

Periorbital emphysema during endodontic retreatment of an upper central incisor: a case report

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IN BRIEF

- Discusses how subcutaneous emphysema could arise in endodontic treatment.
- Stresses that in endodontics, subcutaneous emphysema is caused mainly by the use of air syringe to dry canals and is mostly a preventable complication.
- Highlights that the majority of cases are managed conservatively, but complicated cases require immediate medical attention.

Subcutaneous emphysema is rarely encountered in endodontic practice and consequently there is a dearth of information in the dental literature about this complication. The following report presents an interesting case of periorbital emphysema encountered during endodontic therapy. Attention is drawn to the presentation and management of this mostly preventable complication.

INTRODUCTION

Subcutaneous emphysema is defined as the abnormal presence of air in tissue spaces.¹ Periorbital emphysema is subcutaneous emphysema that arises when air is introduced into the periorbital tissues.² Subcutaneous emphysema arises when air is forced, under pressure, into the subcutaneous fascia leading to a sudden onset of soft tissue swelling. On rare occasions trapped air can spread along the fascial planes to the periorbital, mediastinal, parapharyngeal, pericardial and thoracic spaces causing serious and life threatening complications.³ It is caused mainly by trauma, vigorous coughing, habitual performance of Valsalva manoeuvre and surgical procedures during which air is introduced into soft tissue spaces. It is a relatively uncommon complication of dental and oral surgical procedures. Introduction of air via the air-driven handpiece during surgical removal of impacted teeth is the most common

cause of subcutaneous emphysema.³ Less commonly, it results from non-surgical dental procedures including crown preparations, cavity preparations and root canal therapy. McKenzie and Rosenberg³ conducted a comprehensive search of the medical and dental literature from 1993 to 2008 and found 32 cases of subcutaneous emphysema associated with dental and oral surgical procedures. Of these cases only five related to endodontic therapy, of which two involved the orbital space. In most cases emphysema during root canal therapy resolves spontaneously after a few days.³ However, it can be a frightening and unpleasant experience for both patient and dentist. The purpose of this article is to present a case of periorbital emphysema encountered during root canal treatment and to alert dental practitioners to the presentation, diagnosis, management and prevention of this unusual complication.

CASE REPORT

A 54-year-old female patient, with unremarkable medical history, was referred to the department of Restorative Dentistry at Bristol Dental Hospital (BDH) for the management of a chronic sinus associated with her upper right central incisor (11). Clinical and radiographic examination showed that the 11 was previously root treated and restored with a post-retained crown. The crown margins were open and a chronic sinus tract was seen on the labial gingiva. The root canal filling was overextended

and there was a periapical radiolucency associated with the apex of the tooth. A diagnosis of chronic apical abscess⁴ was made and a decision to remove and replace the post-retained crown and existing root filling was taken.

In the first appointment, the crown was sectioned and removed, the tooth was isolated with a rubber dam and the cast post and core retrieved using ultrasonic vibrations. A temporary post-retained crown was fabricated and cemented using zinc-oxide eugenol cement (TempBond, Kerr, Peterborough, UK). In the second appointment, the tooth was isolated with a rubber dam and Hedstrom files (Dentsply, Weybridge, UK) were used to remove gutta percha from the apical third of the canal, which was then thoroughly irrigated with 0.2% chlorhexidine solution (Corsodyl, GlaxoSmithkline, Middlesex, UK). After that air from the 'three-in-one syringe' was used to remove excess irrigant solution from the access cavity/canal orifice to enhance the visibility of the operative field. Immediately following air blowing the patient complained of having 'a funny feeling' and discomfort in her right eye. On removal of her safety glasses, the patient's upper and lower right eyelids appeared swollen and pale. The swelling was painless, non-erythematous, non-tender and showed crepitus on palpation. The patient was unable to open her right eye and the right eyebrow was raised owing to severe swelling (Fig. 1). Her vital signs were normal and stable. The treatment was stopped

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and advice sought from a consultant in restorative dentistry at BDH, who recommended referral to an ophthalmologist. The patient was reassured and a diagnosis of periorbital emphysema was made. The temporary post-retained crown was recemented with 'TempBond' and the patient accompanied to the nearby eye hospital. The ophthalmologist excluded any visual disturbances and confirmed the diagnosis of periorbital emphysema. The patient was prescribed a course of prophylactic antibiotics (amoxicillin 500 mg TDS and metronidazole 200 mg TDS) for one week and sent home. The following day, the patient was contacted by phone and she reported that the swelling had become smaller and that she had started opening her right eye slightly. On day three, the patient was contacted again and she reported significant reduction in the size of the swelling. One week later the patient contacted us to say that her right eye was back to normal with no associated swelling. Two weeks later on her review appointment, the patient showed complete resolution of the swelling and normal opening of her right eye (Fig. 2). Treatment was then completed by placing MTA (ProRoot MTA, Dentsply, Weybridge, UK) in the apical 3 mm of the canal, followed by a new post-retained crown. The patient gave written consent to the publication of this report.

DISCUSSION

Subcutaneous emphysema occurs when air is introduced into the soft tissues as a result of a surgical procedure, a pathologic state or trauma. Its occurrence in conjunction with a dental procedure was first reported more than a hundred years ago when Turnbull extracted the premolar of a musician who blew his bugle immediately after extraction.⁵ Since then, subcutaneous emphysema has been reported in conjunction with various dental procedures such as restorative treatment,¹ root canal treatment,⁶ scaling⁷ and preparation and placement of crowns.⁸

Most cases of subcutaneous emphysema of endodontic origin occur following the use of air-driven handpieces,⁶ the use of H₂O₂ irrigation⁵ and the use of air syringe to dry the canal. In the present case, the patient developed periorbital emphysema immediately following the use of an air syringe to remove excess irrigant solution from the canal orifice. Most probably,



Fig. 1 A significant soft tissue swelling involving the upper and lower eyelids developed immediately after blowing air at canal orifice

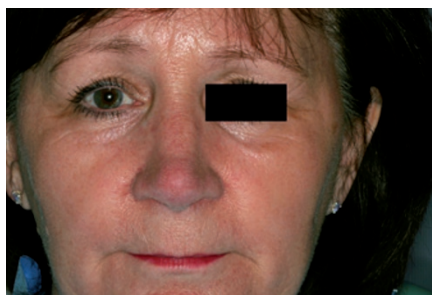


Fig. 2 Complete resolution of the swelling when patient was reviewed two weeks later

compressed air from the air syringe entered via the patent canal and passed to the periapical tissue where it penetrated through the labial cortical plate, underneath the periostium, and spread along the fascial planes to the periorbital space. The periorbital space offers low tissue resistance and therefore air accumulated readily in this space as was evident by the sudden onset of the swelling of upper and lower eyelids. It must be emphasised that compressed air from the water air syringe, used in the present case, was not meant to produce thorough canal drying or replace paper points, but rather to remove excess irrigant from the access cavity and canal orifice to enhance visibility of operative field. It is completely understood that paper points are the standard, safe and appropriate means of drying root canals. Therefore, compressed air should not be used even to remove excess solution from access cavities and canal orifices, as this can safely be accomplished using sterile cotton pellets and endodontic paper points.

In this case, the apical foramen was open by instrumentation and overfilling from the previous treatment. In addition, there was an associated periapical radiolucency that indicates reduced density of bone around the apex of the root. These two factors are expected to have facilitated the passage of air from the canal

into the alveolar bone and subsequently to the periorbital area to produce marked emphysema. Furthermore, the tooth presented with little coronal tooth structure, as it was restored with a cast post-retained crown. Therefore, pressurised air easily entered the canal, which resulted in an increased pressure into the canal and facilitated the subperiosteal spread of air into the periorbital space. Spread of pressurised air through the labial sinus tract or via the gingival sulcus is another possible route for the development of periorbital emphysema. In this case, however, this is unlikely because the tooth was properly isolated with a rubber dam.

Subcutaneous emphysema of endodontic origin may occur during or shortly after the procedure and usually presents as a localised soft skin-coloured swelling without redness.³ The pathognomonic sign of subcutaneous emphysema is crepitus on palpation, which allows one to quickly rule out anaphylactic reaction, angioedema, and haemangioma.³ Pain is a variable feature of subcutaneous emphysema and patients usually complain of discomfort due to soft tissue distension. In the present case, when the swelling was recognised it was initially thought to be an irrigation-related accident, but this was later ruled out because it was a painless and pale-coloured swelling. In addition, chlorhexidine was the irrigant of choice as sodium hypochlorite was avoided to prevent any possible consequences of its extrusion from the open apex of the root. After careful examination, the diagnosis of periorbital emphysema was reached as the patient developed pale swelling and crepitus following the introduction of air into the canal. This diagnosis was later confirmed by the ophthalmologist, who examined the patient within an hour of the development of the swelling. The swelling was, fortunately, limited to the subcutaneous tissues of the upper and lower eyelids and did not cause any orbital damage as shown by ophthalmic examination.

Management of subcutaneous emphysema is controversial due to the limited number of reported cases. In most cases, trapped air is absorbed in the course of three to seven days without active intervention. Most authors, however, recommend a course of prophylactic antibiotics, most commonly penicillin, to prevent

secondary infection from dissemination of oral flora along the emphysematous tract.⁷ Nevertheless, it should be noted that the practice of prescribing prophylactic antibiotics in cases of subcutaneous emphysema is based on empirical speculation rather than scientific evidence. Other authors reported that the administration of 100% oxygen via a nonbreather mask can hasten the resolution of emphysema because oxygen, which replaces the air, is more readily absorbed.⁹ In the present case, the patient was reassured and prescribed a short course of amoxicillin and metronidazole. The patient showed signs of satisfactory recovery following three days and the swelling resolved completely after seven days.

Most general dental surgeons will be unfamiliar with subcutaneous emphysema and may not be able to assess it fully. Therefore, when emphysema is suspected in general dental practice the patient should be referred to a local dental hospital for comprehensive assessment.

The occurrence of subcutaneous emphysema during root canal treatment is

unpredictable. Attention therefore should be paid to prevent this rare complication. Preventive measures include avoiding the use of direct compressed air to dry root canals. This is particularly true in situations where the roots have open apices or associated periapical lesions and where minimal coronal tooth structure is present. Other measures include using remote exhaust handpieces or electric motor driven ones and avoiding the use of hydrogen peroxide as a root canal irrigant.

CONCLUSION

Subcutaneous emphysema is a rare but potentially serious complication of root canal treatment. It is characterised by sudden onset of soft tissue swelling, associated with crepitus, during or shortly after the procedure. Introduction of compressed air into tissue spaces via patent canals, sinus tracts, soft tissue lacerations, or gingival sulcus is the underlying mechanism in most cases. Therefore, blowing compressed air into root canals should be avoided and paper points should be used to dry root

canals. The majority of cases are managed conservatively and patients should be advised as to the nature of emphysema.

1. Steelman R J, Johannes P W. Subcutaneous emphysema during restorative dentistry. *Int J Paediatr Dent* 2007; **17**: 228–229.
2. Uyanik L O, Aydın M, Buhara O, Ayalı A, Kalender A. Periorbital emphysema during dental treatment: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011; **112**: e94–96
3. McKenzie W S, Rosenberg M. Iatrogenic subcutaneous emphysema of dental and surgical origin: a literature review. *J Oral Maxillofac Surg* 2009; **67**: 1265–1268.
4. Patel S, Chong B S. Diagnosis. In Chong B S (ed) *Harty's endodontics in clinical practice*. 6th ed. pp 17–33. Edinburgh: Churchill Livingstone, 2010.
5. Shovelton S. Surgical emphysema as a complication of dental operations. *Br Dent J* 1957; **102**: 125–129
6. Kim Y, Kim M R, Kim S J. Iatrogenic pneumomediastinum with extensive subcutaneous emphysema after endodontic treatment: report of 2 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010; **109**: e114–119.
7. Frühauf J, Weinke R, Pilger U, Kerl H, Müllegger R R. Soft tissue cervicofacial emphysema after dental treatment: report of 2 cases with emphasis on the differential diagnosis of angioedema. *Arch Dermatol* 2005; **141**: 1437–1440.
8. Zemann W, Feichtinger M, Kärcher H. Cervicofacial and mediastinal emphysema after crown preparation: a rare complication. *Int J Prosthodont* 2007; **20**: 143–144.
9. Battrum D E, Gutmann J L. Implications, prevention and management of subcutaneous emphysema during endodontic treatment. *Endod Dent Traumatol* 1995; **11**: 109–114.