



MANAGEMENT OF SUBCUTANEOUS EMPHYSEMA OF ENDODONTIC ORIGIN: A CASE REPORT

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ABSTRACT

Subcutaneous emphysemas result when air is forcefully introduced underneath soft tissues, which can lead to dissection of the fascial planes in the affected area. Although it is of rare occurrence during dental procedures especially endodontic treatment, it is important that dental practitioners are well aware of this condition, as it may be detrimental to patient and distressing to dentist. Hence it becomes imperative that dental health care providers are able to diagnose and treat this potentially fatal complication. This article presents a case of subcutaneous emphysema (which occurred during routine endodontic procedure) along with the guidelines for management and prevention of this complication.

Key words:

Subcutaneous emphysema, endodontic irrigation mishap, swelling and crepitus

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INTRODUCTION

The long-term success of root canal treatment depends on complete debridement and disinfection of canal space which can be achieved by mechanical instrumentation of the root canal along with use of antimicrobial irrigating solutions. Mechanical instrumentation includes the removal of vital and necrotic tissues from the root canal system, along with infected root dentine.^[1] However, the intricate three dimensional internal anatomy of root canal systems harbor residual pulpal tissue, dentin debris, and bacteria, even after meticulous mechanical preparation.^[2] Chemical disinfection with the use of irrigants is the only way to debride those areas of the root canal wall that remain untouched by mechanical instrumentation.

The commonest irrigants used for root canal cleaning are sodium hypochlorite, chlorhexidine, EDTA, hydrogen peroxide etc. Sodium hypochlorite possesses many attributes of ideal antimicrobial agent along with excellent tissue dissolution and endotoxin deactivation activity and hence is the irrigant of choice. Inappropriate use of irrigant may lead to several mishaps which range from damage to the patient's clothing, splashing the irrigant into the patient's or operator's eye, inadvertent extrusion through the apical foramen leading to pain and edema, anaphylactic reactions to the irrigant or air emphysema.^[3] Out of these, air emphysema is a rather uncommon occurrence.

The word emphysema is derived from Greek word, 'whick', which means 'to blow in'. Many authors have reported this complication during repair of facial fractures, periodontal surgery, temporomandibular joint surgery and the extraction of teeth such as a mandibular third molar.^[4] However, its occurrence during endodontic treatment is rare. It may occur when air is expressed through apical constriction into the periapical tissue due to the use of three way air syringe or forceful extrusion of root canal irrigant.

This case report highlights the diagnosis and management of a case of subcutaneous emphysema which occurred during endodontic treatment of maxillary right first premolar.

CASE REPORT

A 20 year old female patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of sensitivity to cold and hot beverages since 4-5 days in the upper right tooth region which accentuated on lying down.

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Figure 1 Pre-operative IOPAR of #14

On clinical examination, a deep carious lesion was observed in relation to upper right first premolar (#14). The tooth was not sensitive to percussion and there was absence of any swelling and vestibular tenderness. Radiographic examination showed carious lesion involving the pulp without any periapical changes [Figure 1].

The diagnosis made was of symptomatic irreversible pulpitis and thus single visit root canal therapy was planned.

Root canal treatment was initiated on the same visit under local anesthesia (Lignox 2% IndocoRemidies Ltd., Mumbai) and rubber dam isolation (Hygiene, ColteneWhaledent) in # 14. With the use of Endo access bur (FG 1, Dentsply, USA) access cavity was prepared and two root canal orifices were located. Electronic apex locator and radiographic confirmation was used to determine working length of buccal (21mm) and lingual canal (21.5mm) thereafter biomechanical preparation was initiated with crown down technique till ProTaper Gold #F1 file (DentsplySirona). Copious irrigation was performed using 5.25% NaOCl and saline at every change of file using a side vented 30 gauge needle (NeoendoSidevent). Final irrigation was done with 5% NaOCl followed by EDTA and the canal was dried with three way syringe.

Within a few seconds of completion of the final irrigation protocol the patient developed sudden pain and swelling in the vestibular region of #14 [Figure 2].



Figure 2 Extraoral frontal appearance upon initial presentation. Swelling with crepitus involving the infraorbital area and nasolabial fold.

Suspecting sodium hypochlorite extrusion or allergic reaction to irrigant, the canal was flushed profusely using saline. There was no improvement in patient's condition and the swelling rapidly increased over next few minutes to involve both lower and upper eyelids of the right eye. Extraoral examination revealed significant soft tissue swelling involving the area from the upper eyelid to the nasolabial fold. Medially the swelling was about a centimeter from the nasal bridge upto the outer canthus of the eye with right eye appearing smaller in size than left eye. There was also presence of unilateral crepitus below the suborbital region and there was absence of any discoloration due to ecchymosis. In view of all the above clinical findings, air emphysema was suspected. Negative orthogradeperiapical aspiration was done using 30 gauge needle in order to relieve tissue pressure associated with air emphysema. The syringe contents revealed frothy straw colored tissue fluid with air bubbles [Figure 3].



Figure 3 Frothy, straw colored fluid with air bubbles on periapical aspiration

The procedure was continued till no further tissue contents could be aspirated. Open dressing was given and the patient was monitored closely for next 60 minutes for signs of any respiratory or cardiac distress. During the waiting period cold compresses were administered for swelling.

To prevent the risk of infection a combination of 250mg levofloxacin and 500mg ornidazole was prescribed along with 25mg of pheniramine (for its antiallergic effect) and 0.5mg of dexamethasone and a combination of 100mg aceclofenac, 325mg paracetamol and 15mg serratiopeptidase (for the pain and inflammation) for a duration of 5 days. Use of cold compress was advised for first 24hrs which had to be replaced with warm compresses thereafter.

Regular monitoring of the patient was conducted on 2nd, 3rd and 7th day and a gradual reduction in pain and swelling was observed [Figure 4].



Figure 4 (a) Resolution of emphysema by day 3
(b) complete resolution by day 7

Complete resolution of swelling was there on 10th post-operative day. Extraoral examination revealed no ecchymosis and intraoral examination showed no epithelial necrosis hence ruling out the possibility of extrusion of sodium hypochlorite and further confirming the diagnosis of air emphysema. Root canal treatment of #14 was completed after the patient turned asymptomatic [Figure 5].



Figure 5 Post-operative IOPAR of #14

CONCLUSION

Air emphysema is the passage and collection of gas in tissue spaces and facial planes. It can be associated with various dental procedures like restorations, periodontal treatment and surgical exodontia. However, it is rare during endodontic treatment. To rule out the possibility of any allergic reaction, a detailed history and a meticulous inspection and palpation of the involved tissue should be done. The usual sequence of events in subcutaneous emphysema is rapid swelling and crepitus.^[5] Crepitus on palpation is pathognomonic of emphysema and an important diagnostic feature and excludes other differential diagnosis for such acute swellings. A subcutaneous emphysema typically does not have an associated erythema and warmth upon palpation. Pain, although present is not usually a major complaint however dysphagia and dysphonia have been reported in few cases.^[6] Tissue space emphysema usually does not spread to the deep anatomic spaces, unlike irrigant extrusion reactions; such as hypochlorite extrusion. However, migration of air into the

neck region could cause respiratory difficulty, furthermore, progression into the mediastinum could potentially lead to other serious complications. Imaging modalities like periapical radiographs, panoramic radiographs and even CBCT are likely to be inconclusive. Due to the lack of soft tissue detail on a CBCT, a hospital referral for multidetector computed tomography (MDCT) of the head and neck can be made to determine the extent and location of the subcutaneous emphysema.^[6] Depending on the extent, patients should be monitored closely prior to discharge for any respiratory or cardiac distress

Although it has an alarming presentation, air emphysema is mostly a benign condition that resolves in 3-10 days. The gas that has been forced into the fascial tissues is resorbed into the blood stream for eventual excretion via the lungs. Antinflammatory, analgesics and antibiotics should be prescribed to the patient since the breach in the mucosa is almost certainly accompanied by ingress of oral flora which has the potential to infect the subcutaneous tissues.^[7] Steroids may also need to be prescribed in order to decrease the swelling.

An initial misdiagnosis of sodium hypochlorite extrusion and profuse irrigation with saline may have resulted in inadvertent periapical extrusion of saline which can account for the aspirated fluid in this case. Although rare, certain complications of air emphysema have been reported in the literature. There have been reports of arrhythmias and electrocardiogram alteration, blindness due to nerve compression, seizures and ischemic brain lesions due to air emboli leading to short-term memory impairment.^[8] Thus, early recognition and dose monitoring becomes critical also that proper management can be implemented to prevent such progressions.^[9]

To prevent the undue occurrence of such complications, three way air syringe should be avoided during endodontic treatment and paper points should preferentially be used to dry the root canals.^[10]

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