INTRODUCTION

Although the incidence of trauma has risen with the increase in motor vehicle accidents, bronchial rupture due to blunt chest trauma is a rare, but could be life-threatening in children. Bronchial rupture can be difficult to diagnose in children due to its varied clinical signs, and there is often no radiographic or physical evidence of intrathoracic injury in the early post traumatic period and some hospitals do not fit out a fiberoptic bronchoscopy for little children. [1,2]

In the past, most patients with airway injury after blunt chest trauma died at the scene or before reaching the hospital. At present, however, improved emergency rescue systems and transportation have decreased the chance of mortality due to this condition.

This report attempts to highlights the early diagnosis and surgical repair of bronchial rupture with a high index of suspicion in a 28-month-old child with blunt chest injury after a pedestrian traffic accident.

CASE REPORT

The present case report is about a 28-month-old girl weighing 11 kg who was struck by a car on the anterior chest while walking. At 30 min later, she was admitted to our hospital. She was alert and physical examinations revealed right shoulder laceration, right knee abrasion, right parietal scalp deep laceration with bony exposure, and subcutaneous emphysema of the neck, arms, thoracic wall and abdominal wall. Her heart rate (HR) was 176 beats/min and her respiratory rate (RR) was 48 breaths/min. The peripheral oxygen saturation (SpO₂) was 87%. Right breath sounds were decreased. The arterial blood gas analysis showed pH 6.97, PaCO₂ 94.9 mmHg, and PaO₂ 72.8 mmHg. The first chest radiography showed a right pneumothorax, pneumomediastinum and right clavicle shaft fracture [Figure 1]. After supplying oxygen through a mask (5 L/min), the SpO₂ was maintained at 93-97%. A 16 Fr chest tube was inserted at the 5th intercostal space, but following chest radiograph still revealed pneumothorax. Chest computed tomography (CT) revealed pneumothorax and pneumomediastinum. However, it was hard to detect the injury site of the tracheobronchial air column. Subcutaneous emphysema was more increased and her mental status changed to drowsy. Prompt decision was needed. Although CT did not show the definite injury site, under suspicion of hemopneumothorax and bronchial rupture, a thoracotomy was planned. Anesthesiologist and surgeon discussed about managing respiration and planned to insert a sterile Foley catheter through the operative
field into to the airway leakage site. The prepare of the cardiopulmonary bypass was not thought be necessary.

On transfer to the operating room, her pre-operative signs were blood pressure 100/60, HR 164 beats/min, RR 48 breaths/min, and SpO₂ 96%. Anesthesia was induced with thiopental sodium 50 mg and rocuronium 8 mg. A 4.0-mm (internal diameter) endotracheal tube was used. Because the site of injury was not definitive and injury of the left bronchus could not be excluded, the tip of the endotracheal tube was positioned in the upper carina. Bronchoscopy and a double-lumen tube were unavailable. A central venous catheter was placed in the right internal jugular vein, and the radial artery was cannulated for arterial pressure monitoring. A right thoracotomy was performed and mechanical ventilation was maintained well. Although dissecting the injured tissue, the airway leakage was increased. Transections of the right intermedius bronchus at the junction of the right middle lobe (RML) bronchus and right lower lobe (RLL) bronchus was immediately identified [Figure 2]. There was RML tearing and the RML pulmonary artery was exposed. Adequate ventilation was achieved by clamping the intermedius bronchus 3 cm proximal to the transection margin. The damaged margin of the bronchus was excised and an end-to-end anastomosis was performed using interrupted sutures using Vicryl 5-0 and Prolene 6-0. The RML tear was sutured using Vicryl 4-0. After checking the inflation of the right middle and lower lobes, a 12 Fr chest tube was placed. After surgery, she was transferred to the surgical intensive care unit. She was left intubation state for chest physiotherapy. However, pneumonia was developed in the dependent portion of the RML and RLL. On the 4th and 8th postoperative day, the patient was extubated and the chest tube was removed. Although chest CT checked on 17th day after surgery showed an intact large airway [Figure 3], recurrent pneumonia made her discharge delayed and on the 50th day after the traumatic accident, she was discharged.

DISCUSSION

Tracheobronchial injury (TBI) is uncommon, but the lack of recognition or incorrect management of this condition may result in life-threatening or disabling airway stricture.[1-4] The true incidence of TBI is unknown, but it is probably 0.5-2% among individuals who sustain blunt trauma.[13] Although rare in children, rupture of the central airway is still more common in children than in adults and there are two peaks of incidence: 5-6 years old children tend to be pedestrians involved in traffic accidents and falls at home and 12-14 years old children tend to be involved in motorbike accidents.[15,6] The prognosis depends on early diagnosis and improvement of the respiratory balance, which is achieved by a combination of endotracheal intubation,
optimal respiration and early surgical intervention. The clinical symptoms of TBI, including chest pain, dyspnea, deep cervical emphysema, pneumothorax, pneumomediastinum, subcutaneous emphysema and persistent air leakage after tube thoracostomy, are well-known. Nevertheless, the immediate diagnosis of blunt injury to the trachea and bronchus is sometimes difficult, resulting in delayed diagnosis and treatment in many cases.\textsuperscript{[1,6-8]} Children suffering from lesions of the tracheobronchial tree often show only minimal clinical symptoms such as chest pain and hemoptysis and they may lack the serial rib fractures typical of adults after massive thoracic trauma because a child’s chest is much more elastic than an adult’s chest. The clinical presentation depends also on the status of the peribronchial connective tissue, communication between the wound and the pleural space and the site and extent of the injury.\textsuperscript{[1,9]} Therefore, diagnosis is based on a high index of suspicion and the gold standard for diagnosis is tracheobronchoscopy.\textsuperscript{[3,8]} which provides the exact site and extent of the injury. A persistent pneumothorax after well-placed chest tube insertion and subcutaneous emphysema are associated with TBI. However, CT is presently the noninvasive method of choice for evaluating patients with major chest trauma and can provide useful information without confirmation by bronchoscopy.\textsuperscript{[2,3,8,9]} In an emergency situation, bronchoscopy may not be appropriate and surgery may be performed depending on the patient’s clinical condition. For adequate repair and pulmonary preservation, the surgery should be performed within 48 h.\textsuperscript{[5,6]} Delayed surgical repair carries a higher risk for infection and stricture formation. In our case, the diagnosis was made by clinical presentation, chest X-ray and CT findings. Only 4 h elapsed between her accident and the right thoracotomy. Although prompt surgical repair, the recurrent pneumonia were happened. Without information of the exact injury site by using bronchoscopy, the position of endotrachial tube was critical to anesthesiologist. Close cooperation between the anesthesiologist and surgeon is needed for successful management. Until the surgeon locates and repairs the airway injuries, effective ventilation must be performed to minimize air leakage. In our case, the transection site was occluded by a blood clot and intact connective tissue, necessitating ventilation before dissection of the injured lesion, although the tip of the endotracheal tube was positioned proximal to the injury site.

After surgery, children may have difficulty clearing secretions and blood clots past their anastomosis or area of repair.\textsuperscript{[13]} In our case, though giving aggressive chest physiotherapy, CT revealed pneumonia in the RML and RLL, which could not be cleared by coughing given the patient’s age. This was a cause of delayed extubation and discharge.

**CONCLUSION**

The diagnosis of TBI in child can be difficult because the symptoms are variable and bronchoscopy may not always be available. However, prompt decision and respiratory management are critical. For early diagnosis of TBI in similar cases, a high index of suspicion should be needed based on symptoms, chest X-ray and CT findings.

In addition, anesthesiologists should be aware of this dangerous condition and must be fully prepared for rapid and appropriate management of the sudden air leakage during operation.

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