

Blunt Traumatic Rupture of the Main Bronchus in Children

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INTRODUCTION

Rupture of the main bronchus by blunt trauma is uncommon, and is one of the most severe injuries in children. During the past three years we have treated two such injuries, and we describe them here.

CASE REPORTS

Case 1—A 3 year-old-boy who was hit on the chest by a truck tyre was admitted to our emergency department with severe respiratory distress. He was unconscious, cyanosed, and tachypnoeic. On physical examination there was reduced movement and diminished breath sounds in his right hemithorax, and on paracentesis we found a massive intra-abdominal haemorrhage. The chest radiograph showed a right tension pneumothorax with total collapse of the right lung and fracture of the fourth rib (Fig. 1). A right thoracostomy tube was inserted but the chest tube continued to leak air and the right lung remained collapsed. The chest tube was connected to suction, but it did not work well and we suspected a ruptured main bronchus.

The patient was taken to the operating theatre for urgent right thoracotomy, where we found a partial transverse laceration of two thirds of the circumference of the right main bronchus 3 cm distal to the carina. The main bronchus was cross-clamped with a vascular clamp proximal to the rupture. The ends of the bronchus were anastomosed end-to-end with interrupted 5/0 polyglylactin sutures with the knots placed on the outside. The broken fourth rib was fixed and a pulmonary laceration in the lower lobe was sutured. A pleural drain was inserted and the thoracic wall closed in a conventional manner.

After the thoracotomy, we did a laparotomy because of ongoing intraabdominal haemorrhage despite massive blood transfusion. At laparotomy we found a perihilar laceration of the spleen, which we repaired. The postoperative course was uneventful and the

patient was discharged on the seventh postoperative day.

Case 2—A 6-year-old boy who had been run over by a car was referred to our hospital with respiratory distress. On physical examination he had subcutaneous emphysema from the neck to the pelvis and moderate cyanosis. A chest radiograph showed a tension pneumothorax and total collapse of the right lung. Right thoracostomy tube was inserted but the chest tube continued to leak. Despite insertion of the second chest tube and suction the right lung remained collapsed, the air leak persisted, and we suspected a ruptured main bronchus (Fig. 2). The patient was taken to the operating theatre for urgent right thoracotomy, where we found a complete transverse laceration of the right main bronchus 1 cm distal to the carina. The air leak



Fig. 1. Anteroposterior chest radiograph showing right pneumothorax and total collapse of the lung (case 1).



Fig. 2. Persistent right pneumothorax after the insertion of thoracostomy tube on the right side (case 2).

was immediately controlled with digital compression. The endotracheal tube was advanced into the left main bronchus under the guidance of the surgeon. The main bronchus was cross-clamped with a vascular clamp proximal to the rupture. Both bronchial ends were debrided and the ends of the bronchus were anastomosed end-to-end with interrupted 5/0 polypropylene sutures. Volume control ventilation was given for 48 hours postoperatively using a 'Newport Breeze' ventilator. The child was extubated on the second postoperative day. A chest radiograph showed atelectasis of the right lower lobe on the sixth postoperative day and medical treatment failed. Bronchoscopy showed complete obstruction with inspissated mucus in the right main bronchus at the anastomotic site. After removal of the inspissated mucus, antibiotic treatment, and chest physiotherapy, the child recovered completely and was discharged on the fifteenth postoperative day.

DISCUSSION

The tracheobronchial tree is injured in about 1% of patients who sustain blunt thoracic trauma (3, 6). Of cases with major bronchial injuries 70% are dead on arrival at a medical centre. This emphasises that major bronchial injuries after blunt thoracic trauma are rare but have a high mortality (4, 8).

The pathophysiological background to a ruptured main bronchus includes rapid anteroposterior compres-

sion of the chest between the sternum and vertebral column (as in case 2), sudden increase in intrabronchial pressure (as in case 1), and shearing on the bronchus caused by rapid deceleration (1, 2, 13). The rupture may be transverse between the cartilage rings as seen in our cases, longitudinal along the membranous segment of the airways, or complex with a combination of both transverse and longitudinal or multiple ruptures (12).

The main symptoms of rupture commonly include dyspnoea, tachypnoea, subcutaneous emphysema, and pneumothorax. Pneumothorax, subcutaneous emphysema, collapse of the lung, and a drop at the upper border of the collapsed lung below the transected bronchus are the most prominent radiographic signs (12). In general there is a persistent pneumothorax with a large air leak and total collapse of the lung on that side, despite emergency tube thoracostomy. In experienced hands, bronchoscopy gives the definitive diagnosis but in an emergency this diagnostic step may be omitted (14). We considered bronchoscopy to establish the diagnosis in both our cases, but we did not have time to do it because of the bad respiratory state of the patients. Computed tomography (CT) is not useful as it provides only indirect evidence of the injury. It is the clinical state of the patient that dictates the extent of emergency diagnostic procedures. A chest radiograph is a basic diagnostic aid, whereas bronchoscopy is available to verify bronchial lesions and the CT scan to detect vascular defects (11).

Endotracheal intubation with a double-lumen tube is the most comfortable method of ventilating the other lung without an air leak during operation (9, 10). If the insertion of the double-lumen tube is not feasible, intubation of the opposite bronchus with the endotracheal tube can be done under the guidance of the surgeon, or by cross-clamping the affected bronchus proximal to the rupture, as we did in our cases.

Primary debridement of injured tissue adjacent to the rupture and end-to-end anastomosis should always be achieved (5, 7), because in secondary reconstructions the late complication rate is higher (11). Repair of a rupture has a good result if technically feasible; however much damage to the ruptured bronchus, and lung parenchyma may require resection (1).

In conclusion, rupture of the main bronchus is a relatively rare, serious, and potentially lethal complication of chest trauma in childhood. Successful repair is dependent on correct diagnosis and early treatment. On clinical suspicion critically injured children may be saved by urgent repair of the main bronchus without further investigations.

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