



# Sodium Hypochlorite-induced Facial Hematoma Following Root Canal Treatment

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This case report highlights a rare complication of root canal treatment involving the inadvertent extrusion of sodium hypochlorite solution, resulting in a sodium hypochlorite-induced facial hematoma. A 44-year-old female patient presented significant right hemifacial swelling and ecchymosis following root canal therapy. Computed tomography imaging confirmed a hematoma involving the facial region without active signs of bleeding. Sodium hypochlorite, a potent cytotoxic agent commonly used in root canal procedures, was identified as the causative agent. Treatment consisted of prednisone, antibiotics, and NSAIDs, resulting in gradual improvement over a month. The cytotoxic properties of sodium hypochlorite, its variable concentrations, and risk factors associated with facial hematomas are discussed. It is essential to emphasize the rarity of such hematomas and highlight the need for precise technique, vigilant monitoring, and interdisciplinary collaboration to mitigate risks and prioritize patient safety.

**Keywords:** Case Report; Facial Hematoma; Sodium Hypochlorite; Root Canal Treatment

## Introduction

Root canal treatment is a widely practiced dental procedure aimed at preserving teeth affected by severe dental caries or pulp inflammation. Effective disinfection and debris removal are crucial aspects of the treatment process, for which sodium hypochlorite (NaOCl) solution is commonly used due to its potent antimicrobial and proteolytic properties. While root canal procedures are generally safe, rare instances of severe soft tissue damage may occur if NaOCl is inadvertently extruded beyond the root apex [1, 2]. This case report presents a patient who developed a facial hematoma following the use of NaOCl during root canal treatment.

## Case Presentation

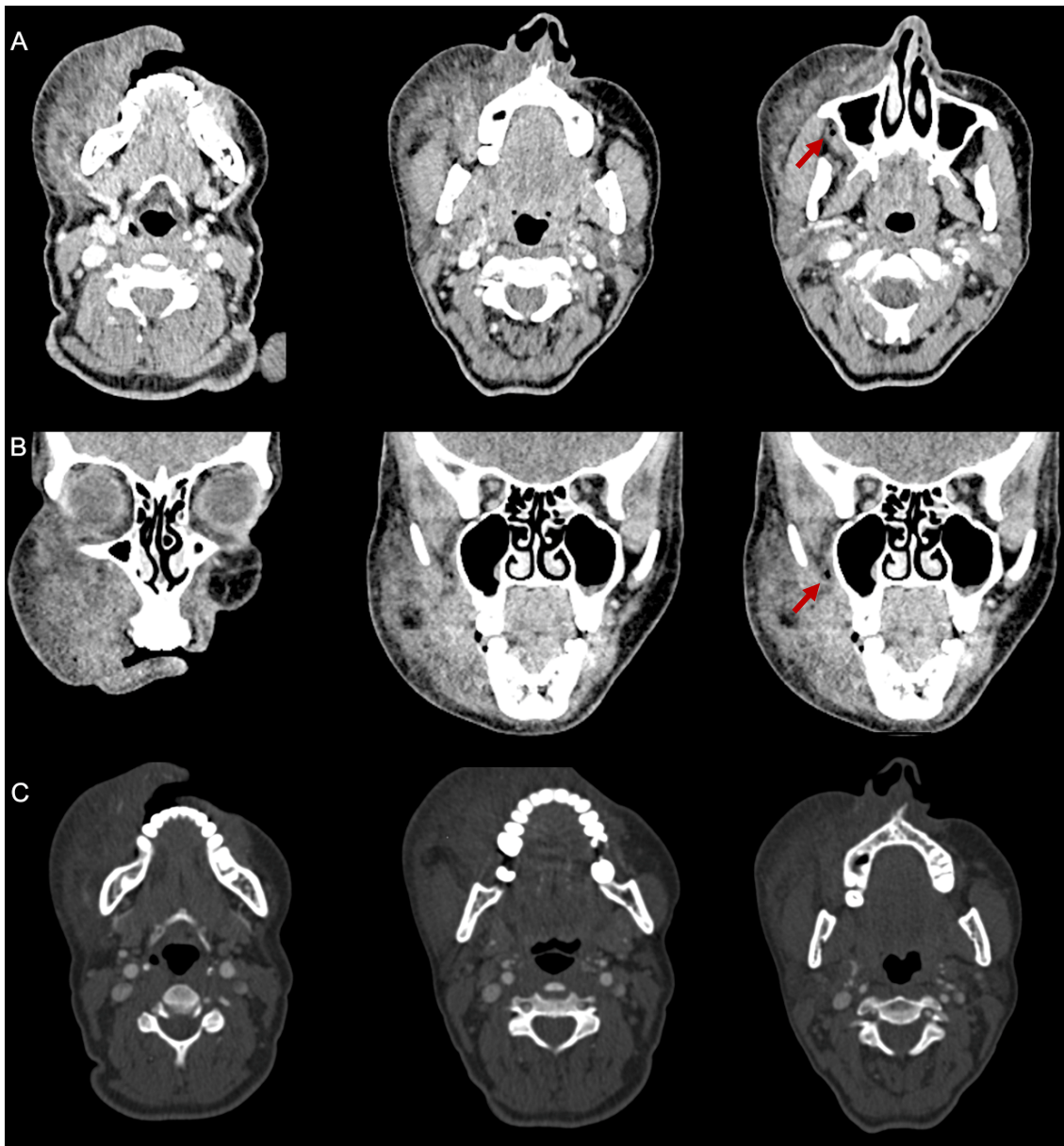
A 44-year-old female patient, with an unremarkable medical history, visited the emergency room with complaints of severe

right hemifacial swelling and pain. She had undergone a root canal treatment on tooth number 16, twelve h prior to her visit. Upon examination, the patient displayed significant right-sided facial edema and ecchymosis, extending from the submandibular region to the periorbital tissues (Figure 1). The affected area was tender to touch, and the patient reported discomfort. No systemic signs of distress, such as fever or breathing difficulties were observed. A computed tomography (CT) examination was performed to assess the deep tissue structures and extension, revealing a hematoma involving the facial region, with buccal and periorbital extension, without signs of active bleeding on the angiographic images (Figure 2). Bony algorithm images revealed post-intervention changes on tooth number 16, consistent with the root canal treatment the tooth underwent (Figure 3). Retrospective medical/dental history investigation revealed that NaOCl was used as an irrigant in this procedure and a diagnosis of sodium hypochlorite-induced facial hematoma was made. The patient

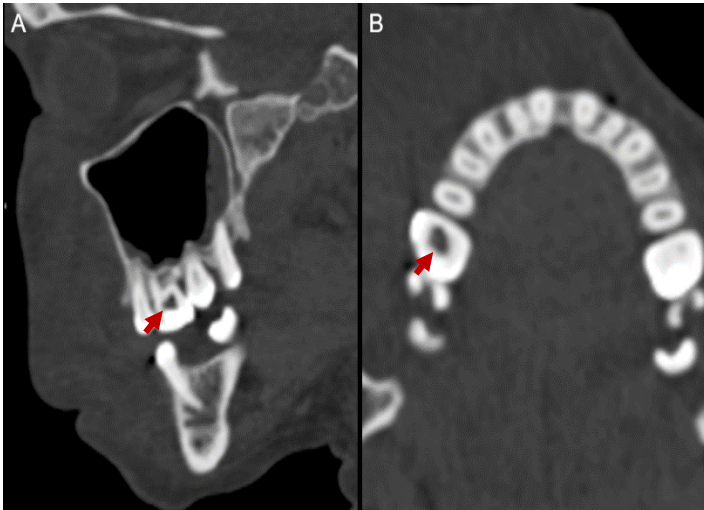




**Figure 1.** Clinical images of the patient's face at presentation exhibiting significant right-sided hemifacial edema and ecchymosis consistent with a facial hematoma. The edema is characterized by a notable swelling, extending from the submandibular region to the periorbital tissues, predominantly affecting the right side of the face. The ecchymosis, evident as purplish discoloration, further emphasizes the extent of soft tissue damage



**Figure 2.** A) Axial and B) Coronal computed tomography (CT) scan performed in the emergency setting highlights a substantial increase in density of the right hemifacial soft tissues, showing a diffuse reticular pattern of increased fat density. A more concentrated area of higher density is observed in the right zygomatic and paramandibular regions compatible with a hematoma; C) Additionally, two gas bubbles, indicative of emphysema, are seen within the right retromaxillary buccal fat, further emphasizing the involvement of this region (A and B, red arrow). On the angiographic CT image, no contrast extravasation was observed, suggesting the absence of active bleeding at the time of examination



**Figure 3.** A) Sagittal and B) axial CT image with bone algorithm reconstruction captures the region of tooth number 16, revealing significant post-intervention changes consistent with the root canal treatment that the tooth underwent. Within the tooth structure, a well-defined radiolucent center is observed, indicating the presence of the root canal space (A and B, red arrow)

was admitted to the hospital and prescribed a regimen of prednisone therapy, amoxicillin with clavulanic acid, and NSAIDs. After two days of hospitalization, the patient was discharged with instructions to monitor the hematoma and report any concerning changes. Subsequent outpatient follow-up at regular weekly intervals demonstrated progressive reduction of swelling and pain over the course of a month, with slight induration persisting on the gingival mucosa near the previously treated tooth. Surgical intervention was not deemed necessary in this case.

## Discussion

Sodium hypochlorite, commonly found in commercial bleaches, is a potent cytotoxic agent that can induce hemolysis and ulceration, inhibit neutrophil migration, and damage endothelial and fibroblast cells when in contact with tissues [3-5]. It has a pH of approximately 11-12 and causes injury primarily by oxidation of proteins [6, 7]. The optimal concentration is still a matter of debate and remains controversial; however, the regularly used concentrations of NaOCl are between 0.5% and 5.25% [8, 9]. Sodium hypochlorite-induced facial hematomas following root canal treatment are infrequent and appears to be more common in women [10]. Additionally, there is a higher incidence of facial hematomas associated with root canal treatments performed

on teeth in the upper maxillary arch [10, 11]. Some risk factors may contribute to the development of facial hematomas following root canal treatment with NaOCl irrigation. These can include technical aspects, such as the improper use or excessive pressure while delivering the irrigant into the root canal system [12]. Anatomical factors may also play a significant role in the occurrence of this complication. Teeth with periapical pathology or non-vital pulps may have compromised apical barriers, making them more susceptible to the spread of the irrigant beyond the root canal space [11].

Clinically, the patient reported severe pain and presented ecchymosis, hematoma and swelling, consistent with previous reports. Some patients may also experience temporary nerve paresthesia as an uncommon side effect. In severe cases, the oropharynx may be involved with the potential for upper airway compromise [13].

Initially, cold compresses should be used to reduce swelling. After 24 h, these should be replaced by warm compresses and warm saline rinses for 1 week to stimulate local microcirculation [8, 14]. Corticosteroids were administered in this case due to their well-established anti-inflammatory properties, and their use has been previously reported in similar situations. Additionally, the prescription of antibiotics is routinely recommended in these incidents to address the presence of necrotic tissue and reduce the risk of infection [10, 15].

Hospital admission and supportive measures were chosen in this scenario. Fortunately, the majority of patients with sodium hypochlorite-induced facial hematomas experience a favorable outcome with spontaneous resolution after a few weeks of conservative management [6, 15].

## Conclusion

Facial hematomas following root canal treatment, although rare, can occur as a complication of the procedure. The comprehensive analysis of this case highlights the importance of proper technique, vigilant monitoring, and interdisciplinary collaboration during endodontic procedures to minimize the risk of adverse reactions to root canal irrigation solutions like NaOCl. Awareness and further research in this area are essential to prevent and effectively manage complications related to such irrigants and ensure optimal patient outcomes. Dental and medical professionals should remain diligent in recognizing and managing these rare complications, with a focus on patient safety and well-being.



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### Conflict of interest

None.

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### Authors' contributions

All authors have contributed significantly to the paper and all authors are in agreement with the manuscript.

### Informed consent:

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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