

Bilateral pneumothorax after emergency tracheotomy: two case reports and a review of the literature

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Abstract

Bilateral pneumothorax may occur after emergency tracheotomy, if a significant upper airway obstruction with a large negative intrathoracic pressure exists.

Key words: Tracheotomy; Pneumothorax

Case report

Case 1

A six-year-old girl was admitted to hospital with acute stridor. She was known to have laryngeal papillomatosis and had had four previous laser applications. She had returned from abroad on this occasion because of problems with follow-up locally and recent deterioration of her condition, through an associated chest infection, for which treatment had been started.

On admission, the child was unwell, sweaty and had marked respiratory distress with stridor, sternal and intercostal retraction. Her heart rate was 129/min and her respiratory rate 36/min.

Oxygen therapy was started and the child was immediately transferred to the operating theatre, where a 3.5 mm endotracheal tube was inserted with great difficulty, after halothane induction.

Tracheotomy was performed through a horizontal skin incision. Using blunt dissection in a vertical direction down to the trachea. A vertical slit incision was made through the trachea and a Size 5, noncuffed Portex tube introduced.

Bilateral chest movements remained reduced and oxygen saturation levels failed to recover. A chest X-ray revealed a marked right pneumothorax, mediastinal emphysema and a small left pneumothorax. Bilateral chest drains with Heimlich valves were introduced. Antibiotic cover was provided with cefotaxim and flucloxacillin but swabs failed to grow any organisms.

The chest drains were removed after 24 and 48 hours. Laser therapy was applied to the papillomas four and 18 days after admission and successful decannulation took place on day 20.

Case 2

A 41-year-old lady was admitted for laser therapy to her larynx. She had had a total thyroidectomy in 1979 for a Hurtle cell carcinoma. She was treated with radiotherapy using radioactive iodine. Recurrent carcinoma with tracheal invasion was treated by laser from 1990 onwards. In September 1992 another session of laser therapy took place, and a large tumoural mass was removed by operation from the trachea. In the immediate post-operative period, the patient developed stridor through glottic oedema. An urgent tracheotomy was performed because of hypoxia with bradycardia. No endotracheal tube was introduced. The tracheotomy was carried out through a horizontal skin inci-

sion, using blunt dissection down to the trachea and incision between the third and fourth cartilagenous rings. Immediately after introducing a cuffed Shiley cannula Size 8, the patient complained of severe pain in the lower part of the neck on the left side. Oxygen saturation decreased. A chest X-ray revealed mediastinal emphysema and bilateral pneumothorax. Chest drains were put in place, vasopressor medication started and mechanical ventilation maintained. The patient subsequently developed an Adult Respiratory Distress Syndrome, but made a good recovery.

Discussion

The complications of tracheotomies are well documented (Waldron *et al.*, 1990) and the specific pitfalls in children, have been clearly described (Dempster *et al.*, 1986; Swift and Rogers, 1987). The most important operative complication remains pneumothorax, occurring in 5.8 to 10.6 per cent of cases (Tucker and Silberman, 1972; Dempster *et al.*, 1986). Pneumothorax has been reported as the single most fatal complication in tracheotomy in children in a review of the literature between 1941–1971 (Tucker and Silberman, 1972).

Few cases of bilateral pneumothorax have been reported in the recent literature (Swift and Rogers, 1987). Far more cases were described prior to the use of endotracheal intubation and mechanical ventilation (Barrie, 1940; Goldberg *et al.*, 1942; Forbes *et al.*, 1947).

The accepted mechanism is that, during the powerful inspiratory movements of respiratory obstruction, high negative intrathoracic pressures are developed. Through incision of the skin and cervical fascia, an initial pathway is established for aspiration of air, through the wound edges, into the mediastinum. The air is trapped in the mediastinum on expiration and forced down along the tissue planes. When appropriate pressure levels are reached, rupture through the pleura causes a pneumothorax. A less common cause is rupture of a lung bleb, with dissection of air to the hilus and mediastinum or into the pleural cavity. A third source is operative injury to the apical pleurae, because of their high position in children (Goldberg *et al.*, 1942).

Prevention of mediastinal emphysema and pneumothorax in tracheotomy for respiratory obstruction consists, in the first place, in the establishment of an adequate airway through a bronchoscope or endotracheal tube. This measure however is not

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always infallible (Bergstrom and Diamant, 1960). The other paramount factor is a meticulous technique. The neck incision should be made as high as possible without endangering the first tracheal ring (Forbes *et al.*, 1947). The dissection should be kept entirely in the midline and away from the mediastinum (Gerson and Tucker, 1982). It is advisable to reduce to a minimum, the interval between the division of the cervical fascia and the insertion of the tracheotomy tube. Avoidance of a tight closure is a must. A high index of suspicion for the possibility of a pneumothorax after tracheotomy for respiratory obstruction is required, and prompt action should be taken.

Conclusions

Pneumothorax remains an important complication of tracheotomy for respiratory obstruction. The prime cause is mediastinal emphysema. Prevention consists of anaesthetic and surgical measures. Close post-operative monitoring is also required.

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