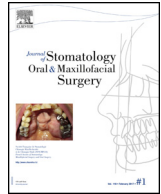




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## Case Report

# Accidental injection of ethylenediaminetetraacetic acid (EDTA) instead of an anaesthetic solution: a case report

A. Altan\*

Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Gaziosmanpaşa University, Tokat, Turkey

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## ABSTRACT

The accidental use of drugs is an unacceptable mistake in medicine, but the misuse of different agents has been reported frequently in the literature. While performing local anesthesia before starting dental treatment, the injection of a wrong agent, as a result of confusing the liquid in the syringe may cause local and systemic complications. Sudden swelling, intense pain, and severe allergic reactions may develop in the patient.

A complication causing soft tissue necrosis is presented in this case report in which Ethylenediaminetetraacetic acid (EDTA) was accidentally injected instead of an anesthetic solution. This case report is unique because it is the first to report an inadvertent injection of EDTA in dentistry.

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## 1. Introduction

Ethylenediaminetetraacetic acid (EDTA) is an effective chelation agent frequently used in endodontics. It is used to increase the efficiency of the biomechanical preparation and to ensure the elimination of the smear layer [1]. It includes four different acetyl groups attached to ethylene diamine. With alkaline earth ions and heavy metals, it forms metal chelates that are quite stable. In dentistry, it was first used by Nygaard-Østby in 1957 for the preparation of narrow and calcified root canals [2]. It is available in liquid and gel forms at concentrations of 15% and 17%. EDTA is currently produced from ethylenediamine (1,2-diaminoethane), formaldehyde (methanal), and sodium cyanide [2]. In addition, EDTA has different uses. EDTA salts are commonly used in personal products, topical drugs, and ophthalmic and otic solutions. However, it may cause allergic reactions, such as contact dermatitis [3]. EDTA salts are anticoagulants and are widely used in laboratory diagnostics. It also allows the preservation of cellular components and morphology of blood cells [4].

The accidental use of drugs is an unacceptable mistake in medicine, but the misuse of different agents has been reported frequently in the literature [5,6]. While performing local anesthesia before starting dental treatment, the injection of a wrong agent, as a result of confusing the liquid in the syringe may cause local

and systemic complications. Sudden swelling, intense pain, and severe allergic reactions may develop in the patient.

A complication causing soft tissue necrosis is presented in this case report in which EDTA was accidentally injected instead of an anesthetic solution. This case report is unique because it is the first to report an inadvertent injection of EDTA in dentistry.

## 2. Case report

A 51-year-old male patient attended an endodontist with a complaint of pain in the upper jaw. After the clinical and radiological examinations, the endodontist decided to apply a root canal treatment to the first left premolar tooth. Sudden pain, swelling (Fig. 1), and arrhythmia occurred following the infiltrative injection of what was thought to be the anesthetic into the vestibular mucosa. The endodontist realized that he inadvertently injected 15% EDTA instead of local anesthesia. He then made an incision on the vestibular mucosa because he was afraid of sudden swelling and knew the anticoagulant properties of EDTA. He administered 45 mg phenamine maleate (Avil) intravenously in response to the risk of an allergic reaction. The patient was then referred to the Department of Oral and Maxillofacial Surgery.

The patient was monitored until the arrhythmia improved and the bleeding in the oral mucosa stopped. In addition, amoxicillin/clavulanic acid (1 g) and diclofenac sodium (75 mg) were prescribed orally twice daily. The patient underwent daily examinations. One week later, necrotic tissues were observed in the vestibular mucosa that had previously been injected in the

\* Corresponding author at: Gaziosmanpaşa University, Faculty of Dentistry, Ali-Sevki EREK Yerleskesi, Tokat, Turkey.  
E-mail address: [dt.ahmetaltan@gmail.com](mailto:dt.ahmetaltan@gmail.com).



Fig. 1. Extraoral view of swelling.

patient (Fig. 2). Necrotic tissues were then debrided under local anesthesia (Fig. 3). The region was primarily closed with 3-0 silk. However, it was observed that the wounded region had opened 5 days later. A complete closure had not been achieved in the region and was subsequently sutured again and closed primarily. The wound region was left to secondary healing. An acceptable healing was observed after a 1-month control (Fig. 4).

### 3. Discussion

The correct use of drugs during dental treatments is highly important. In the dental literature, there are case reports related to the inadvertent injection of various solutions [5–7]. Sodium hypochlorite constitutes most of these cases [7,8]. To our knowledge, this case report is the first report of an accidental EDTA injection and its related complications.

For a successful endodontic treatment, the root canal system should be cleaned and disinfected. Various agents, such as sodium



Fig. 2. Clinical appearance of the necrotic tissue.



Fig. 3. Intraoperative view after debriding the necrotic tissue.



Fig. 4. Intraoral view 1 month after the accidental injection.

hypochlorite and EDTA are used for this purpose [9]. The use of these agents in an injector may cause them to be confused with anesthetic solutions. As a result of this confusion, the inadvertent injection of the solution into the soft tissues may cause serious complications. In the present case, sudden pain, swelling, and arrhythmia occurred after the EDTA injection. Furthermore, the patient still had a hard, palpable swelling after one month.

EDTA is commonly used in several industrial and medical applications, including dentistry. EDTA salts are used as a protective additive and stabilizer in foods, manufacturing, cosmetics, and medicines [10]. EDTA is an immunoreactive protein, and contact dermatitis cases associated with cosmetic, shampoo, sun cream, hair gel, moisturizers and contact lens solution have been reported. [10] Since the patient was injected with 2 mL of 15% EDTA, the patient was administered an antihistamine and kept under observation due to the possibility of developing allergic reactions.

Possible causes of an incorrect drug administration include storing solutions in similar containers, failure to control them carefully before being injected, working with inexperienced staff, and having an excess workload. After a cytotoxic agent is inadvertently administered, it is important that the patient is closely examined and monitored. The use of strong antiinflammatory drugs is also recommended [8]. Antibiotics should be started if there is clinical evidence of a wound infection or if there is necrosis [11]. Nygaard-Østby [12] reported that 15% EDTA is forced through the apical foramen into the periapical tissues; however, periapical tissue damage could not be detected in these cases. Lindemann et al.

[13] showed that EDTA was not capable of destroying collagen. Patterson et al. [14] investigated the tissue reaction in rats after an intramuscular injection of EDTA and EDTA plus Cetavlon (EDTAC). They reported that 15% EDTAC had much greater tissue irritation than 10% EDTA. In the current case, necrotic tissues were observed in the vestibular mucosa. We could not find any previous reports concerning an EDTA injection into human tissues. Since we expected necrosis in the patient, anti-inflammatory medications as well as antibiotics were started in the patient.

In conclusion, to avoid a wrong injection that may lead to serious complications during dental treatment, labelling the agents being used will create a safer environment for the physician and patient. The anesthetic solution should not be stored with other materials of similar appearance and color. The packaging of products may sometime be very confusing. Therefore, the production of clearly labelled solutions in the dental industry helps the dentist. When such a complication is encountered, it should be decided whether the surgical treatment of the injured tissue is necessary, and the patient's follow up and controls should not be neglected. Treating patients carefully is the best way to prevent medical accidents [15].

## References

- [1] Calt S, Serper A. Time-dependent effects of EDTA on dentin structures. *J Endod* 2002;28:17–9.
- [2] Hulsmann M, Heckendorff M, Lennon A. Chelating agents in root canal treatment: mode of action and indications for their use. *Int Endod J* 2003;36:810–30.
- [3] Pruitt C, Warshaw EM. Allergic contact dermatitis from ethylenediaminetetraacetic acid. *Dermatitis* 2010;21:121–2.
- [4] Banfi G, Salvagno GL, Lippi G. The role of ethylenediamine tetraacetic acid (EDTA) as in vitro anticoagulant for diagnostic purposes. *Clin Chem Lab Med* 2007;45:565–76.
- [5] Kilic E, Er N, Alkan A, Ferahbas A. Accidental benzalkonium chloride (zephiran) injection. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011;112:e103–5.
- [6] Swami PC, Raval R, Kaur M, Kaur J. Accidental intraoral injection of formalin during extraction: case report. *Br J Oral Maxillofac Surg* 2016;54:351–2.
- [7] Gursoy UK, Bostanci V, Kosger HH. Palatal mucosa necrosis because of accidental sodium hypochlorite injection instead of anaesthetic solution. *Int Endod J* 2006;39:157–61.
- [8] Motta MV, Chaves-Mendonca MA, Stirton CG, Cardozo HF. Accidental injection with sodium hypochlorite: report of a case. *Int Endod J* 2009;42:175–82.
- [9] Sayin TC, Serper A, Cehreli ZC, Otlu HG. The effect of EDTA, EGTA, EDTAC, and tetracycline-HCl with and without subsequent NaOCl treatment on the microhardness of root canal dentin. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007;104:418–24.
- [10] Russo PA, Banovic T, Wiese MD, Whyte AF, Smith WB. Systemic allergy to EDTA in local anesthetic and radiocontrast media. *J Allergy Clin Immunol Pract* 2014;2:225–9.
- [11] Hales JJ, Jackson CR, Everett AP, Moore SH. Treatment protocol for the management of a sodium hypochlorite accident during endodontic therapy. *Gen Dent* 2001;49:278–81.
- [12] Nygaard-Ostby B. Chelation in root canal therapy: ethylenediaminetetraacetic acid for cleansing and widening of root canals. *Odontol Tidskr* 1957;65:3–11.
- [13] Lindemann RA, Hume WR, Wolcott RB. Dentin permeability and pulpal response to EDTA. *J Prosthet Dent* 1985;53:341–3.
- [14] Patterson SS. In vivo and in vitro studies of the effect of the disodium salt of ethylenediamine tetra-acetate on human dentine and its endodontic implications. *Oral Surg Oral Med Oral Pathol* 1963;16:83–103.
- [15] Kim YK. Malpractice and complications. *J Korean Assoc Oral Maxillofac Surg* 2017;43:1–2.