

# Unusual case of adverse reaction in the use of sodium hypochlorite during endodontic treatment: A case report

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Sodium hypochlorite (NaOCl) is currently used in the debridement and disinfection of the root canal system, supporting the mechanical procedures. Although it is considered a safe irrigant, the literature reports a few cases of adverse reaction caused by NaOCl: They range from injection through the apical foramen to air emphysema and allergic reactions as complications during endodontic treatment. The present report shows the possible severe clinical consequences of concentrated NaOCl extruding through the periapical tissues during root canal irrigation in a patient not allergic to NaOCl. (*Quintessence Int* 2008;39:180.e70–73)

**Key words:** endodontic irrigants, hemorrhage, irrigation complications, skin patch tests, sodium hypochlorite, toxicity

Root canal irrigation plays an important role in the debridement and disinfection of the root canal system and is an integral part of the root canal preparation procedures. Residual pulpal tissue, bacteria, and a smear layer may persist in the irregularities of canal systems if only mechanical therapy is used. These residues are known to be a major risk factor in the development of periapical lesions.<sup>1,2</sup>

Since 1920, when Crane proposed the use of Dakin solution (sodium hypochlorite

buffered with sodium bicarbonate), sodium hypochlorite (NaOCl) has been largely used to support the mechanical preparation of root canals, and it is still considered the most effective irrigant.<sup>3</sup> The rationale of NaOCl use is based on its dissolving and disinfecting capability, lubrication properties, and the safety of this substance, as demonstrated in several investigations.<sup>4,5</sup> The solution concentration varies from 0.5% to 5.25% and, after being warmed up to 50°C, is applied in the canals during and after mechanical preparation.<sup>6</sup>

Although NaOCl is widely used and usually considered safe, a few cases of adverse reactions during root canal irrigation have been reported in the dental literature. Although rarely, injection into the maxillary sinus or periapical tissues, splashing into the eyes, and hypersensitivity and allergic reactions do occur.<sup>1,7–9</sup> The authors describe a case of an unusual adverse reaction during endodontic treatment caused by the injection of NaOCl through a root canal into the periapical tissues.

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## CASE REPORT

A 32-year-old woman was referred to the Department of Odontostomatology and Surgery of the University of Bari for swelling in her right cheek. The patient reported that this lesion had developed rapidly 5 days earlier, during endodontic treatment of her maxillary right canine.

Associated symptoms were an acute pain attack in the right maxillary region and profuse bleeding from the root canal. Antibiotic and analgesic therapy had been prescribed, but, in the following days, the swelling increased, though the pain resolved nearly completely. Medical history was uneventful, except for a reported adverse reaction to NaOCl contained in some cleansers usually used for housework and a family history of vascular fragility. Extraoral examination revealed a light swelling of her right cheek and infraorbital region; diffuse ecchymoses were also visible near her right eye, cheek, upper lip, and neck. Intraoral examination revealed diffuse ecchymoses involving the mucosa of the upper lip and cheek (Figs 1a and 1b). Radiographic examination of the maxillary right canine showed no periapical lesions.

A pharmacologic therapy based on antihistamine (dichlorhydrate cetirizine, 10 mg per day) and corticosteroid (prednisone, 25 mg per day) was prescribed, and the patient was advised to use cold compresses to accelerate the normal resolution of the process.

A skin patch test with a gradual concentration of NaOCl solution was performed, and a direct allergy was excluded.

Two weeks later, all signs and symptoms resolved (Figs 2a and 2b). No pain caused by vertical or horizontal percussion was reported. Root canal treatment was performed without complication, using hydrogen peroxide as a root canal irrigant. Six months later, radiographic control showed no periapical lesion.

## DISCUSSION

Although different solutions have been proposed for chemical root canal irrigation,

NaOCl in several concentrations is widely used. This is mainly due to its peculiar characteristics: a strong dissolving action of the organic vital tissues, as well as necrotic soft tissues, of the pulp and predentin and a significant antiseptic effect due to the release of chloride active ions.<sup>1,6</sup> However, it has also been shown that NaOCl has toxic effects, such as hemolysis, skin ulceration, and necrosis, on vital tissues caused by its high pH (approximately 11 to 12), with oxidation of proteins.<sup>10</sup>

To our knowledge, very few complications in the use of NaOCl in endodontics have been recorded. The literature contains mainly single case reports of damage caused by NaOCl: They range from clothing stains to adverse reactions to the injection through the apical foramen; also, the patient's and operator's eyes can be injured by the splashing of the solution; air emphysema and allergic reactions to the irrigants are also described as complications during endodontic treatment.<sup>1,6-8</sup>

The first complication is surely the most common but also the least important; the others, on the contrary, deserve more attention.<sup>1</sup> Contact of NaOCl with the eyes causes immediate pain, intense burning, and loss of epithelial cells in the outer layer of the cornea. These lesions are usually reversible if an immediate ocular irrigation with sterile saline solution is performed, followed by an ophthalmologic checkup.<sup>9</sup>

The second most common complication is the accidental injection of NaOCl through the apical foramen in the surrounding tissues. In this case, the excellent tissue-dissolving capability will lead to tissue necrosis. Severe pain, hematoma, ecchymosis, hemorrhage, burning sensation, edema, trismus, and hypo- or hyperesthesia are the symptoms more frequently reported by patients.<sup>8</sup>

Allergic reaction was first reported by Kaufman and Keila in 1989.<sup>11</sup> Nowadays, very few studies have been conducted to establish the possible reaction to NaOCl during endodontic treatments. A skin patch test before therapy may be useful in determining the possibility of this event when an allergic reaction has been reported in the patient's medical history.<sup>11</sup> Further accidents may



**Figs 1a and 1b** Initial clinical appearance of the patient. A light swelling of the right cheek and diffuse ecchymosis of same side of the face are clearly visible.



**Figs 2a and 2b** Clinical appearance of the patient 2 weeks later. Resolution of the ecchymosis was observed.

occur if the root canal is dried by using compressed air, which may be forced throughout the periapical tissues. The main symptom is a crepitus of the neoformed swelling.<sup>1</sup>

In the present case, the patient was not allergic to the NaOCl, as revealed by the skin patch test; the decision to change the irrigant solution was made because of the adamant refusal of the patient to use the same solution that had caused the first adverse reaction. Clinically, the diffuse involvement of the oral mucosa and skin and the strong symptomatology were not related to the presence of radiographic lesions.

When adverse reactions occur, correct management includes the change of the irrigant solution to prevent additional reactions and to calm the patient, an adequate analgesia, prophylactic antibiotic therapy to prevent infections resulting from the damage,

and light corticosteroid and antihistamine therapy in selected cases. For the immediate relief of pain, a nerve block with a local anesthetic should be considered. Cold compresses should be used to minimize swelling and improve circulation to the affected area.

## CONCLUSION

This report demonstrates that sodium hypochlorite might cause severe complication during routine endodontic treatments when inadvertently injected through periapical tissues. According to Becking, to avoid adverse reactions, several measures should be carried out, such as using rubber dam, avoiding wedging the needle syringe or employing excessive pressure during

intracanal injection, and defining a precise definition of endodontic working length.<sup>6</sup>

The use of lower concentrations of NaOCl or other irrigants, such as hydrogen peroxide solution, chlorhexidine gluconate, electrochemically activated water, or a combination of 2 solutions to reduce the NaOCl concentration, may be effective and the safest alternatives.<sup>2,4</sup>

## REFERENCES

1. Hulsmann M, Hahn W. Complication during root canal irrigation: Literature review and case report. *Int Endod J* 2000;33:186–193.
2. Gernhardt CR, Eppendorf K, Kozlowski A, Brandt M. Toxicity of concentrated sodium hypochlorite used as an endodontic irrigant. *Int Endod J* 2004;37:277–280.
3. Crane AB. *Practicable Root Canal Technique*, ed 1. Philadelphia: Lea & Febiger, 1920:69.
4. Jeanson MJ, White RR. A comparison of 2.0% chlorhexidine gluconate and 5.25% sodium hypochlorite as antimicrobial endodontic irrigants. *J Endod* 1990;16:235–237.
5. Heling I, Chandler NP. Antimicrobial effect of irrigant combinations within dentinal tubules. *Int Endod J* 1998;31:8–14.
6. Becking AG. Complication in the use of sodium hypochlorite during endodontic treatment: Report of three cases. *Oral Surg Oral Med Oral Pathol* 1991;71:346–348.
7. Kavanagh CP, Taylor J. Inadvertent injection of sodium hypochlorite into the maxillary sinus. *Br Dent J* 1998;185:336–337.
8. Becker GL, Cohen S, Borer R. The sequelae of accidentally injecting sodium hypochlorite beyond the root apex. Report of a case. *Oral Surg Oral Med Oral Pathol* 1974;38:633–638.
9. Ingram TA. Response of the human eye to accidental exposure to sodium hypochlorite. *J Endod* 1990;16:235–237.
10. Pashley EL, Birdsong NL, Bowman K, Pashley DH. Cytotoxic effects of NaOCl on vital tissue. *J Endod* 1985;11:525–528.
11. Kaufman AY, Keila S. Hypersensitivity to sodium hypochlorite. *J Endod* 1989;15:224–226.

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