Chemical burn of the inferior alveolar nerve due to the extrusion of calcium hydroxide in endodontic treatment: A case report

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I. Introduction

Calcium hydroxide has been widely used in endodontic treatment, thanks to its bactericidal effect. Accidental extrusion of calcium hydroxide can cause chemical burn of inferior alveolar nerve, leading to neurotoxic effects, such as paresthesia or continuous inflammatory response. When endodontic material is considered to cause neurotoxic symptoms, the clinician should choose which treatment to take. This case report is to present the extrusion of calcium hydroxide and treatment procedures including surgical intervention.

II. Methods

A female patient experienced Calcipex II® extrusion on left mandibular area, during endodontic treatment. After completion of endodontic treatment on #36, surgical intervention was planned under general anesthesia. After cortical bone osteotomy and debridement, neuroma resection and neurorrhaphy was performed, and prognosis was observed.

III. Case Report

A 48-year-old female patient was referred to the Department of Oral and Maxillofacial Surgery, Yonsei University Dental Hospital for paresthesia of the left mandibular area after endodontic treatment of the left mandibular second molar. The patient had received endodontic treatment at a local clinic about 6 weeks ago. Conventional radiographs and computed tomography of the mandible showed a radiopacity around the left mandibular canal (Fig. 1). History and radiographs confirmed the extrusion of Calcipex II® . After prescribing steroid medications for 2 weeks, the patient was sent to the Department of Conservative Dentistry for the removal of foreign material through canal irrigation. Even though the complete removal of foreign material through conventional endodontic approach was impossible, endodontic re-treatment was scheduled and performed. Before performing endodontic re-treatment, the pin-prick test result was 200 in the left mandibular area and 50 in the right mandibular area. The two-point discrimination test result was 30 mm in the left mandibular area and 9 mm in the right mandibular area.

After the endodontic re-treatment, the patient felt a mild improvement in the paresthesia of the left mandibular area (Fig. 2). The two-point discrimination test result was 16 mm in the left mandibular area and 7 mm in the right mandibular area. However, no discrimination could be made between the left and right mandibular areas with the brush direction test. Hence, neuroplasty and foreign body removal from the left mandibular canal under general anesthesia was planned. However, the patient wanted to postpone the surgery for 2 months, hoping for an improvement without undergoing surgery. After 2 months, the pain threshold test result was 125 in the left mandibular area and 100 in the right mandibular area, and this result was inconsistent when the pin-prick test was performed. Since the patient's symptoms did not show any improvement, surgical treatment was performed. Surgical treatment included neuroma resection, neurorrhaphy and foreign body removal under general anesthesia (Fig. 3A and B). Under general anesthesia, a cortical bone osteotomy was performed and a monocortical block overlying the subapical area of the second molar was removed. Calcium hydroxide paste was found in the spongious bone and the inferior alveolar canal was debrided as far as possible. Radiograph after surgical intervention showed no foreign material (Fig. 4A). The histopathological analysis showed that the curetted material contained foreign bodies and multiple fragments of bone and various sizes of fibrous or fibroadipose tissues. On histological examination, chronic nonspecific inflammatory cell infiltration without foreign body reaction was seen (Fig. 3C and D). Some of the blackish particles contained endodontic pastes. Negative findings were observed for S-100 protein present in nerve bundles (Fig. 3E and F). At the 3 months follow up after surgery hardly any improvement was seen in paresthesia, and the patient was sent to the Department of Prosthodontics for a provisional restoration in the treated area (Fig. 4B). On 20 months follow up, healing of bony fragment was observed on panoramic x-ray, and the endodontically treated #37 was used as abutment for provisional fixed partial denture, without improvement of sensory nerve (Fig. 4C).

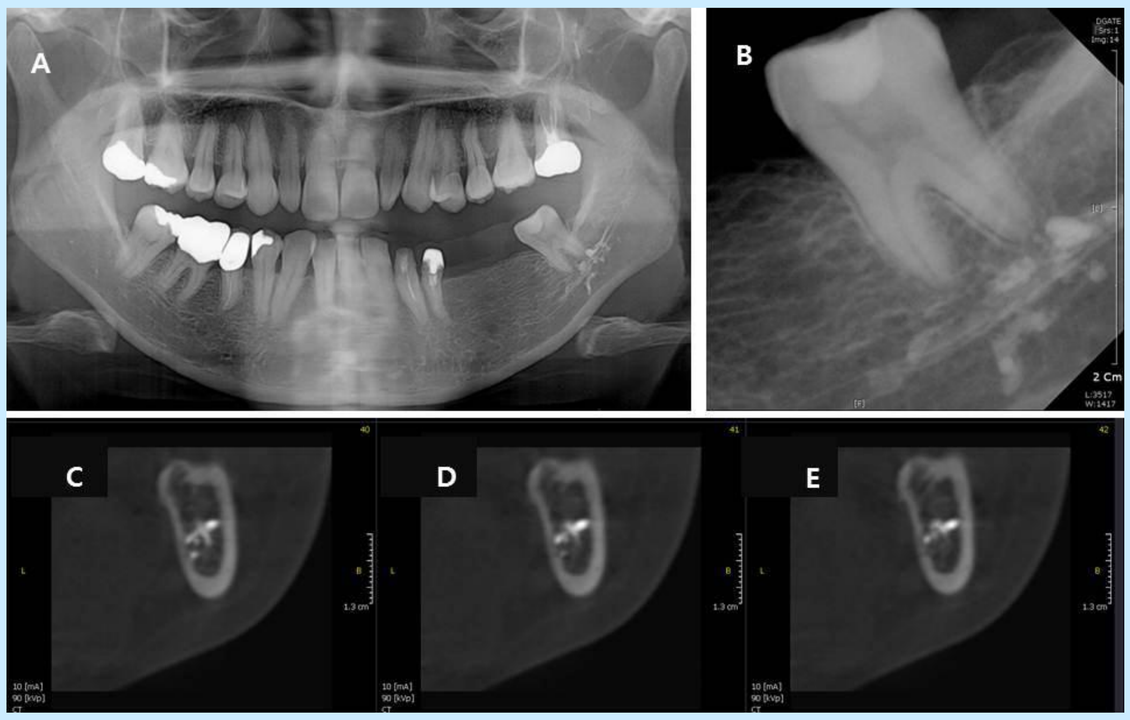

Fig. 1A. Panoramic view of the patient after extrusion of calcium hydroxide. Increased radiopacity around periapical area of #37 and left inferior alveolar canal is seen.
Fig. 1B. Periapical view of #37 after extrusion of calcium hydroxide. Endodontic treatment was performed about 6 weeks ago. The patient complained of paresthesia of left mandibular area. Multiple irregular shaped radiopaque materials are located around distal root of #37 and left inferior alveolar canal is surrounded by multiple radiopaque materials.
Fig. 1C,1D,1E. Cross sectional view of computed tomography on Lt. Mandibular area, after extrusion of calcium hydroxide. Radiopaque materials are located in cancellous bone. It was spread linguo-buccally.

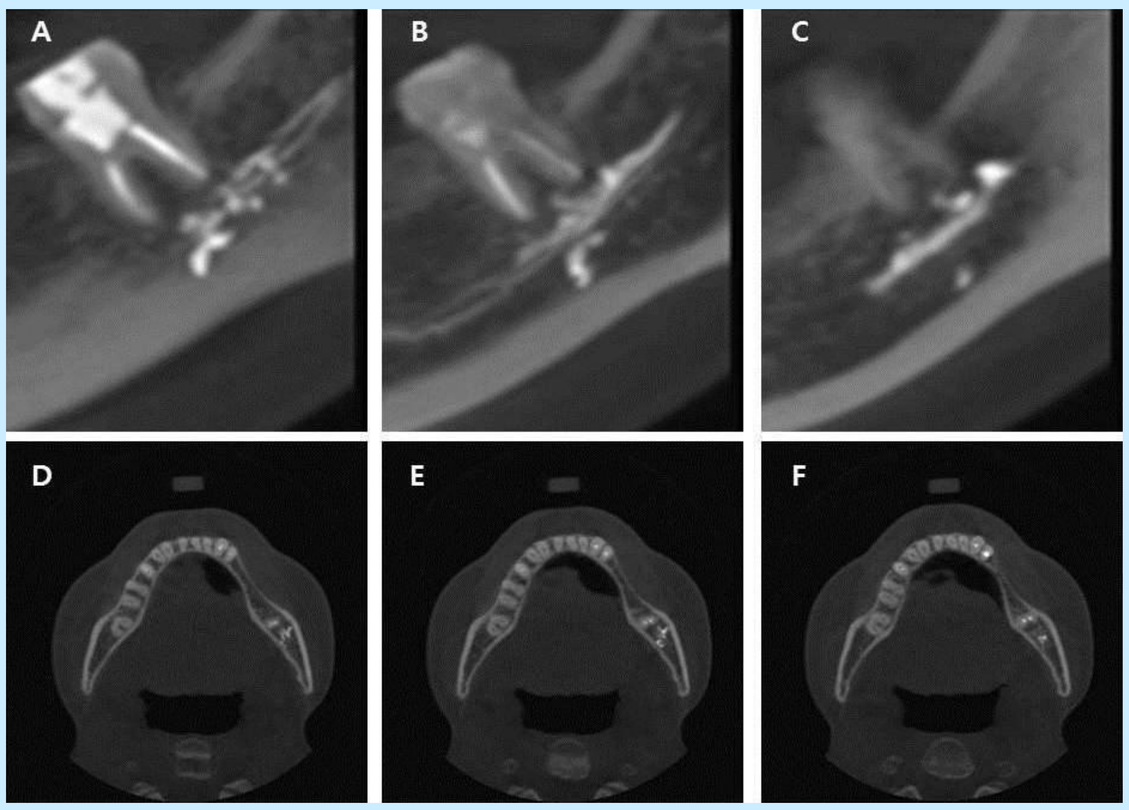

Fig. 2A,2B,2C. Panoramic view of CBCT after completion of endodontic treatment on #36. Root canals are filled with radiopaque material. Extruded radiopaque materials are located along inferior alveolar canal.
Fig. 2D,2E,2F. Cross sectional view of CBCT after completion of endodontic treatment. Radiopaque materials are located around periapical area of #37. It's located in cancellous bone, and there's no penetration of cortical bone. Alveolar resorption due to loss of molars is found on edentulous area.

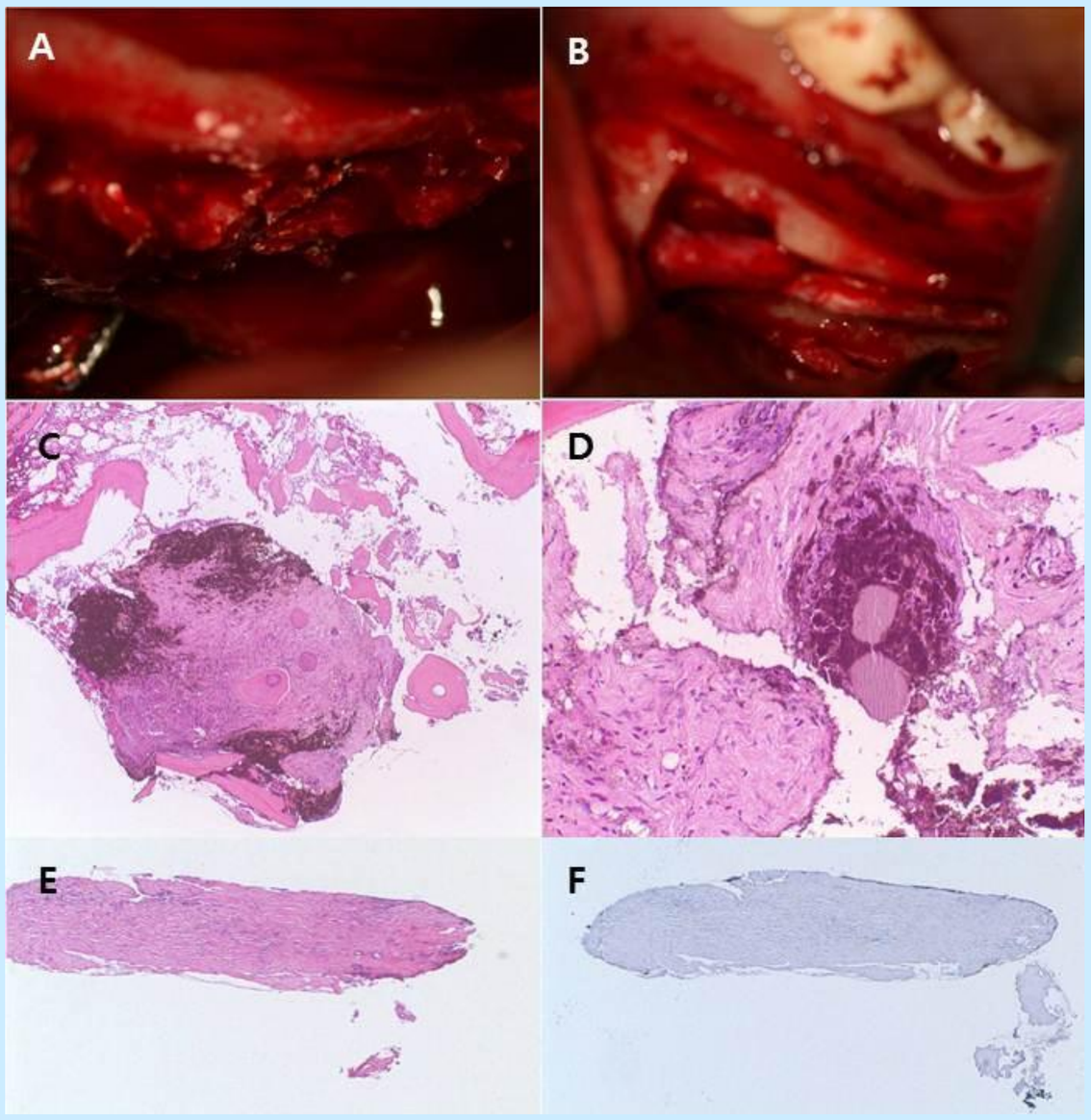

Fig. 3A. Before debridement. Granulation tissues and destructed bones are seen. It's hard to distinguish inferior alveolar nerve and other structures.
Fig. 3B. After debridement and bone osteotomy. Inferior alveolar nerve was sutured, granulation tissues and destructed bones are removed.
Fig. 3C, 3D, 3E. Particles of foreign bodies and multiple fragment of bone and fibrous or fibroadipose tissue of varying size represented the curetted material submitted for histopathological examination. Chronic nonspecific inflammatory cells infiltrate without foreign body reaction. Some of fragments contained endodontic paste particles in the form of blackish foreign bodies
Fig. 3F. Not observed nerve bundle (S-100 negative)

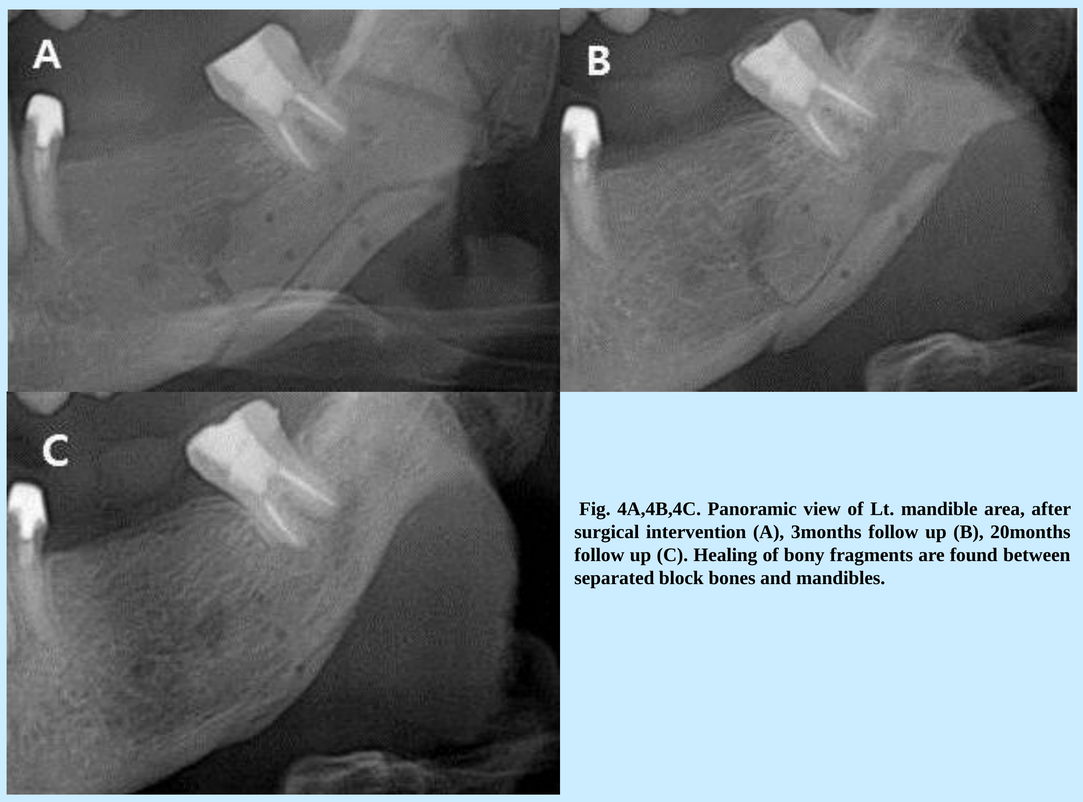

Fig. 4A,4B,4C. Panoramic view of Lt. mandible area, after surgical intervention (A), 3months follow up (B), 20months follow up (C). Healing of bony fragments are found between separated block bones and mandibles.

IV. Conclusion

As root canal sealers have the potential to be neurotoxic, a clinician should be aware of the possibility of extrusion and damage to the inferior alveolar nerve. If a clinician detects any radiopacity near the inferior alveolar nerve, careful monitoring is needed. If symptoms are present, then an immediate decompression and removal of the dental material is recommended for nerve repair. In this case, no improvement in sensory nerve was seen following surgical intervention after 20 months.

Key words: Calcium hydroxide, Extrusion, Inferior alveolar nerve, Neurotoxic effects, Surgical debridement, Decompression

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