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## Case Report

# Management of irrigation procedural errors: A case report

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### ABSTRACT

Sodium hypochlorite is the most widely used irrigant in endodontics because of its tissue dissolving ability and effective antimicrobial action. However, extrusion of sodium hypochlorite from the root canal system may lead to severe cytotoxic effects, regardless of the concentration used. This case report entails the management of inadvertent extrusion of sodium hypochlorite.

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## 1. Introduction

Success of root canal treatment depends upon effective debridement and disinfection of root canal space. Literature reports that mechanical instrumentation alone is not sufficient to completely debride the root canal space.<sup>1</sup> To overcome that, irrigants are used as an adjunct to mechanical instrumentation for effective disinfection of the root canal system. Sodium hypochlorite (NaOCl) is a most popular disinfectant since World War I and has become the most widely used irrigation solution in Endodontics.<sup>2</sup>

Sodium hypochlorite has an alkaline pH which ranges from 10-12 which primarily acts by the oxidation of proteins. It also possesses high antimicrobial and proteolytic activity and has the ability to dissolve necrotic tissues as well as the organic part of the smear layer.<sup>3-5</sup> It is available in different concentrations ranging from 0.5 to 6%. However, there is no consensus on the appropriate concentration of Sodium hypochlorite for disinfection. Although, the literature recommends to use it from 2.5% to 5.25% for effective disinfection of root canal space but with extreme cautions as, at high concentrations it

has been shown that sodium hypochlorite has toxic effects on vital tissues, resulting in complications like hemolysis, ulceration, inhibition of neutrophil migration, damage to endothelial and fibroblast cells, facial nerve weakness, and necrosis.<sup>6,7</sup>

## 2. Case Presentation

A 35 year old female patient reported to the department of Conservative Dentistry and Endodontics with the chief complaint of pain in lower left back tooth region since last ten days. History of present illness revealed that the patient was having dull, throbbing pain which was continuous in nature and the pain aggravated while lying down. There was a history of restoration five years back in the same tooth. Medical history was non-contributory. Clinical examination revealed amalgam restoration on left mandibular 1<sup>st</sup> molar which was tender on percussion. The periodontal probing and tooth mobility was found to be within normal limits. Tooth was hyper responsive to both cold (Endo-Frost, Coltene, Germany) and electric pulp test (Digitest II, Parkel) as compare to contra lateral tooth. Radiographic examination revealed periapical rarefaction in mesial root with widening of lamina dura (Figure 1a). A

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diagnosis of symptomatic irreversible pulpitis with primary acute apical periodontitis in relation to tooth number 36 was made based on clinical and radiographic findings.

Non-surgical endodontic treatment was proposed after obtaining informed consent from the patient. Tooth was anesthetized using 2% lignocaine hydrochloride with epinephrine 1:80,000 (ICPA Health Products Ltd, Ankleshwar, India), and access cavity was prepared under rubber dam isolation followed by achieving the glide path using # No10 and 15 K files. Working length was determined by electronic apex locator (Woodpecker) and verified radiographically (Figure 1b). Intermittent irrigation with unbuffered 5.25% Sodium hypochlorite (Prevest Denpro Ltd, India) and normal saline was done using 27G side vented needle during chemo mechanical preparation. Root canal preparation was done using Protaper gold files (Dentsply Sirona, USA), up to size F2 using crown down technique. While irrigating the canal for final rinse using NaOCl, patient complained of sudden severe burning pain radiating down to the submandibular region. Based on the symptoms, NaOCl extrusion accident was suspected. Further irrigation with NaOCl was stopped immediately followed by aspiration of residual NaOCl and copious irrigation with saline was done to dilute the toxic effects of NaOCl. A calcium hydroxide dressing was placed into the root canal as intracanal medicament followed by temporary restoration.

Patient was prescribed an antibiotic (Amoxicillin Clavulanic acid 625 mg, Thrice daily), analgesic (Ibuprofen 800 mg, Thrice daily), Pan-D OD (Pantoprazole gastro resistant and Domperidone prolonged release) and Chymoral Forte BD (Trypsin- Chymotrypsin) for five days and recalled after 24 hours. On the following day, the patient reported with severe pain and swelling extending from left lower eyelid to lower border of the mandible (Figure 1c). On clinical examination, there was sign of intraoral ecchymosis, gingival necrosis with mildly erythematous border (Figure 1d) and vestibular tenderness with bleeding from the canal in relation to tooth number 36. To reduce the swelling and pain, cold compress was advised for initial 24 hours followed by warm mouth rinse for 4-5 times in a day for at least 15 days. After one week there was significant reduction in ecchymosis, redness and vestibular tenderness in the gingival tissue surrounding the tooth (Figure 1e) and by the 15th day swelling completely subsided with no bleeding, pain, or ecchymosis intraorally (Figure 1f,g). On the 21<sup>st</sup> day, root canal was obturated by lateral compaction technique using AH plus sealer (Figure 1h,i) and patient was kept on follow-up (Figure 1 j).

### 3. Discussion

Sodium hypochlorite is the most widely used endodontic irrigant worldwide because it is the only irrigant capable of dissolving organic tissue within the root canal system.<sup>8,9</sup>

Although, sodium hypochlorite is regarded as safe for endodontic use with different methods of irrigation. In spite of that, accident may happen resulting in severe complications. It is imperative that clinicians are aware and skilled, to diagnose and deal immediately and effectively with any repercussions of a NaOCl accident.

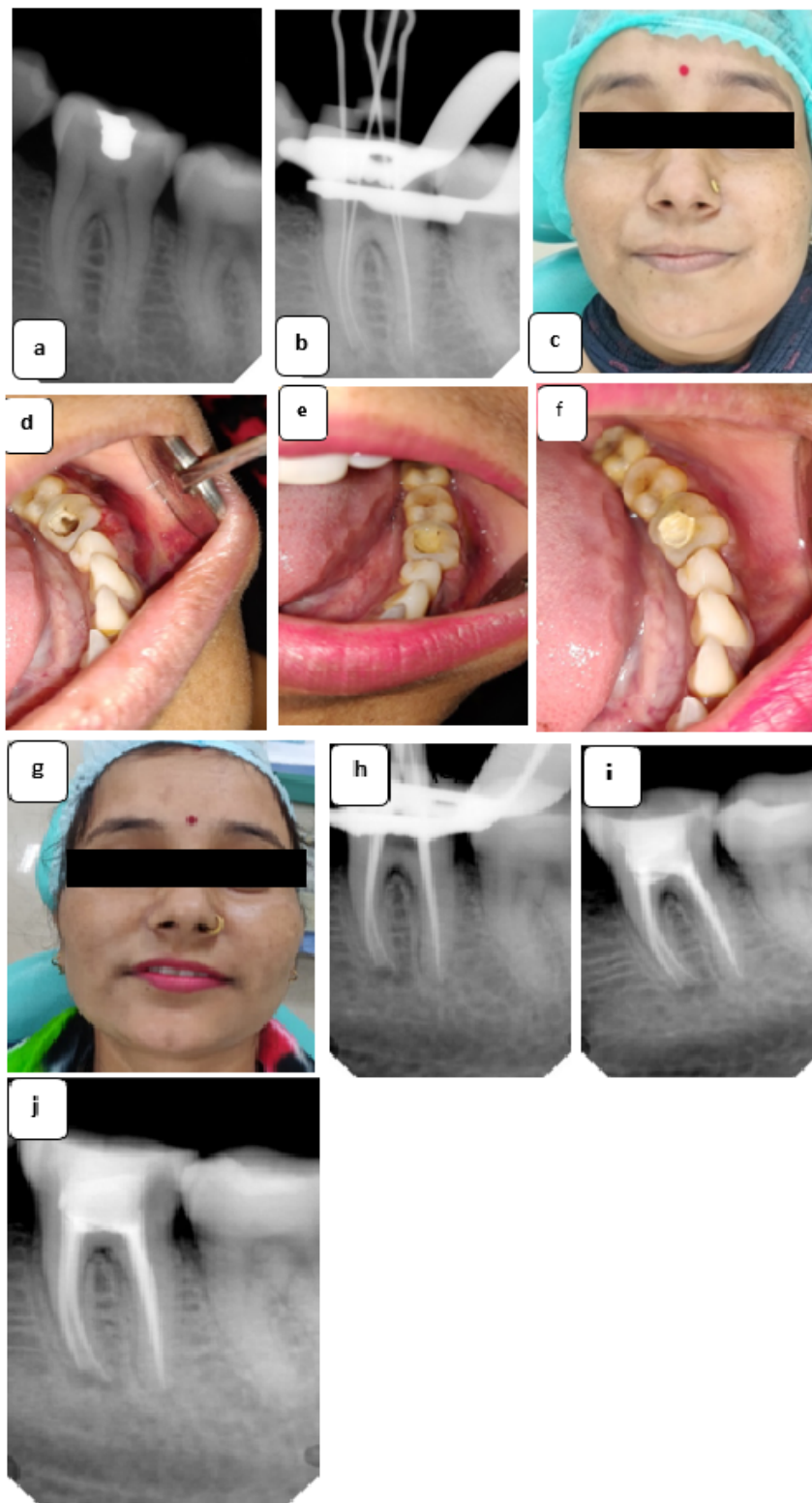
Inadvertent extrusion of sodium hypochlorite beyond the apical foramen is rare and is infrequently reported in the literature.<sup>8</sup> This complication normally occurs in teeth with wide apical foramina or when the apical constriction is destroyed during root canal preparation or by resorption. In addition, extreme pressure during irrigation may result in contact of large volumes of the irrigant with the apical tissues. In this case, extreme pressure during irrigation with binding of needle into the canal by a postgraduate resident had led to the extrusion of NaOCl into the periapical tissue. To prevent this, use of side vented needle at least 2mm short of working length is recommended along with passive and low pressure delivery of irrigant.<sup>8,10</sup>

The literature contains several case reports on complication during root canal irrigation including inadvertent extrusion of sodium hypochlorite, air emphysema and allergic reaction to solutions. It has been observed that these accidents are more common in buccal and infraorbital region as the apex of teeth lying in these areas may sometimes fenestrate the overlying alveolar bone naturally. They are also observed more in maxilla than mandible as the roots of maxillary teeth are lie in close proximity to the labial bone surface. Females are more frequently affected than males because of thin and less denser bone.<sup>8</sup>

The most common clinical manifestations following a NaOCl accident are pain, ecchymosis, swelling, chemical burns and necrosis, ulceration, neurologic damage (paraesthesia and anaesthesia) and in severe injury it may cause respiratory compromise.<sup>10,11</sup> Although multiple factors are responsible for the progression of these clinical sequelae, the volume of NaOCl extruded into the tissue and the reaction time to recognize and institute the palliative treatment has perhaps the most critical influence.<sup>11,12</sup>

Pain was reported in this case within seconds of accident is a immediate sign of tissue injury. However, swelling of the surrounding mucosa, subcutaneous tissue and skin was observed a few hours later. This inflammatory response originates from the reaction of hypochlorite ions with proteins and lipids resulting in soluble soap complexes that facilitate the permeation of the ion deeper into the tissue.<sup>3,13</sup>

Protocol for management of sodium hypochlorite accident depends upon the degree of tissue damage and type of tissue involved. During management, further spreading of sodium hypochlorite solution into the tissues should be interrupted by aspirating all possible sodium hypochlorite from the site of entry followed by copious irrigation with saline to reduce the tissue damage by dilution of irrigant.<sup>5</sup>



**Fig. 1:** **a:** Pre op radiograph; **b:** Working length radiograph; **c:** Extraoral photograph 24 hours after hypochlorite accident; **d:** Intraoral photograph 24 hours after accident; **e:** Intraoral photograph 01 week after accident; **f:** Intraoral photograph 15 days after accident; **g:** Extraoral photograph 15 days after accident; **h:** Master cone; **i:** Post obturation radiograph; **j:** 01 month follow up radiograph

During initial hours of extrusion, cold compressions may be helpful in preventing the further swelling and after 24 hours, hot packs may be beneficial in increasing the circulation. The Wits Oral Health Centre follows a specific set of guidelines developed for the management of Sodium hypochlorite accidents. These guidelines emphasise the uniqueness of each case and that intervention or treatment decisions are made on a case-to-case basis that relies on additional empirical input. The follow-up period varies based on the specific signs and symptoms that present in each patient during the course of the incident.<sup>5,14</sup>

#### 4. Conclusion

Sodium hypochlorite remains the irrigant of choice for endodontic treatment due to its ability to dissolve organic tissue and antimicrobial activity. However, the cytotoxicity of the solution requires caution during clinical procedures. It is imperative that general dentist and clinicians should be aware of protocol required for timely diagnosis and management of sodium hypochlorite accident.

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#### 6. Conflicts of interest

There are no conflicts of interest.

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