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Pneumomediastinum secondary to use of a high speed air turbine drill during a dental extraction

J Torres-Melero, J Arias-Diaz, J L Balibrea

Abstract

Pneumomediastinum and subcutaneous emphysema of the neck and thorax can occur exceptionally following a dental procedure. A case is described of acute subcutaneous emphysema of the lateral region of the neck and thorax associated with pneumomediastinum during a dental extraction with an air and water cooled turbine burn drill.

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Keywords: subcutaneous emphysema, pneumomediastinum, dental surgery.

Subcutaneous and mediastinal emphysema have occasionally been reported after various dental and oral surgical procedures such as endodontic therapy, dental extraction, and facial fracture.¹ Nevertheless, the occurrence of these conditions after dental treatment with compressed air equipment is rare.^{2,3}

Case report

A previously well 29 year old man was referred from a dental clinic with acute severe retrosternal pain, dyspnoea, sensation of discomfort, and a sudden swelling around the eyes and over the cheeks, neck, and anterior chest wall following a dental extraction of the lower right third molar with the use of a high speed air turbine drill (250 000 rpm, 4-5 bars air pressure). The patient did not have any pre-existing lung disease nor chest problems. Physical examination revealed major facial and thoracic subcutaneous emphysema. There was no evidence of airway, oesophageal, or abdominal injury. His vital signs on presentation to the hospital showed a blood pressure of 130/90 mm Hg, heart rate of 115 beats per minute, respiratory rate of 18 breaths per minute, and temperature of 36.8°C. His voice was "brassy". His white blood cell count, haematocrit, and

blood biochemical profile were normal, as was the electrocardiogram. The chest radiograph showed pneumomediastinum and subcutaneous emphysema with mediastinal air dissecting into the neck and supradiaphragmatically. A pneumothorax, however, was not present. An oesophageal contrast study using Gastrografin was performed to exclude any lesion of the aerodigestive tract which showed no abnormalities. A conservative approach was adopted with parenteral nutrition, no oral feeding, and empirical antibiotic therapy with clindamycin 600 mg and gentamicin 100 mg, both intravenously, every eight hours. The mediastinal air disappeared by the fifth day and the patient was discharged well on day 7.

Discussion

Subcutaneous and mediastinal emphysema is a well recognised entity after trauma or any surgical procedure of the respiratory and alimentary tracts, anaesthetic measures, infections with gas-forming bacteria, and it may also occur spontaneously.^{4,5} Mediastinal emphysema associated with a dental procedure was first reported in 1900 by Turnbull. Iatrogenic mediastinal emphysema may result from inappropriate use of dental equipment powered by highly compressed air. The high speed dental drill and the air and water dental syringe are the instruments most frequently involved in these cases.^{6,7}

The roots of the first, second, and third molars communicate directly with the sublingual and submandibular spaces. The sublingual space is also in communication with the pterygomandibular, parapharyngeal, and retropharyngeal spaces. The pressurised air may enter the gums beneath the periosteum of the mandible and dissect through the cervical facial planes into the mediastinum.⁵⁻⁹

Mediastinal emphysema caused by the introduction of air with the use of a high speed air turbine drill is usually harmless but complications including infection, pneumothorax, pneumopericardium, air embolism, pneumoperitoneum, and orbital emphysema with optic nerve damage have occasionally been reported.¹⁰ Because there is a potential for mediastinitis, antibiotic therapy is recommended.⁷⁻¹⁰ Urgent surgical decompression may be required if cardiovascular collapse or large airway obstruction occurs.

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Department of Surgery, Hospital Clinico San Carlos, Complutense University, Madrid, Spain

J Torres-Melero
J Arias-Diaz
J L Balibrea

Correspondence to:
Dr J Torres-Melero,
Hospital Universitario San Carlos, Departamento de Cirugia, Avda Martin Lagos s/n, 28040 Madrid, Spain.

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Commentary

J E Harvey

These two case reports illustrate some interesting points in both the aetiology and management of pneumothorax.

Fortunately pneumothorax is rare during pregnancy and usually occurs in patients with normal lungs, apart of course from any associated leaking subpleural bleb or bulla. Lymphangiomyomatosis, neurofibromatosis, and choriocarcinoma are rare conditions that may cause a haemorrhagic or chylous pleural effusion during pregnancy, with or without an associated pneumothorax. The changes in alveolar ventilation mentioned, and particularly the increase in intrathoracic pressures generated by repeated Valsalva manoeuvres during labour, will all tend to increase the chance of rupture of weak areas on the visceral pleural surface. More than one third of pneumothoraces occur within a few weeks of term so that a chest drain can be inserted to cover the increased ventilation and raised intrathoracic pressures associated with labour, followed if necessary by definitive surgery after delivery.

The case reported by Levine is unusual with a pneumothorax occurring at 32 weeks, so that once it had recurred despite adequate intercostal drainage and a well positioned second drain continued to bubble, the patient was faced with either two months of intercostal drainage or immediate thoracotomy. The use of a flutter bag system, however, allowed outpatient management until normal labour could proceed, subsequently followed by elective ligation of the apical bulla. I have always had reservations about the use of flutter bags on an outpatient basis in case of sudden failure of the flap valve system and development of tension pneumothorax. However, the system used in this case is well designed and seems safe and would certainly have advantages over a urinary catheter and a bottle of Evian water!¹

It is reassuring to note the absence of any infection of the skin or pleura despite the use of the flutter bag for eight weeks. Once an intercostal drain has been in position for over a week a tract often develops around the insertion hole allowing air to be sucked in during inspiration which may necessitate reinsertion of the drain or encourage earlier definitive surgery.

This does not, however, appear to have been a problem in the case described.

The length of time air continues to bubble rather than the initial size of a pneumothorax seems to determine the likely need for surgery,² and this case would normally have required much earlier surgical intervention. Because of the high risk of enlarging or tension pneumothorax developing during labour, prior thoracotomy and resection of apical blebs has been advocated and even intrapartum thoracotomy has been safely undertaken in a few cases. There is no evidence of any teratogenic effect of anaesthetic drugs nor of any increased risk of spontaneous abortion or premature labour following general anaesthesia in pregnancy, but there have also been no reports of pneumothorax or pneumomediastinum causing maternal or fetal death since 1908 and 1949, respectively.³ Should observation, simple aspiration, or intercostal tube drainage fail, then within a few weeks of term intercostal drainage – perhaps using the flutter bag system – should be continued until delivery to guard against the development of tension pneumothorax during labour. Pneumothorax occurring during pregnancy is associated with a higher than usual recurrence rate so that surgical management should always be considered, especially in those (about 20%) who have a previous history of pneumothorax. In those cases who appear to resolve spontaneously or following aspiration or drainage, careful monitoring during the subsequent labour is essential.

In the case described by Levine a choice had to be made between ligation of a bulla and pleurectomy through a thoracotomy or thoracoscopic approach eight weeks from term, or leaving a chest drain in position for eight weeks pending definitive surgery postpartum. The risk of surgery and general anaesthesia at 32 weeks into a pregnancy was deemed to be greater than the risk of a further eight weeks of intercostal drainage using the flutter bag system for the rest of the pregnancy and, of course, throughout labour. This was a difficult choice and I suspect opinions would be divided as to the relative risks to mother and baby, though clearly the results in this case are reassuring.

Both pregnancy and labour may be complicated by the development of pneumomediastinum, but Torres-Melero and colleagues remind us of one of the many other unusual causes of this condition which they also describe as iatrogenic mediastinal emphysema. The presence of air in the mediastinum should always alert clinicians to the possibility of