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Injury to the Inferior Alveolar Nerve Due to Thermoplastic Gutta Percha

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There have been very few cases reported in the English-language literature concerning the management of inferior alveolar nerve injuries secondary to the extrusion of thermoplastic endodontic filling materials into the inferior alveolar canal. The use of these materials is becoming more popular with general practitioners performing endodontic therapy, and thus this type of combined compressive and thermal nerve injury may be encountered more frequently. The difficulties in managing overextension or overfill are in deciding whether to intervene surgically, as well as the correct timing of the intervention. We present the case of a patient in whom such an injury was observed for 12 months.

Report of a Case

On November 6, 1998, an otherwise healthy 29-year-old woman was seen in our outpatient clinic regarding numbness in her right lower lip and chin that developed after endodontic therapy on her mandibular right second molar.

She had seen her family dentist 4 days earlier for what appeared to be routine root canal therapy on her mandibular right second molar. She recalled receiving several injections before being completely anesthetized. The procedure, which involved obturation with thermoplastic gutta percha, was otherwise uneventful. Prescriptions for antibiotics and analgesics were given after completion of the treatment. That night, the patient noticed that the numbness in her tongue had subsided but the numbness in her right lower lip and chin persisted. The next morning, she experienced a sharp pain in her right chin region. She proceeded to call her dentist, who reassessed her radiographs and informed her that gutta percha had extruded out through the apical foramen of the tooth and apparently entered the inferior alveolar canal. She was referred to an endodontist, who in turn referred her to the Oral and Maxillofacial Surgery Service at Toronto General Hospital for further assessment.

On examination, the patient appeared to be a young, healthy woman who had evidence of altered sensation in her right lower lip from the midline to the commissure, extending superiorly to, and including, the vermilion of the lower lip and down to the neck inferiorly. She had no cold, pinprick, or 2-point discrimination in the entire field in question. She had an area of light touch detection that measured approximately 15 mm in maximal diameter in the lower third of the chin, adjacent to the midline, on the right hand side.

Intraoral examination revealed normal sensation in the tongue and lingual gingiva and complete anesthesia of the labial gingiva from the mandibular right first bicuspid to the midline. The cranial nerve examination was otherwise unremarkable.

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FIGURE 1. Panoramic radiograph showing radiopaque material extruded from the apices of the mandibular right second molar, seemingly into the inferior alveolar canal.

Panoramic, occlusal, and periapical radiographs showed extrusion of radiopaque material beyond the apex of the mandibular right second molar into the inferior alveolar canal (Figs 1, 2). This material was seen to be midway between the buccal and lingual cortices and extended in an anteroposterior direction from the root apices.

Surgical debridement of the inferior alveolar canal and decompression of the inferior alveolar nerve were advised and discussed at great lengths with the patient, who subsequently refused to undergo such treatment. She did, however, agree to present for frequent follow-up appointments.

The patient was referred to a neurologist for further assessment and documentation of her altered sensation. This assessment confirmed our clinical findings.

At her 1-month follow-up, the patient reported feeling a “prickly sensation” in the affected area. This “pins and needles” sensation had started a few days earlier. In addition, she described feeling as though insects were crawling on her lower lip. Objective test results were unchanged at this stage.

At the 2-month follow-up, the only subjective change noted was increased hypersensitivity to touch. The patient specifically described difficulty in applying make-up. Again, there were no objective differences from before.

At the 3-month follow-up, the patient described the affected area as totally numb (“like a dead piece of meat”). She did experience occasional “electric shocks” through the right lower lip. Objectively, there was total anesthesia in the affected area.

There were no further changes noted at the 1-year follow-up. During the entire follow-up period, the surgical treatment options were regularly reviewed, but the patient chose to forgo surgery. She also initiated medicolegal proceedings during this time against the general practitioner.

Discussion

Nerve injuries that have been reported as secondary to endodontic treatment can be chemical, ther-

mal, or physical in origin. There have been very few reports in the English-language literature regarding inferior alveolar nerve injuries that occur as the result of overextension of thermoplastic obturation materials into the inferior alveolar canal. These thermoplastic materials are thought to be inert, minimizing the possibility of chemical injury. The neurologic disturbance that occurs is thought to be due to thermal damage as well as mechanical compression of the nerve.

The softening temperature of thermoplastic gutta percha ranges from 53.5° to 57.5°C.¹ Intracanal temperatures of 50° to 100°C have been reported.² It has been shown that temperature elevations of as little as 10°C can cause bone damage and necrosis.³ Nerve tissue is thought to be even more sensitive to thermal insult than bone.²

Mechanical nerve injuries have been well documented throughout the literature. Two classification schemes that have traditionally been applied to these are those by Seddon⁴ and Sunderland.⁵ If the nerve injury in this case was solely mechanical in origin, it could be classified as a neurotmesis (Seddon⁴) or as a third-, fourth-, or fifth-degree injury (Sunderland⁵).



FIGURE 2. Mandibular occlusal radiograph showing radiopaque material extruding both anterior and posterior to the mandibular right second molar.

Such an injury is characterized by severe disruption of all of the components of the nerve trunk, resulting in a poor prognosis for recovery.^{6,7} Surgical intervention is most strongly indicated in such cases because the prognosis for recovery is poor and the possibility of the development of a symptomatic neuroma exists. Early surgical intervention allows for the decompression of the nerve, potentially restoring the microvasculature and enhancing the recovery of the nerve. However, the risks of surgery include nerve transection, as well as further nerve damage, which may lead to complete anesthesia or dysesthesia. Alternatively, neurolysis with resection of the damaged segment may be performed.

In cases such as this one, the dilemma is in deciding whether surgery is indicated, given that the exact etiology of the injury cannot be determined. Fanibunda et al² report on early surgical intervention undertaken in a similar clinical situation with limited success. Despite our advice, the current patient chose to follow a nonsurgical course. At 3 months, the initial hypoesthesia changed to total anesthesia. The patient still declined surgical intervention. It is not surprising that her status was unchanged at her 1-year follow up.

If the only injury sustained by a nerve is compression, it would seem prudent to operate and remove the cause as early as possible. This would enhance the potential for reperfusion of the compressed nerve and potentially improve its ability to heal. In the current

case, there was the additional insult of a thermal injury, the extent of which could not be determined clinically and for which the benefits of early surgical intervention are uncertain. It seems evident from this case that this type of nerve injury may progress and eventually may result in total loss of function. More cases are needed before a protocol can be established for managing combined thermal and compression nerve injuries.

Prevention of this type of nerve injury is very important given the uncertainty and difficulty associated with its treatment. Dentists and endodontists who use thermoplastic techniques should be aware of the consequences of overobturation.

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