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Displaced calcium hydroxide paste causing inferior alveolar nerve paraesthesia: Report of a case

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A patient presented with an intraoral red, painful, and hard swelling in the lower right jaw. Radiographs showed a 2 × 1 cm area of radiopaque material surrounding the apex of the second premolar. The material, according to the patient's dentist, was calcium hydroxide paste used as a temporary dressing material in the root canal. The patient developed paraesthesia in her lower lip probably due to a neurotoxic effect caused by calcium hydroxide. The foreign material was surgically excavated from the spongy bone, directly adjacent to the nerve, and the patient later regained her sensation in the lip. A histopathological analysis revealed necrosis, deposits of foreign bodies, and inflammatory cells and foreign-body giant cells. This report illustrates the toxicity and adjacent clinical symptoms of calcium hydroxide paste when displaced into bone tissue close to the alveolar inferior nerve. It also demonstrates the benefits of removing such displaced material before symptoms progress. (*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003;96:734-737)

During root canal treatment, temporary dressing material may unintentionally escape through the apex of the tooth, resulting in a series of complications including hypaesthesia or paraesthesia of the inferior alveolar nerve.^{1,2} Such complications occur mainly by excess filling material causing direct pressure or by exerting a neurotoxic effect on the neurovascular bundle.¹

In the present case, calcium hydroxide (Ca(OH)₂) paste was displaced through the apex of a premolar during endodontic treatment. The material caused changes in the surrounding bone and affected the inferior alveolar nerve. The aim of this report is to illustrate that periapical calcium hydroxide in excess amounts causes paraesthesia when positioned close to the inferior alveolar nerve. It also demonstrates that the nerve can regain normal function and sensibility after early surgical removal of the calcium hydroxide material.

CASE REPORT

A 49-year-old female presented to the Department of Oral & Maxillofacial Surgery, after having had increasing pain and swelling in her right side of the lower jaw during the previous 2 weeks. Root canal treatment of both lower right premolars had been performed by her general dentist 3 weeks earlier. Prior to our examination she had received 2.6 g fenoxymethyl penicillin daily for eleven days without relieving the symptoms.

Extraoral examination revealed a diffuse swelling at the lower right buccal mandibular border. There was also a palpable tender jugulodigastric lymph node present. A slight redness of the buccal mucosa was seen as well as a hard swelling, tender to palpation, in the intraoral lower right premolar region. The premolars were tender to percussion and slightly mobile. Radiographs showed a 2 × 1 cm large area of radiopaque material surrounding the apex of the second premolar (Fig 1). In discussion with the patient's dentist, information was given that Calasept® (Nordiska Dental, Ängelholm, Sweden), a calcium hydroxide paste, had been used as a temporary dressing material in the root canals of both lower right premolars. The reaction, due to overfill of calcium hydroxide combined with a possible persisting bacterial infection, was suggested to be the explanation to the clinical findings in the second lower right premolar region. Therefore, Clindamycin 150 mg 4 times daily was then prescribed, and surgical removal of the material was planned for when signs of infection had disappeared.

Three days later the patient showed less swelling, but now

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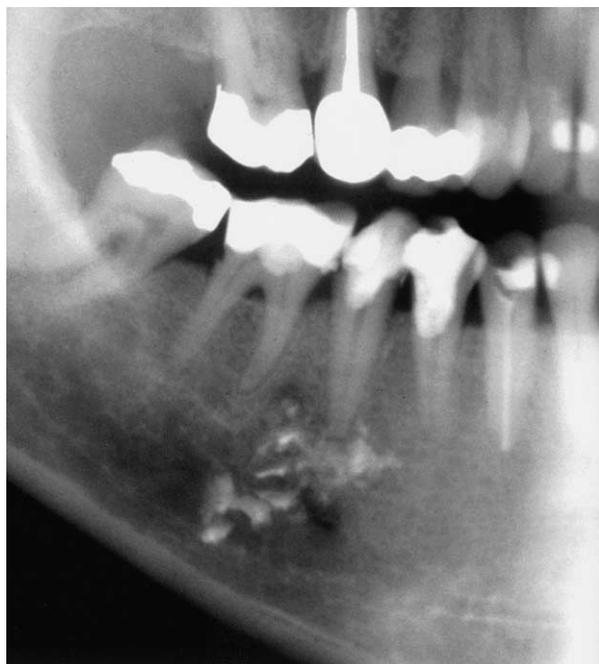


Fig 1. Radiopaque calcium hydroxide paste surrounding apex of the second premolar.

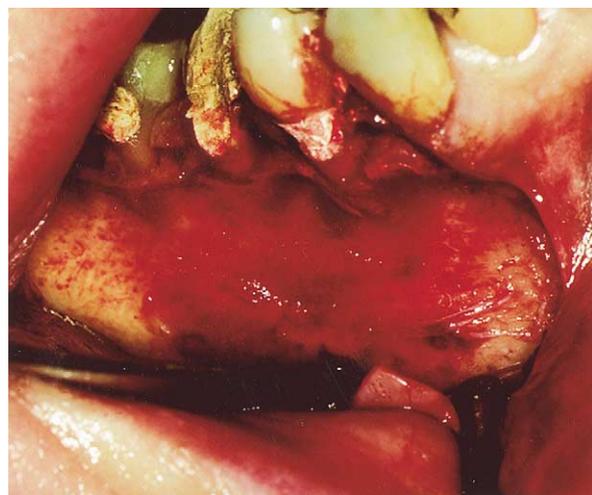


Fig 2. Discolored cortex due to an increase in vascular perforations.



Fig 3. Osteotomy and removal of foreign material around the mental foramen.

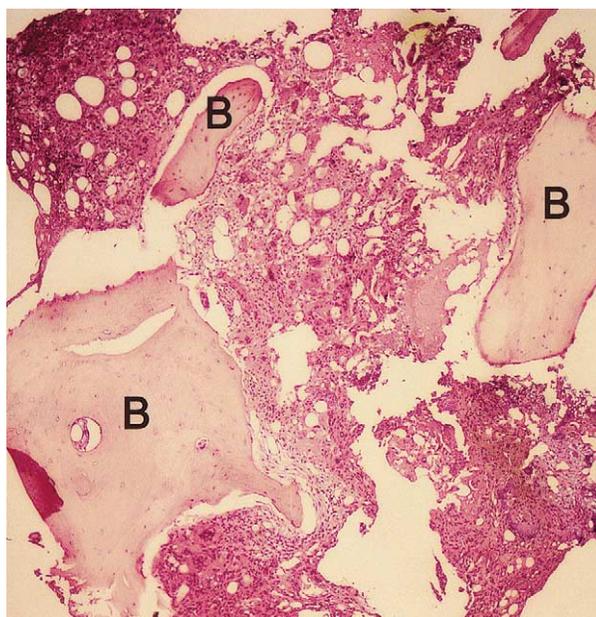


Fig 4. Photomicrograph of the biopsy specimen showing necrotic bone (*B*) surrounded by soft tissue with foreign material (H & E, original magnification $\times 25$).

experienced paraesthesia in her lower lip on the right side. Seven days after her first visit, the clinical symptoms allowed for surgical removal of the displaced material. Under local anaesthesia a buccal sulcus incision was made from the second molar to the canine with a mesial relieving incision. A mucoperiosteal flap was raised and the mental foramen was exposed. The affected area of the cortex was light red in color with several small vascular perforations (Fig 2). Osteotomy of the cortical bone was performed and a monocortical block

overlying the subapical area of the second premolar was removed, including exposure of the lateral wall of the mandibular canal posterior to the mental foramen. Calcium hydroxide paste found in the spongy bone and within the mandibular canal adjacent to the inferior alveolar nerve was removed (Fig 3). The inferior alveolar nerve was kept intact throughout the procedure. After generous saline irrigation an apicectomy of the lower right second premolar combined with an orthograde root filling was performed. For the permanent root filling, gutta-percha and a resin-based sealer were

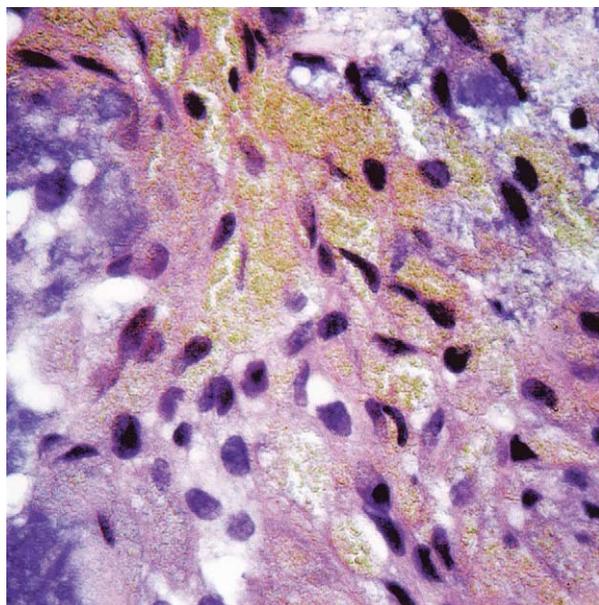


Fig 5. Masses of foreign material in the connective tissue (H & E, original magnification $\times 400$).

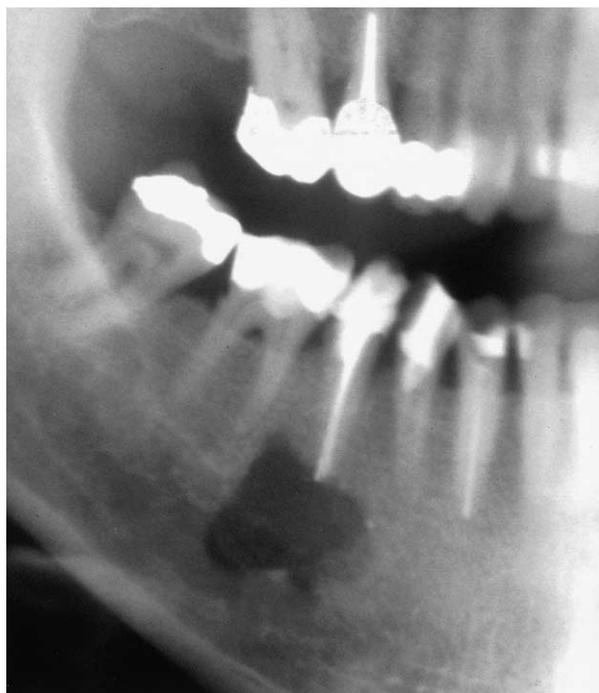


Fig 6. Radiograph showing the extension of the osteotomy as well as the removal of calcium hydroxide paste.

chosen. The flap was resutured and the patient was given Clindamycin 300 mg, 3 times a day for 5 days postoperatively.

A histopathological analysis of the biopsy specimens taken



Fig 7. Radiograph showing significant signs of bone healing, 6 months postoperatively.

from the involved area revealed deposits of foreign bodies seen as an amorphous substance surrounded by necrosis in the tissue (Figs 4 and 5). Necrotic bone could be seen, and, in the periphery, inflammatory cells and foreign-body giant cells were present.

Ten days after surgery, the patient described a normal postoperative healing, except for experiencing anesthesia of the right side of her lower lip. Radiographs showed complete removal of the foreign material (Fig 6). Four weeks after surgery the patient described improved sensibility in the lip and normal mucosal sensibility. Six months after surgery the patient was free of symptoms and showed a normal sensibility of the inferior alveolar nerve (Fig 7).

DISCUSSION

Calasept is a deposit antiseptic with a pH of 12.3.³ It is commonly used as the intracanal antimicrobial agent of choice during endodontic treatment. Calasept is provided in a carpule and the delivery system suggests that it be injected into the pulp space. This case shows that syringe delivery may invite serious complications and that less invasive techniques such as Lentulo spirals should be used.

Calcium hydroxide has a very low solubility at body temperature and will remain in the tissue for some time. Calcium hydroxide has been shown to cause irreversible damage to nerve tissue when exposed for less than 1 hour in several experimental models,³⁻⁵ leading to reduction in nerve activity. The effect is possibly

caused by the excess of calcium and hydroxide ions leading to a destabilization of the nerve membrane potential.³

Some previous studies have indicated that no or only mild problems occur if calcium hydroxide is displaced through the apical foramen providing there is no contact with soft tissue.⁶⁻⁸ The present case report shows the opposite, but this could also to some degree be due to the large volume of calcium hydroxide displaced. The histopathological evaluation of this case also correlated well with earlier experimental studies illustrating tissue reactions to calcium hydroxide.^{9,10} The fact that the symptoms were continually worsening demonstrates the high toxicity of the material when injected in large quantities into vital bone. Swift removal of calcium hydroxide when close to the nerve is recommended when, as in this case, paraesthesia occurs.

In general, when root-filling material is extruded close to the alveolar inferior nerve canal and is accompanied by an altered nerve sensation, the patient should be informed and referred to an oral and maxillofacial surgeon for evaluation. Surgical removal of conventional root-filling material has earlier shown to alleviate pain and paraesthesia.¹¹

In conclusion, this report illustrates the importance of careful application of calcium hydroxide paste into root canals. It also shows the importance of removing such displaced material early when symptoms develop.

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