

CHAPTER 13

Clinico-Pathological Healing of Periapical Tissues in Aged Patients by Root Canal Filling using Calcium Hydroxide: Case Presentation

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《Abstract》

Two root canal filling materials, Calvital and Vitapex (Neo Dental Chemical Products Co., Ltd., Tokyo, Japan), were used to treat six teeth in a 78-year-old man and one tooth in an 82-year-old woman, respectively. Both of these filling materials were paste, consisting chiefly of calcium hydroxide and iodoform. One year later these teeth, along with surrounding alveolar bone, were examined histopathologically following the patients' deaths. Of the six teeth treated with Calvital, four were instrumented prior to root canal obturation and two were not. The teeth that were instrumented prior to obturation showed good healing, while those that were not showed poor healing. The tooth treated with Vitapex was instrumented prior to obturation and showed good periapical healing and osteoid closure of the apical foramen. This finding suggests that canal instrumentation followed by obturation with Vitapex can allow favorable healing even in aged patients.

Introduction

Obtaining tissue specimens from humans in order to study periapical healing after root canal therapy is a significant problem. Animals, especially dogs, are usually used in periapical healing studies [1-5]. Most periapical healing studies that involve humans are radiographic in nature [5-12]. Histopathological studies that do involve humans are based on material obtained during endodontic periapical surgery [13, 14].

In this chapter, we present a case report using teeth treated with two different root canal filling materials along with surrounding alveolar bone obtained post-mortem and examined histopathologically. This especially important case was initially reported by Eda, et al. [15, 16].

The root canal filling materials used in this case report, Calvital and Vitapex, are made by Neo Dental Chemical Products Co., Ltd., and the ingredients are as follows: Calvital is a mixture of a powder containing calcium hydroxide (78.5%), iodoform (20.0%), guanofracin (0.1%) and sulfathiazole (1.4%), with a liquid containing T-cain (0.5%), polysolvate (30.0%) and distilled water (69.5%). Vitapex contains calcium hydroxide (30.3%), iodoform (40.4%), silicone oil (22.4%) and other substances (6.9%). A major difference between the two preparations is that the former is a water-based mixture while the later is oil-based.

Calvital case report

On August 27, 1970, a 78-year-old male was referred to the Department of Gerostomatology, Tokyo Metropolitan Geriatric Hospital, complaining of pain and bleeding near his upper front teeth. His medical history induced cardiac asthma idiopathic cardiac hypertrophy, cerebral thrombosis and gastric carcinoma.

Clinical diagnosis of the teeth revealed acute suppurative pulpitis of the right lateral incisor, as well as and canine and chronic apical periodontitis of the right central incisor, left central and lateral incisors and canine.

Local anesthesia was used for pulp extirpation only for the maxillary right lateral incisor and canine. Canal instrumentation of the maxillary right incisor and canine was performed during one appointment. Canal instrumentation of the maxillary left incisor and canine was performed during two appointments. The root canals of all six teeth were then filled with Calvital and the coronal access sealed with amalgam, and the patient never experienced any new symptoms. The radiopacity of the root canal filling gradually decreased during the time this patient was followed.

On November 16, 1972, 2 years and 3 months after the filling, the patient died of gastric carcinoma. All six teeth with alveolar bone were resected and fixed in 10% formalin. Radiographs of the specimens showed a small radiolucency at the apices of the right lateral incisor and canine, but no radiolucency appeared in the periapical regions of the other four teeth (Figure 1).

The material was demineralized and histopathologically examined through hematoxylin-eosin stained specimens. Histopathologically, the periapical tissues of the right canine consisted of granulation tissue with some suppurative inflammation, and that of the right lateral incisor had severe suppurative inflammation. Although neutrophilic leukocytes infiltrated into the periapical tissues of the right central incisor, and abscess membrane separated the lesion from other normal tissue. In the root canal of the left central incisor, a hard tissue was formed adjacent to the filling material, and a root canal polyp with proliferation of squamous cell epithelium and round cell infiltration appeared. However, other surrounding tissues were composed of fibrous connective tissues. The periapical lesion of the left lateral incisor consisted of granulation containing a slight infiltration of lymphocytes and plasma cells. The lesion of the left canine showed the best healing, and the apical foemen was completely closed by hard tissue (Figure 1, h).

Calvital is more necrogenic than Vitapex because of a higher alkalinity due to calcium hydroxide which is revealed only in water. In the Calvital cases, the periapical healing of the left three teeth was evaluated as good, while that of the right lateral incisor and canine was poor. These results might be interpreted to show that the latter two teeth, in which pulp-like tissue had been extirpated, were not suppurative pulpitis cases but root canal polyp, so these would

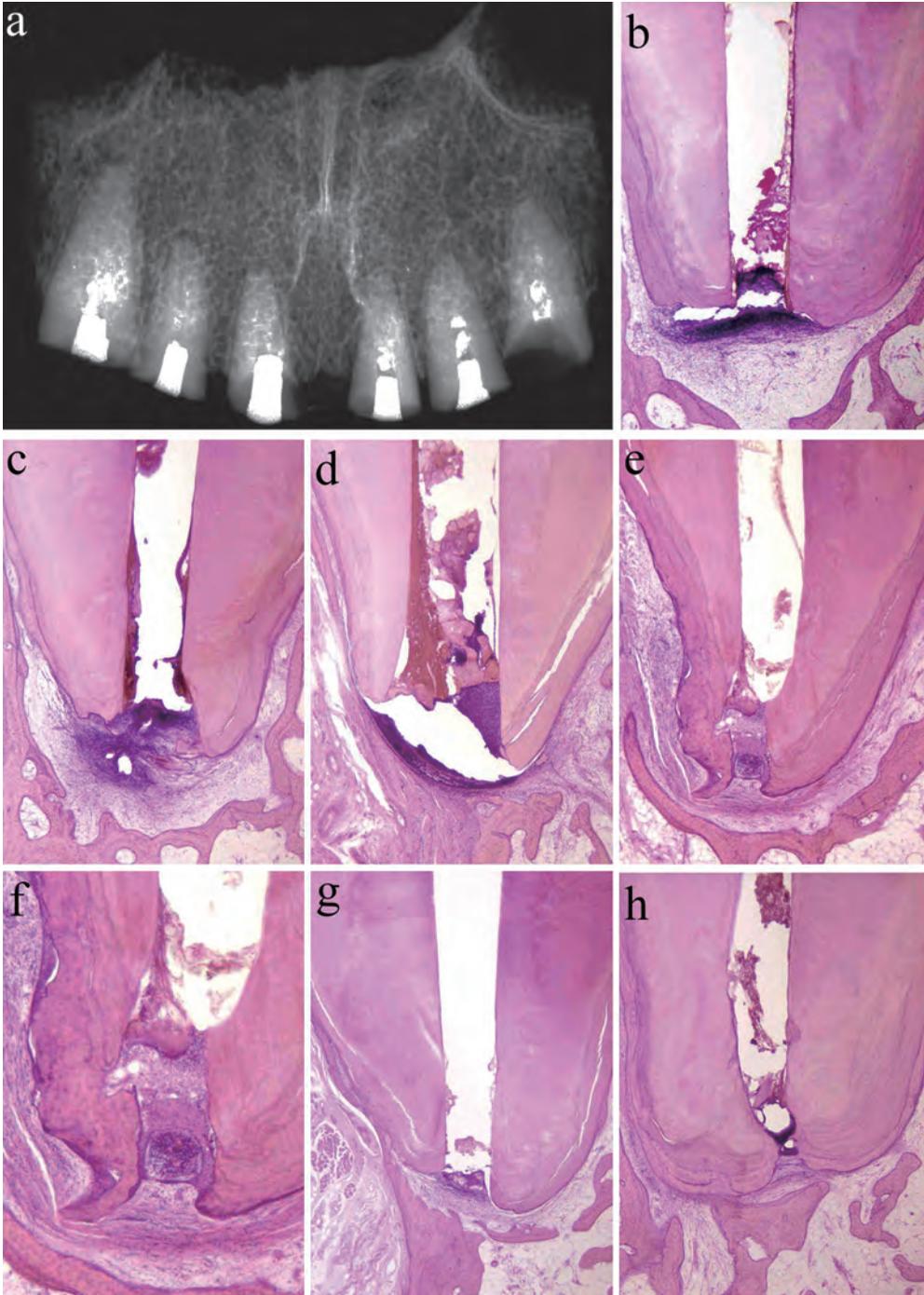


Figure 1 Soft X-ray photograph of six teeth resected with alveolar bone (a), Right canine root apex showing superficial suppurative inflammation (b), Right lateral incisor apex showing severe suppurative inflammation (c), Right central incisor, small alveolar abscess (d), Left central incisor, small root canal polyp (e), Enlarged view, osteoid tissue appearing in the root canal (arrow) along with proliferation of epithelium (f), Left lateral incisor, moderate suppurative inflammation (g), and Left canine, apical foramen closed by osteoid tissue (h).

have required root canal treatment.

Vitapex case report

On August 26, 1980, the extirpation of the upper left central incisor of an 82-year-old female patient was performed under local anesthesia, because of acute suppurative pulpitis, at the Department of Gerostomatology, Tokyo Metropolitan Geriatric Hospital (Figure 2). After root canal treatment, on October 13, the root canal was filled with Vitapex. The lateral incisor had a large periapical radiolucency, but was left untreated because it did not show any clinical manifestations and the general condition of the patient was too poor. On November 14, 1981, she lost consciousness due to a cardiac condition, disturbance of the central blood circulation, and she died on November 19.

Three teeth, including the treated tooth, together with Abelard bone, were resected and fixed in 10% formalin. A radiograph revealed that the filling material had resorbed from a small area in the apical region (Figure 2, d, arrow). The demineralized sections were stained with hematoxylin and eosin, van Gieson's and Schmorl's thioin picric acid stainings.

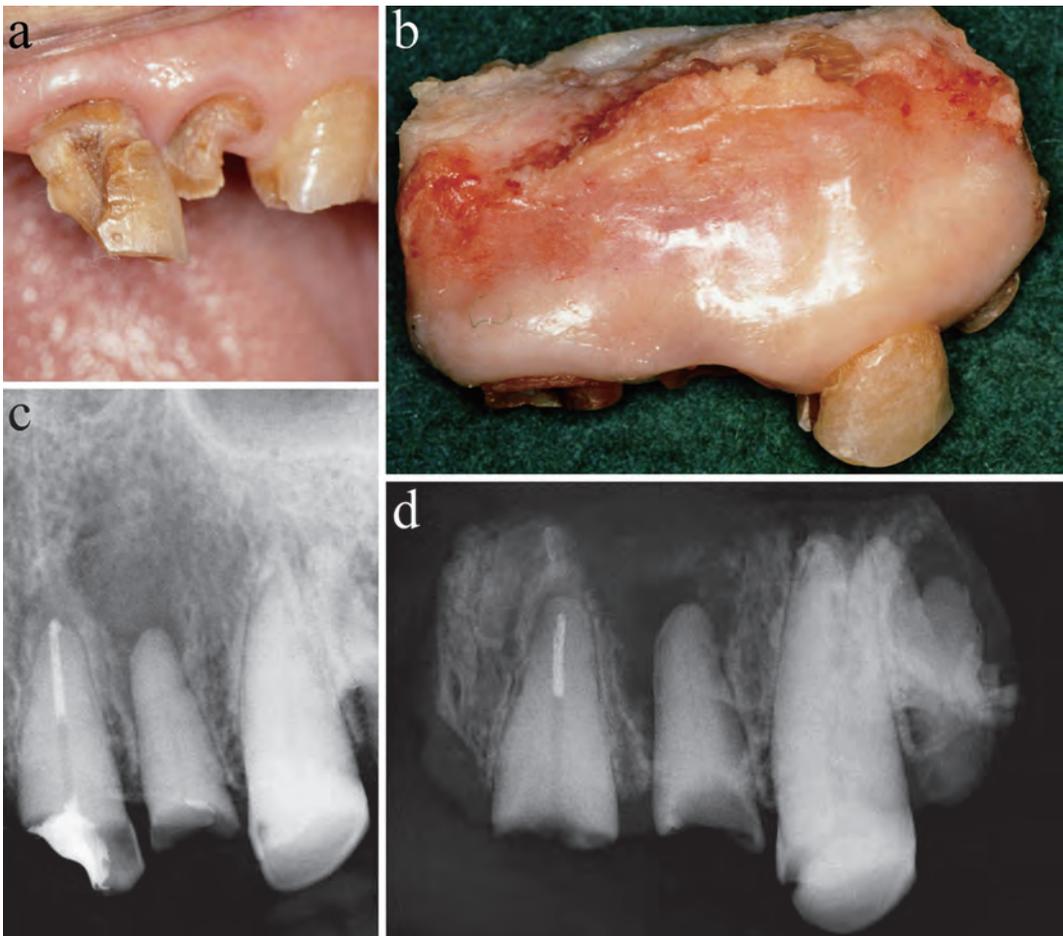


Figure 2 Intraoral photograph of left central incisor (a), Radiograph after filling (b), Resected material (c), and Radiograph of resected material showing a small amount of filling material has disappeared (arrow) from the apical region of the root canal (d).

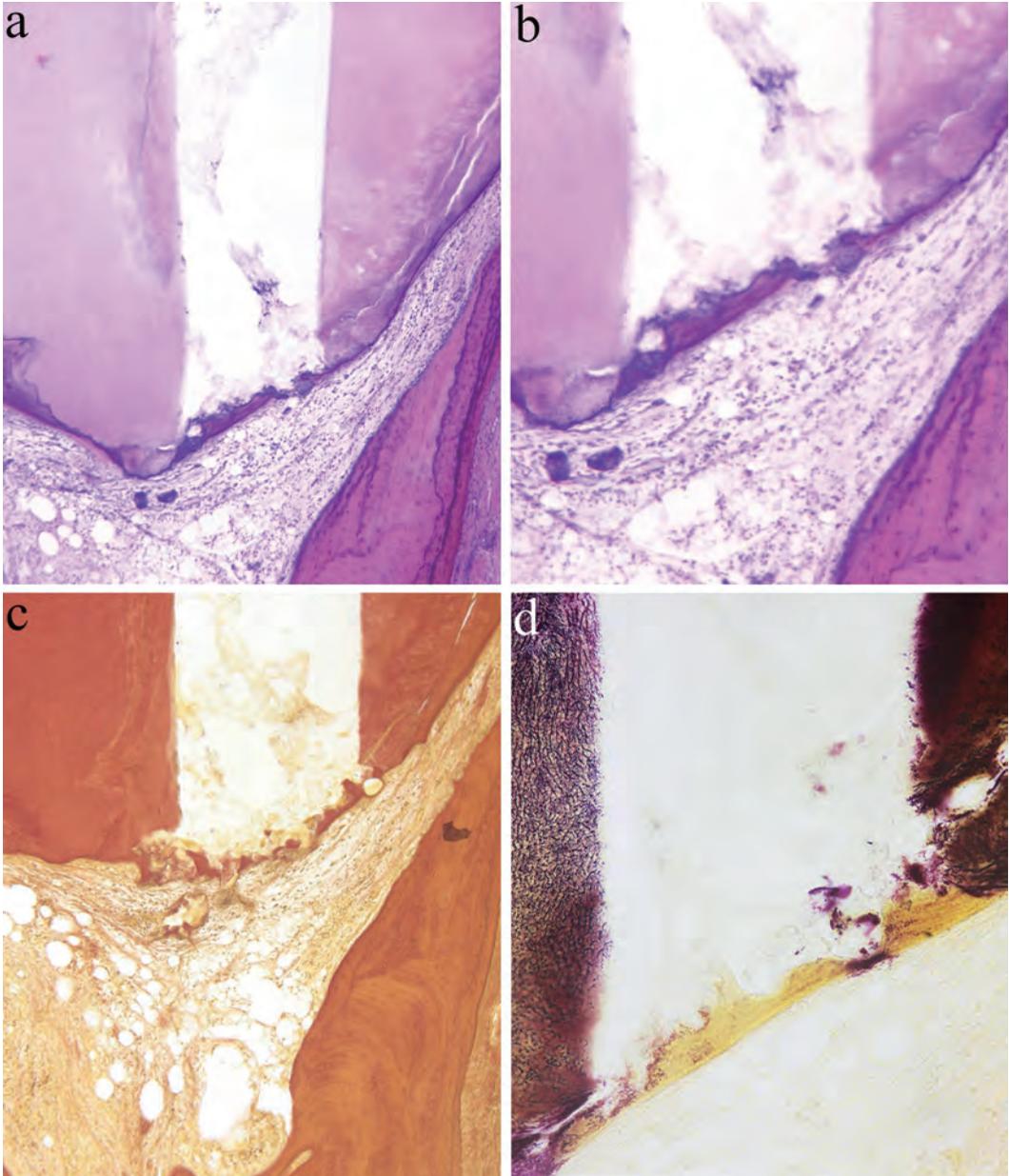


Figure 3 Apical foemen was closed by osteoid tissue (a: HE), Enlarged view, Osteoid tissue heavily stained with hematoxylin (b: HE), Osteoid tissue stained red with van Gieson's stain (c), and Canalliculi were seen in the osteoid tissue (arrow). Schmorl's staining (d).

Although slight resorption occurred at the apex of the central incisor, the apical foemen was completely closed by an osteoid tissue (Figure 3). This hard tissue stained red with van Gieson's stain (Figure 3, c), and was seen to contain bone canalliculi or cementum in the section stained with Schmorl's staining (Figure 3, d, arrow). An amorphous matrix was present inside the root canal.

In the Vitapex case, the apical foemen was closed by an osteoid tissue, which indicates

successful healing. It was very difficult to identify whether the hard tissue was bone or cementum. It may also be noticed that the patient was very old and became ill soon after treatment. Based upon the histopathological findings and her pathobiological condition, it is suggested that Vitapex could be an excellent root canal filling material and that cells in the periodontal ligament of such an aged patient still have a capacity for differentiation to osteoblasts or cementoblasts, as well as pulp cell differentiation to odontoblasts (14). The amorphous matrix remaining inside the root canal in the sections demonstrates that the filling materials, especially calcium hydroxide, existed before the sections were made and that filling material *in vivo* was caused only by dissipation of the radiopaque iodoform.

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