Accidental Injection of EDTA Instead of Anesthesia Solution during Root Canal Treatment: Case Report

SUMMARY

**Background/Aim:** Many irrigation solutions are used during root canal treatment. It is unacceptable to confuse irrigation solutions with anesthetic solution and inadvertently inject the patient. After such an error, local and systemic serious complications can be seen in the patient. The purpose of this case report is to show how careless use of ethylenediaminetetraacetic acid (EDTA) can result in important complications, and offer some treatment methods for curing symptoms resulting from such complications. **Case Report:** A 17% EDTA solution, was inadvertently injected in the buccal mucosa of a 20-year-old male during routine root canal treatment. Severe pain, bleeding and mucosal swelling occurred shortly after the injection. Irrigation with saline was performed by sliding the mucoperiosteal flap at the injection site. Then the flap was sutured primary. At the control one week later, there were no areas of necrosis in the patient, but ecchymosis occurred. Decalcified areas were not detected in dental volumetric tomography examination. **Conclusions:** The dentists must apply the precautions of EDTA irrigation solution during the root canal treatment and manage the treatment of this clinical complication.

**Key words:** Accident, Endodontics, Ethylenediaminetetraacetic Acid, Local Anesthesia, Surgery

**Introduction**

Successful endodontic treatment requires removal of vital and necrotic pulp residue, microorganisms, and microbial toxins from the root canal. Irrigation plays an important role in removing microorganisms from an infected root canal system. Many chemicals, including acids, chelation agents, proteolytic enzymes, alkaline solutions, and oxidizing agents, are used for irrigation in endodontics.

Chelates are stable complexes that form as a result of ring bonding of organic ions with metal ions. The most commonly used chelating solution is ethylenediaminetetraacetic acid (EDTA). EDTA is mainly produced from ethylene diamine, formaldehyde, and sodium cyanide. It reacts with calcium ions in dentin to form soluble calcium chelates. Its use in endodontics was proposed by Nygaard-Ostby in 1957, and today it is used in endodontic treatment to increase the effectiveness of chemomechanical processes, remove smear layers, and to increase disinfection and cleaning of dentin walls. It is also used in personal care products, food products, the textile industry, and in laboratories due to its anticoagulant effects.

This case report describes complications in a patient who was injected with EDTA instead of anesthetic solution. This case report is one of the first cases involving the accidental injection of EDTA.

**Case Report**

A 20-year-old male patient presented to a restorative dental treatment clinic due to widespread caries on his teeth. Due to perforations more than 2 mm in diameter
that occurred in the pulp during the process of caries removal, the tooth was temporarily closed and the patient was directed to the endodontics clinic.

Buccal anesthesia was performed using 17% EDTA solution after performing right inferior alveolar block anesthesia with a local anesthetic solution. The patient developed severe pain at the injection site, bleeding in the form of leakage, and mucosal swelling (Figures 1). Thus, inferior alveolar block and buccal anesthesia were performed, and saline was injected into the region where EDTA had been injected to reduce the effects of the EDTA solution.

To prevent possible irreversible decalcification in the mandibular bone by the EDTA solution, the dental and maxillofacial surgery department was contacted to plan flap operation in the affected region. For evaluation of serum levels of calcium before flap operation, whole blood was collected from the patient and sent for urgent evaluation.

A flap was removed from mandibular molar site and bone tissue was washed with saline to prevent possible local effects (Figure 2A). The flap was sutured in place (Figure 2B), and cold application was started. CBCT was performed to evaluate resorption of bone tissue on the day of the operation and 1 month later (Figure 3 A, B).

The patient was prescribed 600 mg ibuprofen twice a day and 500 mg acetaminophen twice daily to control pain and inflammation, plus 1000 mg amoxicillin/clavulanic acid twice daily for 1 week to prevent secondary infection. Cold application was applied on the first day, with warm application on the subsequent three days.

The patient underwent daily extraoral and intraoral examinations for 1 week. Follow-up examination performed after 1 week indicated that no complications had developed, no necrotic tissue had formed, swelling had subsided, and the patient had areas of ecchymosis in the oral mucosa (Figure 4). Follow-up examination performed after 1 month indicated that the patient had no complaints and the ecchymosis in the oral mucosa had resolved (Figure 5 A, B).
Figure 3 A. CBCT view showing on the day of the operation

Figure 3 B. CBCT view showing one month later

Figure 4. Ecchymosis region

Figure 5. (A, B) Extra oral view one month later, (C) Intra oral view one month later
Discussion

Problems that arise after improper treatment in dentistry are often related to endodontic treatments because they include various surgical procedures and the use of several chemicals and techniques. Endodontic procedure errors can include preoperative errors, root canal and pulp chamber perforation, irrigation solution accidents, and breakage of instruments. Due to increases in health burden and patient awareness, it is important for endodontists to be aware of the legal consequences of such complications.

The outflow of solution from the root canal system can lead to serious local and systemic complications. There are many case reports in the literature regarding complications that develop after apical extrusion of irrigation solutions. In addition, the colorless nature of these agents, the preparation of the irrigation solution before the anesthesia procedure with storage in similar places, and the use of injectors similar to those used for anesthesia can result in errors where the patient is injected with these solutions instead of the anesthetic solution.

Injecting the patient with the incorrect solution is an unacceptable error, which can cause permanent tissue damage, including damage to the alveolar bone, periodontium, nerves, and vascular tissue. There have been a number of case reports of complications after accidental injection of sodium hypochlorite (NaOCl), but only one previous case report regarding complications developing after accidental injection of EDTA solution.

Several groups have described the possible effects of EDTA outflow from a root canal system. EDTA is cytotoxic due to its chelating effects and the marked decrease in pH that it induces. Marins et al. reported that EDTA shows dose-dependent cytotoxicity. In addition, in Karkehabadi et al. among a number of agents tested, EDTA showed the greatest cytotoxicity on periodontal ligament cells. Chandrasekhar et al. compared subcutaneous tissue reactions, and found that EDTA caused a significant increase in the number of inflammatory cells at 48 h after exposure, which decreased on days 14 and 30. Segure et al. reported that the overflow of EDTA solution from the apical foramen not only causes irreversible decalcification of the periapical bone, but may also affect the mechanisms of immunological regulation.

In the present case, after accidental injection of 2 mL 17% EDTA solution, additional anesthesia was performed to relieve the severe pain in the patient. Saline was injected at the same site to reduce the EDTA concentration. A whole blood sample was taken from the patient and sent for immediate evaluation of serum levels of calcium. Flap operation was performed at the oral and maxillofacial surgery department, and washing with physiological saline was performed to prevent resorption of bone tissue. To prevent swelling after the operation, the patient was advised to apply cold on the first day and warm on subsequent days. CBCT was performed to evaluate resorption of bone tissue on the day of the operation and 1 week later. No decalcification was detected in the mandibular bone. The patient was monitored and the development of systemic findings was followed.

After injection of EDTA, Altan reported that an incision line was created to prevent swelling, and no further patient interventions were performed except for daily follow-up examinations. Necrosis developed later in that patient. In our case, since drainage could not be achieved, the flap was removed to from the relevant area and the area was washed with saline to prevent any complications that may occur in soft and hard tissue such as necrosis. Neither resorptive defects nor necrosis occurred because the patient was treated quickly. Only ecchymosis was seen in the mucosa, and this resolved after 1 week.

Conclusions

Irrigation agents should be made ready for use after anesthesia has been provided and the endodontic access cavity has been opened to prevent possible complications related to the accidental injection of irrigation agents into the tissue during endodontic treatment.

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