obturation material or endodontic instruments are present within the inferior alveolar canal.^[12, 13] The third, neurotoxic effects, are related to solutions used to clean the root canal

or solutions used as sealants. The fourth main cause is thermal injury.

Tillota-Yasukawa et al^[14] concluded that the cancellous bone in the molar region has numerous vacuoles, and there is no cortical bone protecting the pedicle. 20% of the cases examined by these authors had slightly denser cancellous bone around the canal, but it was full of perforations that would prevent effective protection of the nerve. They also determined that the distance from the inferior alveolar nerve to the apices of the second and third molars was less than 1 mm. This distance should be evaluated by careful radiographic assessment when endodontic treatment of the second molars is required.^[10]

Surgical therapy of inferior alveolar nerve is indicated in cases of sectioning of the nerve, compression caused by a foreign body, neural neoplasia, and persistent anesthesia or paresthesia.^[15] The main benefit of surgical intervention in the early stages of paresthesia is restoration of the neural microvasculature, which makes recovery of the nerve possible. The method advocated here for retrieval of the endodontic instrument tip is a simple deroofing technique that obviates the need for major surgery under general anesthesia. The patient need not be hospitalized, and recovery is fast with minimum morbidity. Care has to be taken to limit the length of the vertical cuts to the roof of the mandibular canal so that the inferior alveolar nerve is not injured in the process of deroofing it. The rapid resolution of the paresthesia suggested that its cause was a compressive

phenomenon affecting the inferior alveolar nerve.

Overextension and overinstrumentation are the causative factors most often found in paresthesia secondary to orthograde (conventional) endodontic therapy. The anatomical and clinical significance of the inferior alveolar canal in relation to conventional and surgical endodontic therapy should be considered. Also, radiographic measurements should be combined with electronic working length determination using modern apex locators to better help identify the apical end point of root canal preparation. This can prevent over instrumentation and any possible subsequent damage to the inferior alveolar nerve.

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