

Correspondence

Complete disruption of right main bronchus: a case report and literature review

doi: 10.1017/S026502150700124X

EDITOR:

Trauma is the leading cause of death in children. Blunt thoracic injury accounts for 4–6% of paediatric trauma [1–3]. A rare consequence of blunt thoracic trauma in children is complete disruption of a bronchus. We report a case of an 11-yr-old male with complete disruption of the right main bronchus from the trachea.

An 11-yr old, 39 kg male presented to the emergency department after a soccer goalpost fell on his right shoulder and chest. On examination he was noted to be tachycardic and hypoxaemic with decreased breath sounds and subcutaneous emphysema over the right chest. A chest radiograph confirmed a fractured right clavicle and a large right-sided pneumothorax. A chest tube (28 G) was therefore placed and continuous suction applied. A repeat radiograph demonstrated good position of the chest tube with some reduction in size of the pneumothorax. A computed tomography study of the chest was obtained which showed a gross right pneumothorax. The patient was stabilized, given oxygen by face mask and admitted to the paediatric ICU for monitoring.

A significant air leak persisted and the patient, although stable, remained hypoxaemic (arterial blood gas on 100% oxygen via a non-rebreathing face mask: pH 7.30; PO₂ 63 mmHg; PCO₂ 45 mmHg, saturation 89%). An emergency bronchoscopy and probable thoracotomy was scheduled. As the patients' fasting status was uncertain, a modified rapid sequence induction was planned with the intention of using a double-lumen endotracheal tube (28-G, Mallinckrodt, Hazelwood, MO, USA). The difficult airway cart was also requested.

In the operating room, standard monitors were applied. The surgeon was present. Following 2 min

of preoxygenation, anaesthesia was induced with fentanyl (25 µg), propofol (120 mg) and rocuronium (40 mg). The double-lumen tube was passed with ease through the larynx into the mid trachea but mechanical ventilation was unsuccessful. A flexible fiberoptic bronchoscope (Pentax 4I-7P, 2.4 mm diameter; Pentax, Lake Success, NY, USA) was quickly advanced into the bronchial lumen by the surgeon who could only visualize blood in the airway. The patient then began to desaturate dramatically and so the bronchial lumen of the tube was passed rapidly into the left main bronchus and the tracheal and bronchial cuffs inflated. Ventilation was established to the left lung but completely absent in the right. The patient was turned to left lateral decubitus position and a right thoracotomy performed. The surgical finding was that of complete disruption of the right main bronchus, 0.5 cm distal to the carina. There was no evidence of damage to the great vessels or surrounding structures. The rupture was repaired and, following closure of the thoracotomy, the patient was transferred back to the ICU on a low-pressure ventilatory regime. He was extubated 12 h later and made a full and uneventful recovery.

The case is of interest for several reasons: the lesion in the paediatric population; the use of muscle relaxants in thoracic injury; and the difficulties of one lung ventilation in the paediatric population.

Tracheobronchial disruption is a rare and life-threatening injury. It has an incidence of only 0.7% of all blunt thoracic injury [4]. There is a male predisposition, and it is more often right sided [5,6], perhaps because this bronchus is shorter. It is typically a main-stem bronchial injury at the carina [6]. In children, it can occur without apparent injury to the chest wall. This is because the thoracic cage is so compliant that mechanical forces of blunt trauma can be absorbed without skeletal injury. However, the very plasticity of the rib cage means that large amounts of kinetic energy can be applied to the internal thoracic structures [5].

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Accepted for publication 25 June 2007 EJA 4582
First published online 15 August 2007

When tracheobronchial disruption is complete, failure of a chest drain to resolve a pneumothorax is inevitable. A persistent air leak through the drain is apparent. A bronchoscopy is mandatory to complete the diagnosis. In adults, this can be performed awake. However, in children a 'sedated' or awake bronchoscopy is unlikely to be tolerated.

We had elected to perform a rapid sequence induction due to uncertainty over the patient's fasting status. A recent meal and delayed gastric emptying associated with trauma, necessitated rapid airway protection with an endotracheal tube [7]. However, manual ventilation should be avoided to prevent displacement of the airway at the level of injury. This was the case with our patient during induction of anaesthesia but could have occurred at scene or in the emergency room if the emergency personnel had elected, quite understandably, to intubate the trachea of this hypoxic child. The loss of spontaneous ventilation in this patient could have been catastrophic. We were completely unable to manually ventilate the patient as mechanical breaths passed through the path of least resistance, into the pleural space.

In the post event analysis, we were concerned that a more sinister outcome could have resulted from our use of a muscle relaxant. In our review of the literature, there is indeed recommendation that mechanical ventilation be avoided to prevent separation and loss of the airway at the site of trauma [8]. However, other authors, who report their experience with this type of injury, have used mechanical ventilation without apparent loss of airway [9,10].

In the scenario of a persistent air leak from a chest drain following trauma, anaesthesia should incorporate a plan for one lung ventilation that is age and lung-side specific. We were then fortunate in our choice of lung isolation. The authors' preference for endobronchial blockers was deferred preferring, instead, a double-lumen tube. Had we chosen a blocker, there would have been no place to seat it due to the proximity of the rupture to the carina. Another option would have been to try to place the straight endotracheal tube down the left main-stem bronchus with bronchoscopic guidance [8,9]. This may have been possible but difficult due to the anatomy of the left main stem in the setting of rapid desaturation and because our bronchoscopic view was obscured by blood. If this child had been younger, this may have been our only option as the only smaller commercially available double-lumen tube, the 26 G, is not stocked at our institution.

Finally, there are alternate management options for the management of complete tracheobronchial

disruption that include jet ventilation through intrabronchial catheters [11], emergency cardiopulmonary bypass or emergency thoracotomy with direct intubation of the main-stem bronchus [8].

The aim of this case report is to alert colleagues to this rare and potentially life-threatening consequence of blunt chest trauma in children. Based on the literature and our experience with this case, airway management should ideally include the maintenance of spontaneous ventilation.

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