

Allergy to sodium hypochlorite during root canal therapy: a case report

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Summary

Sodium hypochlorite (NaOCl), is the most popular irrigation solution used in root canal treatment but it is known to be an irritant to vital tissues. There have been many case reports dealing with toxic effects of this material. Although the allergic potential of NaOCl has been described in the medical literature, only one case of known hypersensitivity to NaOCl has been reported in the dental literature. In this paper a case is presented, describing both local and systemic adverse tissue reactions, caused by an allergic response, after NaOCl irrigation.

Keywords: allergy, root canal irrigation, sodium hypochlorite.

Introduction

Sodium hypochlorite has now become the most popular irrigation solution in endodontics, since Crane described the use of Dakin's solution, a 0.5% sodium hypochlorite (NaOCl) solution, in 1920. In modern endodontic practice, sodium hypochlorite continues its popularity because of its properties of tissue dissolution, lubrication and also its antibacterial properties (Grossman & Meiman 1941, Shih *et al.* 1970, Hand *et al.* 1978, Bloomfield & Miles 1979, Harrison & Hand 1980, Nakamura *et al.* 1985, Ingle & Taintor 1985). Another important advantage that makes the use of NaOCl justifiable is the absence of clinical toxicity when used with an appropriate irrigation technique (Harrison *et al.* 1978, Lamers *et al.* 1980). Effective concentrations of sodium hypochlorite range from 2.6 to 5.25% (Grossman 1981, Ingle & Taintor 1985). The dilution of NaOCl was suggested by Spanberg *et al.* (1973) who found that concentrations over 0.5% were cytotoxic. They recommended diluting the solution to a

1% concentration to keep its antibacterial property at the lowest toxic level. There are also other studies reporting the cytotoxicity of NaOCl on vital tissues, but these results are still controversial (Lamers *et al.* 1980, The *et al.* 1980, Koskinen *et al.* 1981, Pashley *et al.* 1985, Spanberg *et al.* 1988). Moreover, there are many case reports concerning the cytotoxic effects of sodium hypochlorite when accidentally injected beyond the confines of the tooth (Becker *et al.* 1974, Herrmann *et al.* 1979, Grob 1984, Reeh & Messer 1989, Sabala & Powell 1989). The short- and long-term consequences of these incidents have varied.

Although sodium hypochlorite is commonly used in endodontics, only one known case of hypersensitivity to NaOCl has been reported in the dental literature (Kaufman & Keila 1989). The following report describes a case of local and systemic tissue reactions following irrigation with NaOCl. An allergy test carried out later showed that the patient was hypersensitive to NaOCl.

Case report

A 32-year-old female was referred to the endodontic clinic at the School of Dentistry, Ege University. The patient's medical history was non-contributory. Her chief complaint was persistent pain in the area of the maxillary central incisor teeth. On clinical examination, the teeth had intact crowns that were extremely mobile. Radiographic examination revealed mid-root fractures on both the central incisors (Fig. 1). The patient stated that she had a traffic accident 18 years previously and there had been no other injuries to the dental hard tissues.

It was decided to perform a pulp extirpation and root canal treatment on both teeth. After local anaesthesia and rubber dam isolation, canal preparation was performed on the maxillary left central incisor with periodic irrigation using 1% sodium hypochlorite. The patient reacted immediately following the application of

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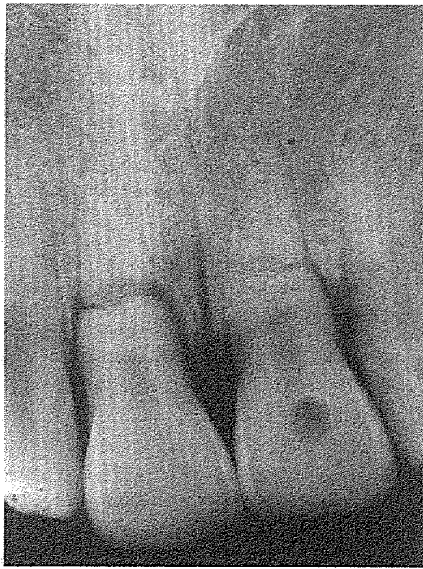


Fig. 1. The patient presented with mid-root fracture on the upper central incisors.

approximately 0.5 ml of sodium hypochlorite into the root canal. She appeared to be in extreme pain and described a burning sensation. Within a few seconds, her left cheek and upper lip become swollen. The swelling extended to the infraorbital area. There was a profuse haemorrhage from the root canal of the maxillary left central incisor. The mucous membrane of the left cheek and upper lip showed ecchymosis. The severe pain began to diminish after approximately 6 min, although the patient continued to have discomfort (Fig. 2).

The patient began to have difficulty in breathing, so she was taken to the intensive care unit of the medical hospital at Ege University. During emergency treatment, soluble corticosteroid, 4 mg dexamethasone was given intramuscularly and an antihistamine (chlorphenoksamin HCl) given intravenously. Penicillin was prescribed for possible secondary bacterial infection and ibuprofen was also administered for pain control. A cold wet compress was applied for about 6 h to the left side of the face in order to relieve the pain and burning sensation. Following this, the patient was advised to change from the cold compress to warm to improve local circulation. She was hospitalized overnight.

The patient was contacted by telephone and reviewed two days after the incident. She stated that the swelling had increased and she had loss of sensation on the left side of her nose and upper lip. The pain

had abated, however, except for discomfort from the distended swelling.

The swelling remained for 3 days following the NaOCl irrigation. There was diffuse ecchymosis on the left side of the face. She reported that the pain had diminished but she still had no sensation on the left side of the face.

A week after the NaOCl injection, the patient presented normal tissue contours and a slight discoloration due to hemosiderin staining. She continued to have a lack of sensation on the left side of her lip and nose but she no longer had any pain.

Ten days after the incident there was no paraesthesia on the left side of the face. Tissue contours and colour had returned to normal (Fig. 3).

Since the incisor teeth were asymptomatic, the root canals were prepared with periodic irrigation using 3% hydrogen peroxide and physiological saline solution, alternately, and medicated with calcium hydroxide (Merck, Darmstadt, Germany), mixed with distilled water. At the following appointment, the root canals were obturated with gutta-percha and root canal sealer (Calcibiotic Root Canal Sealer [CRCS] Hygenic Corp, Akron, OH, USA). However, the root canal of maxillary right central incisor could be obturated only in the coronal part of the root because of the presence of dislocation between the apical and the coronal parts. The endodontic therapy was uneventful. Sixty days after the root canal treatment, the incisor teeth were clinically asymptomatic and appeared normal radiographically (Fig. 4).

Although the seepage of NaOCl through the fracture line into the periodontal tissues might have caused the severe tissue reaction, because of its toxicity, it was suspected that the local and systemic adverse tissue reaction might have developed as a result of an allergic reaction to NaOCl. The patient was referred, therefore, to a specialist for allergy tests to NaOCl. After the effects of the corticosteroid and antihistamine were over, some 15 days after their administration, a skin scratch test was performed on the right arm of the patient.

The results of this test are normally read after 20 min but, in this case a positive reaction (++++) developed much more quickly, and erythema and oedema began to progress up the arm in a few minutes. A tourniquet was applied above the test area and an antihistamine (chlorphenoksamin HCl) was given intramuscularly to prevent the risk of anaphylactic shock. In addition, a corticosteroid cream was applied topically to prevent further erythema and oedema (Fig. 5).

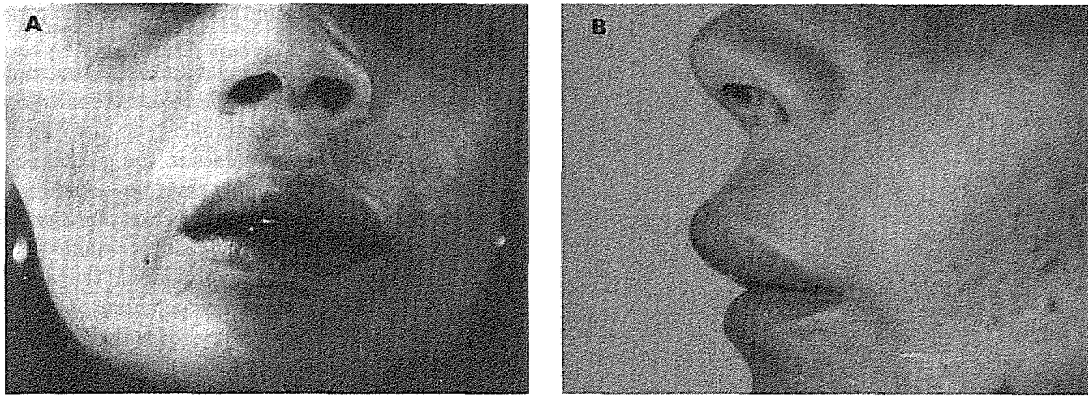


Fig. 2. Immediately after incident. Swelling of left side of upper lip and cheek. (A) the front view of the face, (B) profile of left side of the face.

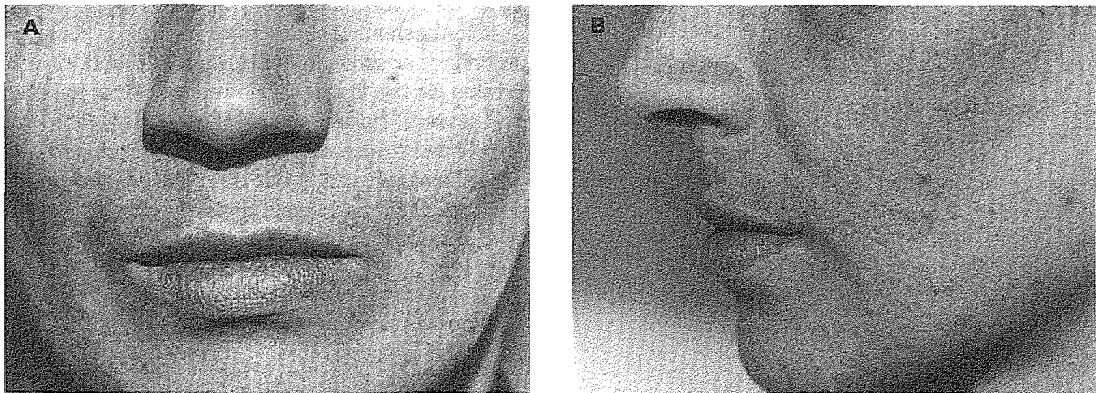


Fig. 3. Ten days after incident. Tissue contours had returned to normal. (A) the front view of the face, (B) profile of left side of the face.

Discussion

The toxic effects of NaOCl and its irritation potential on soft tissues have been described in various case reports. Authors who presented the cases of tissue reactions to NaOCl have referred only to the toxic and irritant effects, but not to its allergic potential (Becker *et al.* 1974, Herrmann *et al.* 1979, Grob 1984, Sabala & Powell 1989, Reeh & Messer 1989). Although the allergic potential of NaOCl is reported in the medical literature (Sulzberger 1940) only one reference in the endodontic literature warns of this possibility (Cohen & Burns 1984).

Contact urticaria may be defined as a wheal and flare reaction occurring when a substance is applied to the intact skin. This reaction may range from localized urticaria to a generalized form progressing to asthma. (Rook *et al.* 1987, Arnold *et al.* 1990). It should be kept

in mind, however, that persons who exhibit contact urticaria, which is chiefly vascular, may concomitantly have epidermal sensitization and eczema from the same allergen (Roitt *et al.* 1987).

NaOCl is known to cause irritation dermatitis. However, in the case reported, severe oedema developed after irrigation with the substance and generalized oedema, erythema, difficulty with breathing and hypotension followed. Corticosteroid and antihistamine were given to prevent an anaphylactic reaction and ameliorate these severe signs and symptoms. The presence of these clinical symptoms led to a diagnosis of contact urticaria.

A number of dermatological tests are available for determining the aetiology of allergic diseases. Generally six types of skin tests are carried out. These are scratch tests, intracutaneous tests, patch tests, passive transfer tests, provocative tests, and immunoassay tests. Among

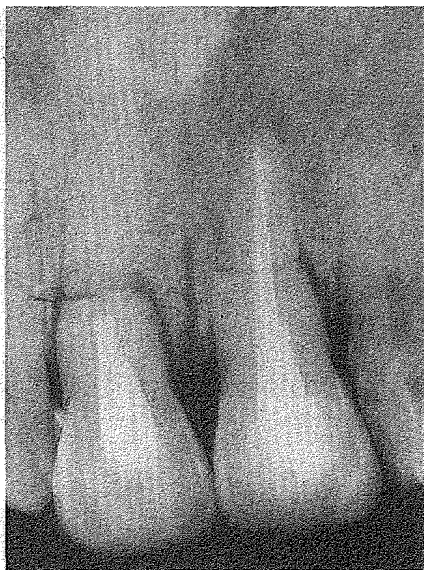


Fig. 4. Radiograph 60 days after the completion of the root canal therapy.

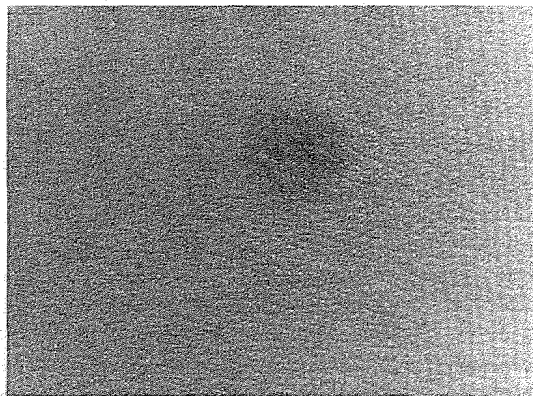


Fig. 5. Thirty minutes after skin scratch test. Erythema, oedema and a few vesicles are seen.

these, scratch tests are one of the most reliable tests because the risk of general tissue reaction is minimized (Roitt *et al.* 1987).

In this case, the patient did not inform us about her sensitivity to NaOCl as a household cleansing material, when her medical history was recorded. However, after the incident, she told us that when she had been using a household cleansing agent, she had developed a skin rash that had spread from her hands to her elbows and she had experienced breathing difficulties. As a result of these complaints, her physician had advised her to stop

using household cleansing agent but did not perform any allergy test.

In order to prevent a similar incident, the medical history of each patient should be recorded meticulously. If there is any suspicion about allergy to any substance like household cleansing materials, the patient should be referred to a specialist for tests. In addition, care should be taken to prevent the injection of irrigant into the soft tissue. Should an incident such as that described above occur, the dentist should remain calm, especially in cases with the potential for airway obstruction from angioneurotic oedema; the patient should be referred immediately to hospital. Excruciating pain which may be experienced by the patient in the first 5–6 min should be controlled with a local anaesthetic nerve block. Analgesics should be given in order to relieve the post-incident pain. A course of antibiotics should be prescribed as there is potential for secondary or spreading of existing infection. Cold compresses for the first 6 h followed by warm compresses, and mouth rinsing should be advised. The dentist should assist the patient in remaining calm and explain what has happened, what is anticipated, and reassure the patient that a normal appearance will be regained within a short time.

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