

SUBCUTANEOUS FACIAL EMPHYSEMA COMPLICATING DENTAL ANAESTHESIA

B. MILNE, HOWARD KATZ, JOSÉ K. ROSALES, I.K. ASSIMES AND STEPHANE SCHWARTZ

ABSTRACT

A 20 year-old female developed swelling and protrusion of the tongue and marked facial swelling while under general anaesthesia for dental restoration and gingivectomy. The initial diagnosis was angioedema; however x-rays showed marked subcutaneous emphysema more extensive in the perimandibular area with a minimal amount in the neck. There was no evidence of pneumomediastinum or pneumothorax. The iatrogenic subcutaneous emphysema was felt to be due to air-driven dental equipment. Tracheal intubation was maintained for 21 hours to prevent airway obstruction. The patient was treated with oxygen and antibiotics. Subcutaneous emphysema may occur following root canal therapy, tooth extraction, periodontal surgery and operative dentistry, due to the use of air-driven dental equipment. It has the potential to cause obstruction.

KEY WORDS: SURGERY, dental; COMPLICATIONS, emphysema; ANAESTHETICS, nitrous oxide.

SUDDEN SWELLING of the face during dental rehabilitation may herald the onset of subcutaneous emphysema, although other conditions such as angioedema must be considered. Subcutaneous emphysema has been reported to occur following dental procedures including root canal therapy,¹ tooth extraction,² periodontal surgery³ and operative dentistry^{4,6} subsequent to the use of high speed air-driven drills, air-water syringes, or gas producing solutions.⁷ Other causes of subcutaneous emphysema in the facial region include facial trauma; injury to the larynx, trachea or alveoli; rarely tonsillectomy,⁸ and even spontaneously as a result of sneezing or blowing a musical wind instrument.⁹

As most of the reported cases of subcutaneous emphysema during dental therapy have occurred in the dental office and were without complication, we report our experience of a case of subcutaneous emphysema following dental treatment under general anaesthesia which could have led to a problem in maintaining the airway.

B. Milne, M.D., M.Sc., F.R.C.P.(C), Fellow; Jose K. Rosales, M.D., F.R.C.P.(C), Anaesthetist in chief; I.K. Assimes, M.D., Department of Anaesthesia. Howard Katz, Ph.D., D.D.S., Director, Dental Pharmacology; Stephen Schwartz, D.D.S.M.S., Assistant Professor of Pedodontics; Montreal Children's Hospital and McGill University, Montreal, Canada.

Correspondence and reprint requests to: Dr. J.K. Rosales, Anaesthetist-in-Chief, Montreal Children's Hospital, 2300 Tupper Street, Montreal, Canada H3H 1P3.

CASE HISTORY

A 20 year-old 38 kg white female with cerebral palsy, mental retardation and a seizure disorder was admitted for dental restoration, extractions and gingivectomy to be done under general anaesthesia. Medications included methsuximide 300 mg TID, phenobarbitone 30 mg BID and 60 mg HS, mephenytoin 100 mg TID and dicyclomine 10 mg TID. There was no history of allergy and the patient had had four previous general anaesthetics for dental work without a problem. Physical examination was unremarkable except for decreased strength in all limbs, jerky limb movements, gingival hypertrophy and poor oral condition. Haemoglobin, electrolytes, and blood urea nitrogen were normal.

The patient was not premedicated and anaesthesia was induced with thiopentone 375 mg and atropine 0.4 mg intravenously followed by halothane 0.5–2.5 per cent in oxygen. A 7.0 mm cuffed nasotracheal tube was inserted atraumatically with the patient breathing spontaneously. Anaesthesia was maintained with halothane 1.5–1.0 per cent in nitrous oxide-oxygen 3:3. The dental procedure consisted of calculus removal with an ultrasonic Cavitron (45 min), operative dentistry with a conventional high speed drill and air-water syringe (amalgam restorations in four quadrants and composite restorations in upper and lower anterior segments, 1.25 hr) and a full mouth gingivectomy

accomplished by an electrosurgery technique with intraoral suction (1 hr).

While the dental surgeon was preparing to extract the teeth after the gingivectomy, the patient's tongue appeared to suddenly protrude from the oral cavity to the point that visual access to the teeth was difficult. At the same time the cheeks, mandibular, submandibular and periorbital tissues were noted to be extremely distended and tense (Figure 1). No creptitus was elicited. The halothane and nitrous oxide were discontinued and the four dental extractions were done quickly. There was no decrease in blood pressure, change in heart rate, or other evidence of swelling, oedema or urticaria. An initial diagnosis of angioedema was made and diphenhydramine 50 mg and hydrocortisone 100 mg were given.

The patient was then transferred to the intensive care unit breathing spontaneously with the tracheal tube in place. Half an hour later, when the swelling seemed to have decreased slightly, creptitus could be elicited over the face and eyelids. A chest x-ray was normal with no evidence of pneumothorax or pneumomediastinum. Antero-posterior and lateral x-rays of the neck showed widespread subcutaneous emphysema more extensive in the perimandibular area with a minimal amount in the neck.



FIGURE 1 Subcutaneous facial emphysema with protrusion of the tongue.

A diagnosis of subcutaneous emphysema was made. Oxygen was administered through a T-piece and intravenous penicillin therapy was instituted. The facial swelling diminished over several hours and the trachea was extubated 21 hr later with no sequelae due to the subcutaneous emphysema.

DISCUSSION

The portal of entry of the air causing the subcutaneous emphysema in this patient is somewhat enigmatic. Other reports of facial subcutaneous emphysema^{1,3,5,13,14} have stated that the swelling occurred shortly or immediately after the use of high speed drills or air-water syringes. In this case, these devices had last been used approximately one hour before discovery of the emphysema. These instruments are powered by compressed air and, in the case of the high speed drill, some air may be directed towards the drill point to cool the burr. It is possible that the subcutaneous emphysema commenced with the operative dentistry with air passing subperiosteally into the submandibular tissues which was unnoticed until there was enough air in the soft tissues at the base of the tongue to displace it forward and to alert the dentist. Continued use of nitrous oxide may have exacerbated the emphysema, as more nitrous oxide would enter into the air space than nitrogen would diffuse out. Similarly, Rosenberg, *et al.*¹⁰ reported a case of iatrogenic subcutaneous emphysema during dental anaesthesia where left-sided facial swelling was noted before tracheal extubation. The tongue was also raised slightly anteriorly. There was no respiratory impairment. The trachea was extubated and the patient was placed in a mist tent. The authors advocate the use of clear plastic drapes to aid in observation of the patient during operation.

The possibility exists that the subcutaneous emphysema may have arisen from injury to the pharyngeal or tracheal mucosa. This would appear unlikely as the bulk of the air was in the submandibular area with little in the neck and there was no pneumomediastinum or pneumothorax.

The initial diagnosis of angioedema was made because of the marked swelling which appeared to involve the tongue. In retrospect, the tongue was probably pushed forward by air in the floor of the mouth. The possibility of haematoma was also considered. The marked swelling and protrusion of the tongue (Figure 1) would no doubt

have led to difficulty in maintaining the airway had the trachea not been intubated already.

Thus we report that subcutaneous emphysema arising from dental therapy may pose potentially lethal problems due to airway obstruction. Pneumomediastinum,¹ and fatal air embolus¹¹ may also arise from the use of air-driven drills and air-water syringes. Treatment of subcutaneous emphysema consists of protection of the airway by tracheal intubation if necessary, administration of oxygen to aid in denitrogenation and antibiotic administration, as infection can be a serious complication.¹²

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of M. Szasz in typing the manuscript.

REFERENCES

1. LLOYD, R.E. Surgical emphysema as a complication in endodontics. *Brit. Dent. J.* 138: 393 (1975).
2. RHYMES, R. Postextraction subcutaneous emphysema. *Oral Surg.* 17: 271-273 (1964).
3. SNYDER, M.B. & ROSENBERG, E.S. Subcutaneous emphysema during periodontal surgery: report of a case. *J. Periodontol.* 48: 790-791 (1977).
4. HAYDUK, S., BENNETT, R.C. & MONHEIM, L.M. Subcutaneous emphysema after operative dentistry: report of a case. *J. Amer. Dent. Assoc.* 80: 1362 (1970).
5. GEFNER, I. Subcutaneous facial emphysema following an amalgam restoration. *Brit. Dent. J.* 148: 192 (1980).
6. DUNCAN, J.M. & FERRILLO, P.J. Interstitial emphysema after a restoration. *J. Amer. Dent. Assoc.* 74: 407-409 (1967).
7. WALKER, J.E.G. Emphysema of soft tissue complicating endodontic treatment using hydrogen peroxide: a case report. *Brit. J. Oral Surg.* 13: 98 (1975).
8. PRUPAS, H.M. & FORDHAM, S.D. Emphysema secondary to tonsillectomy. *Laryngoscope* 87: 1134-1136 (1977).
9. BRADY, F.A., ROSE, S.M. & HIESHIMA, G.B. Orbital emphysema. *Brit. J. Oral Surg.* 14: 65-71 (1976).
10. ROSENBERG, M.B., WUNDERLICH, B.K. & REYNOLDS, R.N. Iatrogenic subcutaneous emphysema during dental anesthesia. *Anesthesiology* 51: 80-81 (1979).
11. RICKLES, N.H. & JOSHI, B.A. Death from air embolism during root canal therapy: a possible case in a human and an investigation in dogs. *J. Amer. Dent. Assoc.* 67: 397-404 (1963).
12. FEINSTONE, T. Infected subcutaneous emphysema: report of a case. *J. Amer. Dent. Assoc.* 83: 1309 (1971).
13. CHARLEBOIS, P.A. Three unusual cases of emphysema. *Can. Anaes. Soc. J.* 11: 104-105 (1964).
14. CHARLEBOIS, P.A. Danger from the dental drill. *Can. Anaes. Soc. J.* 11: 190-191 (1964).

RÉSUMÉ

Au cours d'une chirurgie dentaire avec gengivectomie, effectuée sous anesthésie générale chez une patiente de vingt ans, on a observé un œdème et une protusion de la langue ainsi qu'un œdème marqué de la face. Le diagnostic initial a été celui d'œdème angio-neurotique. Cependant à la radiographie on a pu observer un emphysème sous-cutané important à la région péri-maxillaire et, à un degré moindre, au niveau du cou. On n'a pas trouvé de signes de pneumomédiastin ou de pneumothorax. Cet emphysème sous cutané a été considéré de cause iatrogénique, et a été attribué à l'équipement dentaire actionné à l'air comprimé. La patiente a été gardée intubée durant vingt et une heures en vue de prévenir l'obstruction des voies respiratoires, de l'oxygène lui était administré par tube en T durant cette période. Son traitement incluait également des antibiotiques. Un emphysème sous-cutané peut survenir au cours de traitements de canaux, d'extractions dentaires ou de chirurgie dentaire ou péri-dentaire lorsque le chirurgien utilise un équipement actionné à l'air comprimé.