

Sodium hypochlorite irrigant mishap- a 'dentistogenic' case report

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Abstract:

Background -Iatrogenic injury most commonly occurs due to the deleterious effects of therapeutic agents used during treatment. Endodontics employs a wide array of instruments, irrigants and obturating materials. Sodium hypochlorite (NaOCl), a strong oxidising agent is one of the most widely used root canal irrigants.

Aim- The aim of this paper is to present a case report of iatrogenic injury to the labial mucosa consequent to accidental spillage of 3% NaOCl used during endodontic treatment in a 22 years old male patient.

Case description-The patient presented with multiple ulcerations on the labial mucosa following root canal therapy. The mucosal injury was managed conservatively. The tissues healed almost completely within 3 weeks.

Conclusion – Root canal irrigants should be used judiciously under adequate isolation in clinical practice.

Clinical significance -Optimal isolation protocol is mandatory for routine clinical procedures.

Keywords - sodium hypochlorite, iatrogenic, isolation.

Date of Submission: 03-09-2022

Date of Acceptance: 17-09-2022

I. Introduction

Iatrogenic trauma can be defined as any trauma that has been induced by the dentist's activity, manner, or therapy¹. In endodontic therapy, numerous instruments and irrigants are employed for cleaning and shaping the root canal system. Sodium hypochlorite is one such irrigant which is employed frequently in root canal therapy. The introduction of NaOCl for endodontic irrigation has been documented as early as 1920². The rationale behind using sodium hypochlorite for irrigating the root canal is that it alters the integrity of the cytoplasmic membrane of the endodontic microflora, disrupts biofilm formation and exerts strong solvent action on tissues³. NaOCl is routinely used in concentrations ranging from 0.5 - 5.25%^{2,4,5}. The oxidizing effect of sodium hypochlorite is a function of its concentration and so is its toxicity⁵. NaOCl is a nonspecific agent whose action is not limited exclusively to necrotic tissues^{6,7}. The adverse effects from injudicious use of NaOCl range from oral /extra oral mucosal damage to life threatening airway obstruction⁵. Thus, greater the concentration of sodium hypochlorite, greater is the caustic effect precipitated on the tissues⁶.

The major disadvantages of NaOCl include cytotoxicity (based on the concentration used), pungent odour and unpleasant taste⁸. This article highlights the clinical manifestations and management of oral mucosal damage resulting from incautious usage of sodium hypochlorite during endodontic irrigation.

II. Case Report

A 22 year old male patient presented with intense pain and irritation of oral mucosa in the mandibular anterior teeth region. Upon eliciting history, initiation of root canal treatment in 31 and 41 for the management of symptomatic apical periodontitis was noted. Usage of 3% NaOCl with open ended needle for irrigation had been documented. On clinical examination, multiple ulcerations with inflammation of the surrounding soft tissues in the lower right labial mucosa were seen (Figure1). The patient had no signs of paraesthesia or numbness. History of allergy to household bleach was ruled out. Immediately, the sloughed tissues were gently debrided with wet gauze and flushed copiously with saline. Topical anaesthetic gel was applied. The patient was reassured and prescribed with antibiotics to prevent the incidence of superadded infections, analgesics to alleviate pain and antioxidants to facilitate re-epithelialization. Patient consent was obtained for documentation of the case.

Review on the 8th day showed considerable healing of the ulcerations as well as disruptions in the mucosal barrier (Figure2). On the 16th day, the healing was almost complete and the tissue contours were restored (Figure3). The root canal treatment was completed in the subsequent visits.



Figure 1- Ulcerations on the labial mucosa following accidental spillage of NaOCl



Figure 2- Healing of ulcerations on the 8th day



Figure 3-Healing of ulcerations and restoration of tissue contours on the 16th day

III. Discussion

Irrigation is an integral part of the efforts concerted to eradicate the endodontic microflora from the root canal system. NaOCl, of all the irrigants, is widely used hitherto for its excellent antimicrobial efficacy and broad spectrum of action. Endodontic microflora are highly susceptible to NaOCl⁸. Invitro studies have demonstrated elimination of *P.endodontalis*, *P.intermedia*, *P.gingivalis* within 15 seconds of contact with 0.5-5.25% NaOCl⁹. It brings about fatty acid degeneration and proteolysis by saponification, amino acid neutralization and chloramination¹⁰. Tissue dissolution depends on the frequency of agitation, amount of organic component in relation to the quantity of the irrigant used and the surface area of the tissues¹¹.

In this case report, multiple ulcerations on the labial mucosa could have occurred possibly due to the accidental spillage/ residual dripping of NaOCl from the irrigation needle during the disinfection procedure. Although NaOCl has a pungent odour and is effervescent in nature¹², the operator would have failed to notice the spillage of NaOCl over the healthy mucosal tissues as it is colourless. The patient stated that he did not experience pain or discomfort during/ immediately after the completion of the procedure. This initial lack of pain and discomfort could be ascribed to the numbness produced by the local anaesthesia (2% lignocaine with adrenaline – 1:80,000).

On the outer surface of the lips, there were barely any ulcerations compared to the inner mucosal surface possibly as the outer surface of lips is protected by a moderately thick stratified squamous keratinized epithelium^{7,13}. The factors responsible for optimal healing and minimal scarring in oral tissues include the distinct phenotype of oral fibroblasts, rich vasculature, moist environment and growth factors in saliva¹⁴.

Prevention of occurrence of such mishaps is of paramount importance for dental practitioners. Rubber Dam has been recognized as the standard of care and is the most reliable method of isolation^{2,5,15}. The learning curve to its usage as well as the misconception about the technique being time consuming often precludes young practitioners from utilizing rubber dam technique of isolation. Studies have shown that on an average, it takes about 4 minutes for application of rubber dam¹⁶. This small step could avert unwarranted soft tissue complications during routine clinical procedures.

The efficacy of NaOCl increases with increasing concentrations but it is preferably used in lower concentrations to decrease the cytotoxicity factor^{10,13}. The measures employed to enhance the effectiveness of low concentration sodium hypochlorite are

1. Frequent replenishment of the irrigant in the canal system¹⁷
2. Increasing the contact time within the root canal system^{6,18}
3. Heating the irrigant mildly using chairside devices^{2,18}

Alternatively, irrigants such as chlorhexidine (CHX), EDTA, herbal irrigants which exhibit comparatively lesser cytotoxicity^{10,19} can also be utilised. Studies have shown that irrigation of canals with chlorhexidine in conjunction with sodium hypochlorite results in the formation of parachloraniline - a carcinogen²⁰.

Replacing open ended (hypodermic) needles with closed ended, side vented needles with Luer-Lok mechanism serves to reduce the risk of residual dripping of irrigant thus preventing oral mucosal damage²¹. Using the index finger rather than the thumb reduces the force with which the irrigant is delivered thus minimizing the likelihood of tissue dissolution²².

IV. Conclusion

The dental practitioner should adhere to standard isolation protocol and use the irrigant judiciously during endodontic therapy to prevent any mishaps and other unwarranted complications.

Clinical significance

Optimal isolation protocol, when followed, reduces the occurrence of mishaps in clinical practice.

Acknowledgement

The authors would like to extend their gratitude to the Department of Conservative dentistry and endodontics, Asan Memorial Dental College & Hospital, Chengalpattu, India.

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Srividya N, et. al. "Sodium hypochlorite irrigant mishap- a 'dentistogenic' case report." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(09), 2022, pp. 01-04.