Spontaneous subcutaneous and mediastinal emphysema – a complication of lung function tests in *Pneumocystis carinii* pneumonia

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Summary: A case is described of subcutaneous and mediastinal emphysema developing as a complication of lung function tests in an immunocompromised patient with presumed *Pneumocystis carinii* pneumonia.

Introduction

Subcutaneous emphysema and pneumomediastinum have been associated with blunt or penetrating trauma, soft tissue infections or any condition that creates a pressure gradient between the perivascular interstitial and intra-alveolar spaces. The development of mediastinal and subcutaneous emphysema following lung function tests is an unusual complication which prompted this clinical report.

Case report

A 66 year old woman with Stage IV B lymphocyte depleted Hodgkin's disease went into complete remission with six courses of cytotoxic chemotherapy using a combination of doxorubicin, vinblastine, bleomycin (total dose 90 mg) and prednisolone. She was a non-smoker and had no history of lung disease and her chest X-ray at presentation of her disease was normal.

She was admitted 3 weeks after her final course of cytotoxics with progressive shortness of breath and a dry cough, having failed to respond to a course of amoxycillin. Clinically she was dyspnoeic at rest, not cyanosed, with a relatively silent chest. A chest X-ray showed extensive bilateral parenchymal lung shadowing suggestive of an opportunistic chest infection. Sputum examination revealed no abnormality and *Aspergillus* precipitin test and complement fixation tests against viral and

other microorganisms were negative. Her general condition and respiratory status did not permit an open lung biopsy or bronchial brushings and a presumptive diagnosis of *Pneumocystis carinii* pneumonia was made, treatment being initiated with oral cotrimoxazole, 120 mg/kg/day.

Lung function tests were performed (they showed a restrictive defect) but had to be curtailed because of an acute increase in shortness of breath

Figure 1 Subcutaneous and mediastinal emphysema following lung function tests.

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during the procedure. There was no history of chest pain, or a bout of coughing. Approximately 20 hours later she was noted to have obvious crepitus in the subcutaneous tissues of the neck and chest wall. A chest X-ray confirmed extensive subcutaneous and mediastinal emphysema with no evidence of pneumothorax (Figure 1). This complication did not cause her any further distress and disappeared spontaneously over the next 3 weeks. During this period and for a further 3 weeks, she was maintained on high dose oral cotrimoxazole with clinical improvement and gradual radiological resolution of the pulmonary parenchymal shadowing substantiating a diagnosis of *Pneumocystis carinii* pneumonia.

Discussion

The basic requirement for the development of spontaneous pneumomediastinum and subcutaneous emphysema is the existence of a pressure gradient between the alveolus and its surrounding structures. Such a gradient is created under certain clinical conditions which result in either an increase in intra-alveolar pressure or a decrease in perivascular interstitial pressure or both.¹ This results in alveolar rupture with the introduction of air into the perivascular adventitia leading to interstitial emphysema which may be complicated by the development of a tension pneumomediastinum, tension pneumothorax and air block. Mediastinal emphysema has been described in a variety of clinical situations including parturition,² the administration of general anaesthesia³ and acute bronchial asthma⁴ as well as occurring in apparently healthy subjects with no underlying pulmonary disease.⁵

The development of mediastinal and subcutaneous emphysema after routine spirometric studies has been reported once previously in a healthy young adult male when a maximal inspiratory effort with breath holding before forced

expiration was thought to have created a significant pressure gradient between the alveolus and the interstitium, resulting in rupture.⁶ Similarly, prolonged and repeated Valsalva manoeuvres are reported to have caused interstitial emphysema in a healthy college student in association with marihuana smoking.⁷

Macklin and Macklin⁸ have emphasized the marked predisposition to alveolar disruption when there is pre-existing infiltration, either infective or inflammatory, of the pulmonary parenchyma. We postulate that in our patient *Pneumocystis carinii* pneumonia was a predisposing factor in the development of interstitial emphysema following the respiratory manoeuvres associated with lung function tests. *Pneumocystis carinii* pneumonia has been associated with pneumomediastinum and pneumothorax in infants⁹ but Doppman *et al.*¹⁰ in a review of the atypical radiographic features in 30 cases of *Pneumocystis carinii* pneumonia specifically note a total absence of spontaneous pneumothorax in adults. However, in recent reports^{11,12} *Pneumocystis carinii* pneumonia has been demonstrated to cause lung tissue destruction and spontaneous pneumothorax in patients with the acquired immunodeficiency syndrome. In our patient there was no evidence of cavity lesions or pneumothorax.

As in most cases of non-traumatic mediastinal and soft tissue emphysema, our patient responded to conservative management with a favourable clinical outcome. Although mediastinal emphysema is in general a benign condition, it may be prudent to suggest caution in performing lung function tests in critically ill patients with opportunistic lung infection where it seldom aids in the management.

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