

## CASE REPORT

# Management of the sodium hypochlorite accident: a rare but significant complication of root canal treatment

Jonathan Hatton, Stephen Walsh, Alan Wilson

Department of Maxillofacial Unit, Western Sussex Hospital's Trust, Chichester, West Sussex, UK

**Correspondence to**

Jonathan Hatton,  
jonathanrhatton@gmail.com

Accepted 1 March 2015

**SUMMARY**

A 66-year-old female patient presented to the accident and emergency department, 3 h following a dental appointment. Significant right-sided facial swelling, bruising and pain were present. The patient had been sent by her general dental practitioner with a covering letter explaining that a hypochlorite accident had occurred during root canal treatment of the upper right first premolar tooth. An iatrogenic perforation was suspected. The patient was admitted under the care of the maxillofacial team and intravenous antibiotics, analgesia and steroids were administered. The patient was prepared for the possibility of requiring surgical intervention under a general anaesthetic. No nerve injury was encountered and the periorbital tissues were spared. A full recovery was made by the patient with no surgical intervention required but significant bruising and swelling were present up to 4 weeks following the incident.

**BACKGROUND**

This report outlines the importance of correct management of this distressing and potentially very damaging complication of a common dental procedure. Swift action is required by the primary care dental practitioner, emergency medical team and surgical teams in order to reduce the likelihood of severe complications.

Currently, no national guidelines exist on the management of this condition and published reports are poorly documented.

Root canal treatment (RCT) aims to effectively access, disinfect and prevent future reinfection of the root canal system in teeth affected by advanced disease.<sup>1</sup> Given the complex anatomical features of the root canal system, mechanical debridement of the canals alone, is not enough for sufficiently reducing the infecting bacterial load. As such, auxiliary chemical disinfectants are used to increase the effectiveness of the treatment, and may further facilitate the lubrication of instruments and dissolution of vital and necrotic tissue.<sup>2-4</sup>

Sodium hypochlorite (NaOCl) has long been used as a root canal irrigant and shows activity against a range of bacterial and viral species commonly isolated from infected root canals.<sup>5</sup> Alternative irrigants are saline, chlorhexidine and hydrogen peroxide.<sup>6</sup> Concentrations of NaOCl between 0.5% and 5.25% are used. The high pH (between 11 and 12) of NaOCl lead it to be particularly cytotoxic and damaging to vital tissues.<sup>2, 7</sup>

This chemical property increases the penetrating capability of the solution.<sup>3</sup> Although rare, NaOCl accident during RCT can cause significant morbidity and distress for the patient and concern for the practitioner. As such, its swift and correct management, as well as the potential sequelae which may follow, need to be undertaken and understood respectively by the primary care dental practitioner in order to maintain the patient–dentist relationship and ensure patient safety.

Immediate management of the NaOCl accident should focus on reducing symptoms for the patient, namely pain and distress. A rational and reassuring approach is essential. Administration of local anaesthetic may help with pain relief if not already present. Following thorough irrigation with saline, analgesia should be prescribed and the application of a cold compress can further help to reduce the discomfort and associated ‘burning sensation’. Appropriate referral to a maxillofacial unit should be undertaken without delay.

Given the anatomical position of root apices, important structures such as nerves (the inferior alveolar and mental nerves in the lower arch and infraorbital in the upper arch) need to be considered, as well as possible involvement of the periorbital tissues and, in severe cases, the oropharynx and the potential for upper airway compromise. Less significant complications associated with NaOCl use such as damage to soft tissues (figure 1) and clothing on contact can be reduced by using the appropriate protective measures including aprons, eye protection and most importantly, rubber dam (a tool not used in this case).

Given the formation of necrotic host tissue and the common presence of preoperative bacterial infection of the root canal system, the development of infection is a recognised sequelae. NaOCl may reduce neutrophil activity and further predispose to this.<sup>8</sup> Antibiotic therapy needs to be swiftly administered to prevent delayed infections and may need to be issued intravenously in severe cases.<sup>9</sup>

**CASE PRESENTATION****Patient's symptoms**

- ▶ Right face swelling and bruising
- ▶ Pain during and now after RCT today
- ▶ Pain rated as 5/10

**Clinical findings**

- ▶ Right buccal space swelling with bruising of the skin of the face



CrossMark

**To cite:** Hatton J, Walsh S, Wilson A. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-207480



**Figure 1** Clinical photographs on admission.

- ▶ Pain intraoperatively which had somewhat decreased by the time of presentation
- ▶ Rapid onset of symptoms (patient presented 3 h following a dental appointment)
- ▶ No airway compromise, no immediate signs of systemic upset

**Medical history**

- ▶ Fit and well
- ▶ Active and independent
- ▶ No regular medications
- ▶ Sensitivity to nickel.

**INVESTIGATIONS**

Radiographs were not ordered on admission because of a reduced radiography service out of hours (intraoral films are not



**Figure 2** Periapical radiograph of the tooth in question at time of admission.

usually available). An intraoral periapical radiograph was taken 1 day following admission showing evidence of pulp floor bur penetration (figure 2).

**DIFFERENTIAL DIAGNOSIS**

The presenting history of this condition was pathognomonic with a sodium hypochlorite accident. An acute presentation of the apical pathology associated with the upper right first premolar could not be ignored as a possible cause although facial bruising is rarely seen in this instance.

**TREATMENT**

- ▶ Admission to hospital under the care of the maxillofacial team for intravenous antibiotics to reduce the likelihood of secondary infection, analgesia and steroids for the reduction of local inflammation
- ▶ Medications prescribed were as below
  - Co-amoxiclav 1.2 g three times a day for 24 h (home on oral 625 mg three times a day 5/7)
  - Dexamethasone 6.6 mg three times a day for 24 h
  - Paracetamol 1 g four times a day, diclofenac 50 mg three times a day
- ▶ Patient prepared for surgery (the situation was explained and the patient advised to stay starved from midnight on the night of admission) in case surgical intervention was required
- ▶ Cold compresses for the first 24 h followed by warm compresses to reduce bruising and swelling. These were applied locally to the area
- ▶ Appropriate review (see below) and correspondence with dentist

**OUTCOME AND FOLLOW-UP**

A full recovery was made owing to the swift provision of appropriate care.

The patient was reviewed 24 h, 1 week (figure 3) and 1 month following admission at which time the resulting bruising from the hypochlorite accident were still visible.

**DISCUSSION**

RCT is a common treatment modality in dental practice. Despite its abundant use, NaOCl accident remains a relatively uncommon occurrence. However, the potential serious complications of such an accident mean that its correct management is imperative for the safety and well-being of the patient and the continuation of the working relationship between dentist and



**Figure 3** Photographs taken 1 week following admission showing the persistent bruising of the face.

patient. The reported complications range from low-grade tissue damage, swelling and associated pain, to long-term altered nerve function which may be permanent, airway compromise and even loss of vision if the eye is involved.<sup>10</sup>

There are currently no national UK guidelines on the management of this significant event. Literature is available and case reports are generally in agreement on the need for hospital admission, intravenous medications and the benefit of cold, followed by warm compresses.

NaOCl accident is a distressing and potentially embarrassing incident for the dentist. Despite this, appropriate management and follow-up is essential and therefore formal and urgent referral by telephone, is recommended, to the nearest maxillofacial team.

Avoiding a NaOCl accident starts with thorough preoperative assessment of the patient and the tooth in question. The restorability of each and every tooth of course needs to be assessed prior to commencing RCT. Teeth with immature apices or those that have been over instrumented at the apex (causing a widening of the apical constriction) need to be treated with care and this stresses the importance of a good quality preoperative radiograph and estimate of working length.<sup>2</sup>

While rare, allergy to NaOCl (may be reported as a reaction to household cleaning products by the patient) is recognised and should highlight to the practitioner the need for in-depth medical history. Alternative irrigation solutions may need to be considered<sup>11 12</sup> and lower concentrations of NaOCl (0.5–1.0%)

may retain the antibacterial and tissue dissolving properties of the irrigant but reduce host tissue irritation and destruction.<sup>13</sup> The passive use of irrigating needles with a side vent, to prevent the extrusion of debris and irrigant are key safe technique points that should be employed. Should a NaOCl accident be suspected (the patient may report immediate pain or a burning sensation and swelling may become apparent within minutes), copious irrigation with saline is recommended. It is advised to leave the tooth open to drain if profuse bleeding or swelling is present but otherwise sealing well with a temporary restorative material will help to prevent infection of the root canal space and periapical tissues. RCT can be completed following the acute phase of NaOCl accident management taking all the above necessary precautions.

**Acknowledgements** The authors thank the maxillofacial team at St Richard's Hospital for their guidance during the management of this case.

**Competing interests** None.

**Patient consent** Obtained.

**Provenance and peer review** Not commissioned; externally peer reviewed.

## REFERENCES

- Hargreaves KM, Berman LH. *Cohen's pathways of the pulp expert consult*. 10 edn. St. Louis, Mo: Mosby, 2010:992 p.
- Hülsmann M, Hahn W. Complications during root canal irrigation—literature review and case reports. *Int Endod J* 2000;33:186–93.
- Lam TSK, Wong OF, Tang SYH. A case report of sodium hypochlorite accident. *Hong Kong J Emerg Med* 2010;17:173–6.
- Senia ES, Marraro RV, Mitchell JL, et al. Rapid sterilization of gutta-percha cones with 5.25% sodium hypochlorite. *J Endod* 1975;1:136–40.
- Zhu W, Gyamfi J, Niu L, et al. Anatomy of sodium hypochlorite accidents involving facial ecchymosis—a review. *J Dent* 2013;41:935–48.
- Grossman LI. *Endodontic practice*. 10 Subedition. Philadelphia: Lea & Febiger, 1981:458 p.
- Hales JJ, Jackson CR, Everett AP, et al. Treatment protocol for the management of a sodium hypochlorite accident during endodontic therapy. *Gen Dent* 2001;49:278–81.
- Gatot A, Arbellet J, Leiberman A, et al. Effects of sodium hypochlorite on soft tissues after its inadvertent injection beyond the root apex. *J Endod* 1991;17:573–4.
- Becking AG. Complications in the use of sodium hypochlorite during endodontic treatment. Report of three cases. *Oral Surg Oral Med Oral Pathol* 1991;71:346–8.
- Ingram TA III. Response of the human eye to accidental exposure to sodium hypochlorite. *J Endod* 1990;16:235–8.
- Calışkan MK, Türkün M, Alper S. Allergy to sodium hypochlorite during root canal therapy: a case report. *Int Endod J* 1994;27:163–7.
- Kaufman AY, Keila S. Hypersensitivity to sodium hypochlorite. *J Endod* 1989;15:224–6.
- Spangberg L, Engström B, Langeland K. Biologic effects of dental materials. 3. Toxicity and antimicrobial effect of endodontic antiseptics in vitro. *Oral Surg Oral Med Oral Pathol* 1973;36:856–71.

## Learning points

- ▶ Root canal treatment is a commonly undertaken dental procedure. Although the possible complications are rare, the resulting damage can be significant and even life-threatening.
- ▶ Communication between primary and secondary care teams is of paramount importance to improve the management of the patient.
- ▶ All necessary precautions should be taken by the dental practitioner in order to minimise potential harm during root canal therapy.
- ▶ Currently there are no national guidelines available on the management of this condition and so an appreciation of the available literature is useful in treatment planning.

Copyright 2015 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.  
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact [consortiasales@bmjgroup.com](mailto:consortiasales@bmjgroup.com)

Visit [casereports.bmj.com](http://casereports.bmj.com) for more articles like this and to become a Fellow