British Journal of Obstetrics and Gynaecology
May 1980. Vol. **87.** pp 440–443

MEDIASTINAL AND SUBCUTANEOUS EMPHYSEMA IN A PREGNANT PATIENT WITH ASTHMA

CASE REPORT

BY

W. M. HAGUE, *Lecturer*

Department of Medicine, Northern General Hospital, Sheffield

Summary

A pregnant patient with asthma developed mediastinal and subcutaneous emphysema in the third trimester. The aetiology, diagnosis and management of mediastinal emphysema are discussed.

MEDIASTINAL emphysema is a rare, but well recognised, complication of labour (Spellacy and Prem, 1963). It is also well known as an unusual complication of bronchial asthma (D'Assumpçao and Smith, 1967). Several cases have been described in early pregnancy but no other record of the condition complicating status asthmaticus in the third trimester has been found.

CASE REPORT

Mrs L.P., 20 years old, had a 14-year history of asthma, with several admissions to hospital in status asthmaticus. Her regular treatment included salbutamol orally and by inhalation, and beclomethasone by inhalation. On several occasions, she had been treated with oral prednisolone, the last being at Christmas 1978. In February, 1979, she was admitted at 20 weeks in her first pregnancy with a history of cough, sputum and breathlessness for one week; these symptoms had not responded to intravenous aminophylline, oral diazepam and prednisolone, prescribed by her general practitioner. On examination, she had a tachycardia (132/minute) with inspiratory and expiratory rhonchi. Although the accessory muscles of respiration were active, the patient was able to talk. She improved rapidly on intravenous hydrocortisone and aminophylline, with oxygen, followed by oral prednisolone, and was discharged home after six days on her previous therapy with the introduction of sodium cromoglycate by insufflation. She was readmitted at 30 weeks gestation with a history of dyspnoea of sudden onset 24 hours previously; the dyspnoea had not responded to intravenous aminophylline. The asthma was of similar severity to her previous admission. The pregnancy was otherwise proceeding normally. The patient was treated with a salbutamol infusion, intravenous hydrocortisone and ampicillin, oxygen, physiotherapy and nebulised salbutamol by patient-triggered intermittent positive pressure ventilation (IPPV) at a pressure of 10 to 15 cm water using a Bird ventilator, to which she initially responded well. Thirty-six hours after admission, and ten hours after her third IPPV treatment, the patient complained of the sudden onset of pain in both shoulders and the neck, particularly on the left, with an associated increase in dyspnoea. On examination, there was marked subcutaneous emphysema of the left supraclavicular fossa which spread into the anterior cervical triangle. There was no change in chest signs and the peak expiratory flow rate remained static at 85 l/minute. A chest X-ray (Fig. 1) showed mediastinal emphysema radiating into the neck with some basal band shadows, but no evidence of pneumothorax. Cloxacillin and oral prednisolone in high dosage were added to the treatment and the patient was observed closely. She improved over the next few days with reducing doses of prednisolone

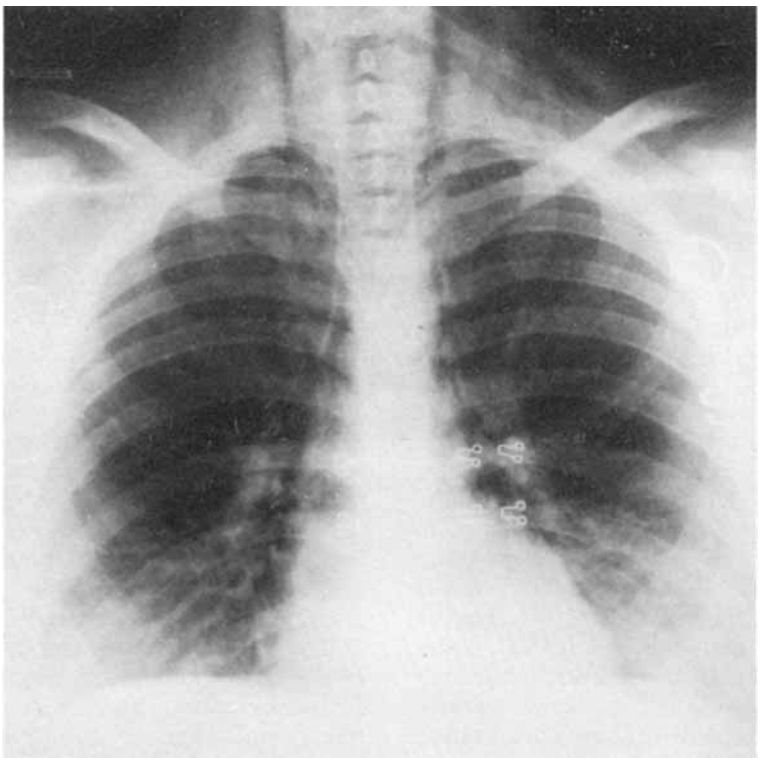

FIG. 1
Chest X-ray one hour after onset of chest pain showing pneumomediastinum.

and was discharged home after 10 days. By 15 days, there was no evidence of residual emphysema and the chest was completely clear, clinically and radiologically. Prednisolone was stopped and the patient maintained on beclomethasone by inhalation and cromoglycate by insufflation. There were no more respiratory problems in the remainder of the pregnancy, but the patient developed mild pre-eclampsia at 36 weeks gestation and was admitted for bed rest and observation. Labour was induced at 38 weeks, in view of persistent mild hypertension. Epidural anaesthesia was used both to lower the blood pressure and to facilitate the elective forceps delivery of a live male infant (3·49 kg) to minimise maternal pushing and resulting increased intrapulmonary pressures. There have been no further asthmatic episodes to date.

DISCUSSION

Mediastinal emphysema in pregnancy is uncommon. Estimates of the incidence range from 1:2000 (Spellacy and Prem, 1963; Kosmak, 1925) to 1:100 000 (Kobak and Abrams, 1949) deliveries. It is known to complicate the second stage of labour (Spellacy and Prem, 1963; Gordon, 1927; Bard and Hassini, 1975) and has been described as a rare complication of hyperemesis in early pregnancy (Friend, 1966; Compton and Bazin, 1957; Gray and Hanson, 1966), following general anaesthesia for Caesarean section (Gray and Hanson, 1966) and after a bout of persistent coughing in pregnancy (Kobak and Abrams, 1949).

The condition is thought to result from an increase in intrathoracic pressure leading to the rupture of an alveolus with consequent leakage of air along the vascular sheaths to the hilum and into the mediastinum (Macklin and Macklin, 1944). Other known causes include tracheal or oesophageal rupture, often following instrumentation or trauma; entry of air to the neck

from the deep fascial planes, following surgery or trauma, or from the retroperitoneal space via the periaortic tissues following perforation of stomach or intestine. It is a well known, if uncommon, complication of bronchial asthma, particularly in young children (D'Assumpçao and Smith, 1967) and is also described in pneumonia, whooping cough, bronchitis and following inhalation of foreign bodies into the bronchial tree—all presumably causing partial bronchial obstruction with consequent alveolar overdistension and rupture. It also occurs spontaneously in perfectly healthy people at rest (Gray and Hanson, 1966). The use of patient-triggered IPPV to deliver a nebulised aerosol of bronchodilator substances at low pressures is not thought to be a significant aetiological factor (I. W. B. Grant, 1979, personal communication).

Clinically, the main symptom is usually pain, often following a bout of coughing or vomiting; it is retrosternal and may radiate to the shoulders and down both arms; it is sharp and often aggravated by inspiration or by lying flat. There may be a sensation of constriction associated with dyspnoea and acute anxiety. However, there may be no symptoms at all or, at most, a sensation of some swelling in the neck.

The cardinal sign is subcutaneous emphysema, either palpated or elicited as a superficial crackling sound on auscultation. The apex beat may not be palpable, cardiac dullness may be reduced and the heart sounds may be distant. Hamman's sign (Hamman, 1945)—a 'crunching' noise, synchronous with the heart beat—may be heard, usually at the left sternal edge, varying in intensity with posture, being loudest with the patient sitting up or lying on the left side. A small pneumothorax is often present, usually on the left. There may be associated signs related to any underlying aetiology, such as pneumonia, trauma.

The diagnosis is confirmed by chest radiography. Air in the mediastinum may be seen (Macklin and Macklin, 1944) as a sharp distinct line running parallel to the left border of the heart in the postero-anterior view. The lateral will usually reveal substernal air, which may displace the oesophagus or larynx. The ECG is usually within normal limits but 25 per cent of patients may show non specific changes such as T wave inversion, ST segment deviation, decreased voltage or axis shifts (Macklin and Macklin, 1944).

Spontaneous mediastinal emphysema may be benign and self limiting, usually clearing within a week (Gray and Hanson, 1966). However, the condition described as 'malignant pneumomediastinum' (Macklin and Macklin, 1944) may rarely develop with increasing mediastinal pressure, as in a tension pneumothorax. The patient is shocked, dyspnoeic and cyanosed with engorged neck veins, tachycardia and low blood pressure. Unless relieved, pulmonary oedema, circulatory failure and death ensue.

Treatment of spontaneous mediastinal emphysema is conservative and expectant, with analgesia and oxygen therapy. Associated pneumothoraces should be drained via an underwater seal if causing respiratory embarrassment, or, if the lung is more than 25 per cent collapsed. 'Malignant pneumomediastinum' requires urgent release of the air, either via a needle inserted parallel to the deep surface of the sternum in the third or fourth intercostal space (Collins, 1948), or by multiple incisions over the subcutaneous tissues where the air has accumulated (Gray and Hanson, 1966). Cervical mediastinotomy or even splitting the sternum may be necessary (Hamman, 1945). Endotracheal intubation and positive pressure ventilation may be of benefit in these severe cases. Other associated lesions need the appropriate therapy.

The prognosis of the benign spontaneous lesion is excellent, although recurrence has been reported and two deaths have been documented (Gordon, 1927).

In those cases where mediastinal emphysema occurs in pregnancy, elective forceps delivery is recommended to minimise increased intrapulmonary pressure as a result of straining.

ACKNOWLEDGEMENTS

I am grateful to Professor D. S. Munro, Professor I. D. Cooke and Dr A. Singer for permission to report this patient.

REFERENCES

Bard, R., and Hassini, N. (1975): Pneumomediastinum complicating pregnancy. *Respiration*, **32**, 185–8.

Collins, V. L. (1948): Mediastinal emphysema. *Med J Aust*, **1**, 614–8.

Compton, B. C., and Bazin, F. J. (1957): Subcutaneous emphysema in early pregnancy. *Am J Obstet Gynecol*, **74**, 1141–2.

D'Assumpçao, C., and Smith, W. G. (1967): Spontaneous mediastinal and subcutaneous emphysema complicating bronchial asthma. *Med J Aust*, **1,** 328–30.

Friend, J. R. (1966): Subcutaneous emphysema in early pregnancy. *J Obstet Gynaecol Br Commonw*, **73,** 849–52.

Gordon, C. A. (1927): Respiratory emphysema in labor with two new cases and a review of 130 cases in the literature. *Am J Obstet Gynecol*, **14,** 633–46.

Gray, J. M., and Hanson, G. C. (1966): Mediastinal emphysema: aetiology, diagnosis and treatment. *Thorax*, **21,** 325–32.

Hamman, L. (1945): Mediastinal emphysema. *JAMA*, **128,** 1–6.

Kobak, A. J., and Abrams, R. H. (1949): Pregnancy complicated by massive subcutaneous emphysema of mediastinal origin (Hamman's syndrome). *Am J Obstet Gynecol*, **57,** 789–92.

Kosmak, G. W. (1925): Subcutaneous emphysema following labor. *Surg Gynecol Obstet*, **40,** 434.

Macklin, C. C., and Macklin, M. T. (1944): Malignant interstitial emphysema of the lungs and mediastinum. *Medicine*, **23,** 281–358.

Spellacy, W. N., and Prem, K. A. (1963): Subcutaneous emphysema and pregnancy. *Obstet Gynecol*, **22,** 521–30.