



## Management of an Endodontic Mishap during an Endodontic Retreatment of Lower Anterior Teeth and Performing Mindful Endodontics - A Case Report

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### Abstract

Failure in endodontics may occur due to vast and various reasons encompassing under/over filled canals, ledges, perforations, separated instruments and missed canals. We report a case of a Sodium Hypochlorite (NaOCl) accident during an endodontic retreatment in mandibular central incisors. NaOCl accidents are rare and irreversible in nature and there's yet a discrete medication to treat them, therefore management strategies target limiting the harm and preventing further complications. This case report discloses various etiological factors responsible for NaOCl accidents and their management in clinical practice.

**Keywords:** Sodium hypochlorite accidents; Endodontic mishaps; Endodontic irrigant; Endodontic retreatment

### Introduction

Sodium Hypochlorite (NaOCl) is a water-soluble chemical compound used in dentistry specifically in Endodontics for disinfection and/or bleaching. It has an alkaline pH and used in concentrations of 0.5% to 5.25% [1,2]. The majority of lower incisors have a single canal and only 36% of them possess two canals, therefore missing a canal while preparation is a probable event as it's totally dependent upon the clinician's skills and knowledge [1,3].

Efficient chemo-mechanical debridement and disinfection of the root canal system are the chief cornerstones for the success of the endodontic treatment. NaOCl till date remains the gold standard irrigant to be used in endodontic therapy. Despite the favorable features of NaOCl, it's recommended to be used with extreme caution due to the caustic effect it has on soft tissues [1].

Seepage of the NaOCl into the oral mucosa and periradicular area can occur directly (spillage of NaOCl directly on the soft tissues), or indirectly (extravasation through the apical foramen during irrigation) causing injuries known as "Sodium hypochlorite accidents" and thus compromising the treatment's functional and aesthetic outcomes. Till date, there is no definitive treatment for NaOCl accidents, however present treatment modalities focus more on decreasing symptoms, limiting the progression, and preventing secondary infection [4-6].

### Case Presentation

A 27-year-old healthy female presented to the clinic complaining of "throbbing pain and tenderness upon biting in her lower front teeth". Clinically, the lower anterior teeth were tender to percussion. The Periapical Radiograph (PA) revealed previous root canal treatment on FDI teeth 31, 32, 41, 42 (Figure 1A, 1B). The root canals were done one year back in Egypt. Discomfort was present ever since the treatment was done but started to increase in the past month, till it escalated to its peak few days back. Pain was not relieved by analgesics. Periapical radiolucency was noted in association with both mandibular central incisors, with extrusion of Gutta-Percha (GP)/sealer in 31 and 41. No abnormalities were detected intra or extra orally.

After investigations, provisional diagnosis was established as Symptomatic Apical Periodontitis (SAP). Non-surgical retreatment was proposed, and the patient was made aware of the surgical approach in case the non-surgical one did not manifest favorable outcomes. However, the patient was informed that the periapically extruded gutta-percha might break during the attempt of removal. Agreement was reached and treatment commenced.

### OPEN ACCESS

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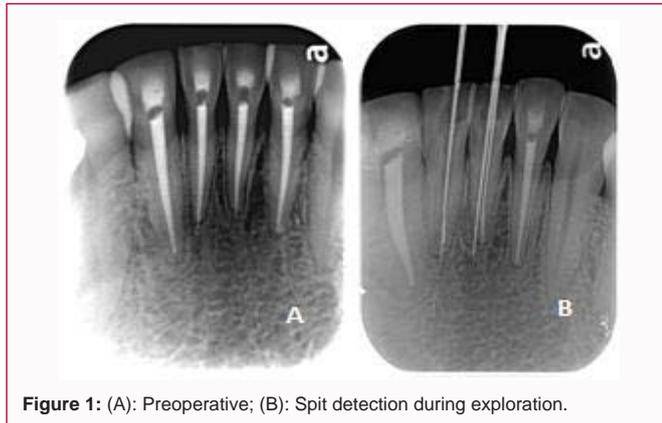


Figure 1: (A): Preoperative; (B): Spit detection during exploration.



Figure 2(A-C): During the first two weeks. (D) Soft tissue after healing.

Retreatment was initiated in 31 and 41 under Dental Operating Microscope (DOM), local anesthesia and rubber-dam isolation. GP was completely removed using rotary retreatment files and 2.5% NaOCl in a side vented needle was intermittently used for thorough irrigation. Non-setting calcium hydroxide was used as an intra-canal medicament and non-eugenol temporary filling was placed. As soon as the patient reached home, she felt sever tingling sensation in her lower jaw. She was recalled the next day to the clinic, and upon intra-oral investigation the lower labial vestibule seemed blanched and tearing of vestibular mucosa could be seen (Figure 2A). Patient was reassured and canals were immediately re-opened and generously rinsed with normal saline as contemplation of NaOCl accident was reached. Retreatment was discontinued to attend to the accident and alleviate its symptoms. Analgesics and antibiotics prescribed along with advising the patient to apply cold and warm extra-oral compressions targeting the affected site.

Recalls were done every 24 h for a week to re-examine and perform saline irrigation. Clinical signs of soft tissue damage increased during the recalls (Figures 2B, 2C). The patient was advised to avoid spicy food and to keep the area clean using mouth rinses and soft brushing, along with the medications that would help in healing the lesion. Third week recall showed healing of the soft tissues (Figure 2D).

## MINDFUL ENDODONTICS

**ANATOMY AND WORKING LENGTH**

Proper knowledge of root anatomy and accurate working length determination using electronic apex locator (EAL) to detect canal terminus.

**MAGNIFICATION**

Use of Endodontic loupes and microscopes enhance visualization and therefore better inspection of the root canals.

**IRRIGATION NEEDLES**

Side vented four locked irrigation needles are advised to avoid excessive and accidental irrigant extrusion.

**IRRIGATION SOLUTION**

Use of no more than the recommended concentration % of the irrigation solution to prevent apical tissue injury.

MINDFUL ENDODONTICS TO PREVENT  
IRRIGANT RELATED MISHAPS.  
BY DR. OLA ELSHEIKH

Figure 3: Basic steps to follow Mindful Endodontics.

Once the patient became asymptomatic, retreatment was commenced. During exploration of the canals an apical split was detected in tooth 41. The apical split was confirmed under magnification as well as on radiograph (Figure 1B). Working length was determined using an Electronic Apex Locator (EAL) and completion of the treatment under local anesthesia and rubber-dam isolation was done. Tooth 31 had 1 mm extruded GP, the patient was informed about the risk of GP separation and further apical expulsion of the separated piece. Obturation was eventually done once the symptoms were eased.

Informed consent for publication was obtained from the patient.

### Discussion

Persistence of symptoms after primary root canal therapy is an indicator of failure. Missed or partially debrided canals are a common cause of failure that occur due to improper access or inadequate visualization. Therefore, clear knowledge and understanding of the anatomy and its aberrant variation is an integral prerequisite to endodontic treatment to avoid mishaps and maximize treatment outcomes, as the presence of an extra canal differs between populations [7]. Studies were done to examine the various types of root canal systems using different methods such as radiographic examination, root sectioning, staining, and clearing methods. 36%

**Table 1:** NaOCl accident symptoms and severity.

Symptoms	Severity		
	Mild	Moderate	Severe
Visual pain score	0-3	44351	7+
Swelling	<30%	30%-50%	>50%
Ecchymosis	Localized	Localized	Diffuse
Ulceration	-	-	Intraoral ulceration
Necrosis	-	-	Intraoral necrosis
Airway obstruction	-	-	Present
Referral	General Dentist/ Endodontist	OMFS	OMFS

to 26% of lower incisors are thought to have two canals with type II being more prevalent according to Vertucci-1987/2005 [8,9].

Chemical irrigation is critical to flush out and eradicate microbes during endodontic therapy. The root canal system accommodates variety of microbes; each differing as per the stage of the disease. They exist in a planktonic form or in a self-developed matrix attached to the root canal walls [8]. One of the most widely used chemical irrigants in endodontic therapy is Sodium Hypochlorite (NaOCl) for its favorable properties and superior performance. Using it in concentrations of 0.5% to 5.25% has promising features such as tissue dissolving properties, antibacterial action, and disinfection, bleaching and cost effectiveness [8-11]. Although in re-treatment cases 2% chlorohexidine is the irrigant of choice [12], but in this case NaOCl was used for its tissue dissolving property that was needed for the undetected canal.

Despite the desirable features of NaOCl, accidental injection into the apical tissues can promote dangerous consequences in the form of Sodium Hypochlorite accidents as in this case. These accidents generally occur due to: Either using inappropriate forces during irrigation or over-instrumentation that leads to the widening of the apical constriction and hence extravasation of the chemical irrigant. In this case the cause of the accident is thought to be due to over-instrumentation of the apical foramen, consequently allowing hypochlorite to invade the apical tissues as soon as the re-treatment was initiated. The range of severity of the accident depends on intra and extra oral findings and can be classified into mild, moderate, and severe (Table 1).

Pain is usually a common symptom; therefore using a visual scale helps in translating pain into a quantitative score and thus establishes the severity. Clinical presentation of hypochlorite accident include: Pain, tenderness, swelling, ecchymosis, ulceration, and tissue necrosis. Serious complications may involve obstruction of the airway and leading to death, that's why these accidents should be quickly recognized and managed to limit the series of threatening events [12-14].

Treatment modalities depend on the severity and the time of presentation. Immediate management is common for all stages, and can be summarized as following:

Reassure the patient and irrigate generously with normal saline. Prescribe non-steroidal anti-inflammatory drugs to reduce pain and inflammation. Cold and warm compressors are advised to reduce inflammation and improve the circulation. Iatrogenic damages should be carefully assessed using intra-oral radiographs. Instructions such as avoiding spicy food and keeping the area clean are important for personal home care [12-14].

In moderate and severe cases antibiotics are prescribed to prevent secondary infection and referral to Oral and Maxillofacial Surgeon (OMFS) done to perform any surgery or hospital admission if intravenous administration is needed.

### Tactics to avoid such procedural accidents and missing a canal

Exercise your knowledge, understanding and the use of proper magnification and illumination. Leur-lock and side vented needles are best recommended. Confirm the concentration and identity of the irrigation solution prior usage. Avoid applying excessive pressure while irrigating. Accurate establishment and maintenance of the working length using EAL and the use of rubber stops may assist in keeping the irrigation needle 2 mm to 3 mm short of the entire canal length [1,13].

Pre-endodontic restoration (wall build-up) and the use of rubber dam isolation in endodontics are mandatory to facilitate an isolated operational field and prevent seepage of the chemical irrigant directly onto the intra-oral tissues (Figure 3) [15].

### Conclusion

Presence of an extra canal is usually seen in maxillary first molars, mandibular lateral incisors and mandibular second molars. The presence of an extra canal varies between populations; therefore clinicians should be aware of the differences amongst the population they're treating. NaOCl accidents may occur despite the clinician's vast knowledge and careful manipulation, hence rapid intervention and understanding will best serve the case and cease the damage. Usage of the recommended methods of irrigation and practicing "Mindful Endodontics" helps in reducing the risk of unfortunate events during treatment.

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