

Subcutaneous emphysema secondary to dental extraction: A case report

S Tan,* D Nikolarakos*

*Gold Coast University Hospital, Southport, Queensland, Australia.

ABSTRACT

Although less frequently encountered in dental practices, subcutaneous emphysema of the face and neck has been reported in patients following dental extractions, particularly when lower molar teeth are extracted with the use of a high-speed air-turbine drill designed for restorative treatment, which forces air into the cervical fascial spaces. As facial swelling and pain are the most common presentations, subcutaneous emphysema can often be misdiagnosed as an allergic reaction or odontogenic infection. While usually a benign and self-limiting condition, subcutaneous emphysema may have life-threatening complications such as tension pneumothorax, cardiac tamponade, air embolism, tracheal compression and mediastinitis, which are important to recognize in an emergency setting. Dentists should be aware of the serious risks of inducing subcutaneous emphysema and avoid performing tooth extractions with high-speed air-turbine drills which are specifically designed for use for restorative treatments only.

Keywords: Dental extraction, high-speed air-turbine drill, pneumomediastinum, subcutaneous emphysema.

(Accepted for publication 21 September 2016.)

INTRODUCTION

Subcutaneous emphysema and pneumomediastinum are often associated with head and neck trauma, surgical procedures, general anaesthetic or infections. It is a lesser known complication of dental extractions, due to the use of high-speed air-turbine handpieces causing air, bacteria, oil and debris to be forcefully injected into surrounding connective tissue.¹ The mechanism of subcutaneous emphysema, clinical presentation and treatment is discussed. Physicians and dentists should be aware of the potential life-threatening complications of subcutaneous emphysema of the face and neck and be able to differentiate it from an allergy or odontogenic infection.

CASE REPORT

A 33 year old female presented to the emergency department for oral and maxillofacial surgical review after developing painful right-sided cheek and neck swelling after a dental extraction earlier that day. After a failed endodontic treatment on her 46, the decision was made to extract it. Due to the prolonged time and difficulty extracting it with forceps, an air-turbine high-speed dental drill was used as an emergency measure to section the tooth and remove it.

The patient denied other medical conditions or regular medication use. On examination, she had slight right-sided cheek swelling extending down her neck to her clavicle, with surrounding erythema. Vital signs were within normal limits and she was afebrile. On palpation, crepitus was felt over her neck and upper chest wall (Fig. 1).

Head, neck and chest plain film X-ray showed subcutaneous emphysema within her neck, without spread to the mediastinum (Fig. 2). Orthopantomogram confirmed a recently extracted 46 (Fig. 3). Chest X-ray showed no free air in the mediastinum (Fig. 4). Blood tests showed a mildly elevated white cell count of 10.

The patient was admitted for close observation, analgesia and prophylactic I.V. antibiotics (amoxicillin and metronidazole). Her pain and swelling slowly improved and she was discharged after 2 nights.

DISCUSSION

Subcutaneous emphysema and pneumomediastinum can be defined as air in the soft tissues and mediastinum. It can result from iatrogenic, traumatic, infectious or spontaneous causes. Of these, iatrogenic causes are the most common, from head and neck surgery, intubation, general anaesthesia, coughing or Valsalva manoeuvres and mechanical ventilation.¹



Fig. 1 Clinical examination showing mild right-sided facial swelling.

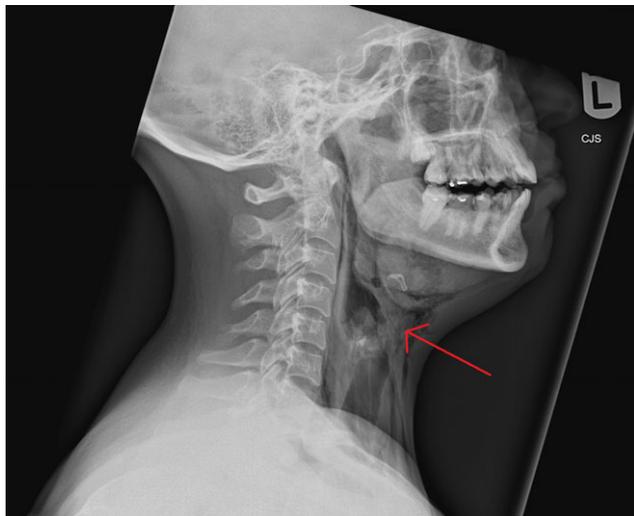


Fig. 2 Head and neck plain film X-ray showing air in the soft tissues of the neck.



Fig. 3 Orthopantomogram showing recently extracted 46.

Trauma-induced subcutaneous emphysema can result from facial bone fractures, intraoral trauma or barotrauma, in which air is forced into the surrounding soft tissues. This is commonly seen when patients with facial fractures sneeze or blow their nose. Infective processes in which gas-producing organisms involve the head and neck may also contribute. These include β -lactamase-producing and anaerobic gram-negative bacteria. In patients with previous pulmonary disease, weakening of the alveolar walls and increased intra-alveolar pressure increases risk of spontaneous subcutaneous emphysema.²

Subcutaneous emphysema after dental extraction is a rare complication, with the first reported case dating back to 1900.³ This usually results from the use of high-speed air-turbine dental drills used to section the tooth and remove surrounding alveolar bone during a surgical extraction.

High-speed dental air-turbine drills are designed to cut tooth structure whilst discharging air and water to cool the friction-induced heat at the cutting interface and wash away debris. They are designed primarily for dental restorative treatment, driven by compressed air and high rotational speeds up to 450 000 rpm.⁴ Due to the high pressures, compressed air and debris may be forced into the subcutaneous layer through the surgical wound or tooth socket when used in a surgical extraction to remove bone around a tooth or sectioning it. Although usually a local effect, if a large amount of air is injected, air can track into deeper structures via cervical fascial planes resulting in pneumomediastinum.

Roots of the molar teeth communicate directly with the sublingual and submandibular space. The sublingual space in turn communicates with the pterygo-mandibular, parapharyngeal and retropharyngeal space, the latter of which is the main route of communication from the oral cavity to the mediastinum.⁵

Subcutaneous emphysema has also occurred following root canal or periodontal treatment and dental



Fig. 4 Chest X-ray showing no free air in the mediastinum.

implants, as these procedures are more likely to disrupt the dentoalveolar membrane.⁶ Hydrogen peroxide has also been implicated in the development of subcutaneous emphysema during endodontic treatment.⁷

Differential diagnoses of neck swelling after dental procedures include haematoma, cellulitis, angioedema, allergic reaction and subcutaneous emphysema.⁸ Correct diagnosis is important to direct treatment and management. Symptoms may not always occur immediately, and a lag period for several hours may occur.

Characteristic findings on examination include crepitus on palpation and tenderness. Facial and neck swelling, dyspnoea, chest pain and odynophagia are the most common symptoms. Occasionally, brassy voice and dysphagia may be seen. The presence of free air in the retropharyngeal space may lead to Eustachian tube dysfunction and hearing loss, dysphonia and dysphagia. Retrosternal pain and dyspnoea may indicate pneumomediastinum. Hamman sign, a crunching or bubbling sound caused by movement or air accompanying cardiac pulsation may also be seen.⁹

Treatment of subcutaneous emphysema in the face and neck is usually conservative, with bedrest and reassurance, as the condition is generally benign and self-limiting. However, microorganisms from the oral cavity flora can easily migrate to the mediastinum, causing infective mediastinitis and sepsis.¹⁰ Subsequently, broad-spectrum antibiotics are administered to cover β -lactamase producing bacteria and gram-negative anaerobes.

Life-threatening consequences of air in the mediastinum include venous distention, hypotension, hypercarbia and acidosis. Tracheal compression, pneumopericardium, tension pneumothorax, air embolism and cardiac tamponade are also serious

complications.¹¹ Urgent surgical decompression may be required if cardiovascular collapse or large airway obstruction occurs.

Serial imaging may be indicated to monitor progression and extent of the emphysema, particularly if the condition fails to improve or worsens clinically. Computed tomography scans may be required in addition to plain films for further anatomical definition.

Dentists should be aware of the expected risk of this potentially serious complication occurring whenever high-speed restorative air-turbine drills are used during a surgical extraction, and therefore avoid using them. Surgical drills, which are designed to vent air away from the operative site, should always be used for dental extractions instead. Use of a rubber dam, vented high-speed devices or using sonic/ultrasonic hand drills can help minimize the risk of subcutaneous emphysema during endodontic procedures. Early recognition of a symptomatic patient after dental extraction should not delay immediate transfer to the hospital emergency department for further assessment.

REFERENCES

1. Yang SC, Chiu TH, Lin TJ, Chan HM. Subcutaneous emphysema and pneumomediastinum secondary to dental extraction: a case report and literature review. *Kaohsiung J Med Sci* 2006;22:641–645.
2. Rossiter JL, Hendrix RA. Iatrogenic subcutaneous cervicofacial and mediastinal emphysema. *J Otolaryngol* 1991;20:5.
3. Turnbull A. A remarkable coincidence in dental surgery. *Br Med J* 1900;1:1131.
4. Arai I, Takayuki A, Yamazaki H, *et al.* Pneumomediastinum and subcutaneous emphysema after dental extraction detected by regular medical checkup: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009;107:e33–e38.
5. Meyerhoff WL, Nelson R, Fry WA. Mediastinal emphysema after oral surgery. *J Oral Surg* 1973;31:477–479.
6. Falano O. Surgical emphysema following root canal therapy. *Oral Surg Oral Med Oral Pathol* 1984;58:101–102.
7. Kaufman A. Facial emphysema used by hydrogen peroxide irrigation: report of case. *J Endod* 1981;7:470–472.
8. Chen SC, Lin FY, Chang KJ. Subcutaneous emphysema after dental extraction. *Am J Emerg Med* 1999;17:678–680.
9. Samuels TL. Rare complications of surgical emphysema and pneumomediastinum occurring post dental extraction. *Postgrad Med J* 2009;85:1006.
10. Reznick JB, Ardry WC. Cervicofacial subcutaneous emphysema after dental extraction. *J Am Dent Assoc* 1990;120:417–419.
11. Goodnight JW, Servaraz JA, Wang MB. Cervical and mediastinal emphysema secondary to third molar extraction. *Head Neck* 1994;16:287–290.

Address for correspondence:

*Dr Stephanie Tan
Gold Coast University Hospital
1 Hospital Boulevard
Southport, Qld 4215
Australia
Email: stephtan88@gmail.com*