Complete Laceration of the Middle Lobe Bronchus Caused by Blunt Trauma

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Bronchial ruptures due to blunt trauma are rarely encountered injuries. A previously healthy 42-year-old man fell from heights of 8 meters. A prompt chest tube-drainage for suspected right sided tension pneumothorax and a tracheal intubation were performed. Massive air leak and pneumothorax of the right lung continued. Laceration of the tracheobronchial tree was suspected. Operation was performed 20 hours after patient’s arrival. The complete avulsion of the middle lobe bronchus was identified during operation, and a middle lobectomy was performed. The patient was transferred to a rehabilitation hospital on 20th post-operative day without complication. Early decision making for surgery resulted in a good outcome. When a complete atelectasis of the whole right lung and a massive air leakage continues despite appropriate chest-tube drainage in a blunt trauma patient, laceration of the tracheobronchial tree should be suspected.

Keywords: blunt trauma, tracheobronchial laceration, tension pneumothorax

Introduction

Bronchial ruptures due to blunt trauma are rarely encountered injuries. We present a case of a complete laceration of the right middle lobe bronchus following a falling accident, which was successfully treated by the middle lobectomy and subsequent intensive care.

Case

A previously healthy 42-year-old man fell from heights of 8 meters. He arrived to the emergency department with unstable respiratory condition and with a Glasgow Coma Scale score of 13, a SpO2 of 74%. A prompt tube-drainage for right sided tension pneumothorax and a tracheal intubation were performed. Massive air leakage was seen from the chest tube. The chest roentgenogram and chest computed tomography (CT) scan showed sustained, right side pneumothorax (Fig. 1) and associated injuries, including multiple rib fractures on the right side, a fracture of the right scapula, fractures of multiple thoracic vertebral bodies, an open fracture of right fifth finger, and a sub-capsular liver injury. A massive air leak and a right side pneumothorax of the whole right lung continued despite insertions of two additional chest tubes. CT did not demonstrate apparent laceration of the trachea-bronchial tree. A bedside emergent flexible bronchoscopy was performed, however, evidence of a right bronchial rupture was not detected because of the bloody secretion. His ventilatory requirements were increasing, and gas exchange was getting worse. Laceration of the tracheobronchial tree was suspected, especially in the right main bronchus or the bronchus intermedius, because the severity of air leakage and bloody secretion in the right main
bronchus. Then, an emergent operation was performed. A bronchial blocker was positioned in the right main stem bronchus for single ventilation, and a right posterolateral thoracotomy was performed. The middle lobe bronchus was completely disrupted (Fig. 2A). The pulmonary artery was noted to have sub-adventitial discoloration, but no hematoma was present. Any other injury was not seen in the right thoracic cavity. Major fissure was complete. Dissection of the minor fissure was performed, and the middle lobe was excised. After the complete debridement of the disrupted bronchial end (Fig. 2B), the stump was closed with interrupted 4-0 monofilament absorbable sutures. An intercostal muscle flap was buttressed over the bronchial stump. The chest drainage tube was removed on the 5th postoperative day. The patient came off the ventilator on 10th postoperative day. A bronchoscopy performed on 14th postoperative day showed a complete healing and no stricture at the
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Bronchial stump. Pathological examination showed peribronchovascular hemorrhage in the resected middle lobe. The postoperative course was uneventful, and the patient was transferred to a rehabilitation hospital on 20th postoperative day.

Discussion and Conclusion

Three theories are proposed by Kirsh et al. regarding the mechanism of injury to the trachea and bronchus by blunt chest trauma.\(^1\) The first theory involves tracheobronchial disruption with a sudden, forceful compression of the chest, decreasing the anterior-posterior diameter of the chest while widening the transverse diameter, which makes lateral forces pull the lungs apart at the carina. The second theory is associated with a rapid increase in airway pressure, especially in the trachea and larger bronchi, which is made by compression of the chest and trachea while the glottis is closed. This may cause airway ruptures at the membranous portion. The third theory is related to rapid deceleration occurring in blunt trauma such as motor vehicle accidents and falling accidents. The lungs are fixed at the carina, while they are more mobile within the pleural space. This mechanism produces a shearing force, causing rupture of the trachea and bronchi.

In our present case, it is assumed, like the third theory, that sudden rotation of the middle lobe by the blunt trauma caused the disruption of middle bronchus. The incidence of middle bronchial rupture after blunt chest trauma is relatively rare and is reported to be approximately 1% among patients with blunt tracheobronchial injuries.\(^2\)

Reviewing 265 patients with tracheobronchial laceration by blunt chest trauma, Kiser et al. reported that the mortality of patients with tracheobronchial laceration was 36% before 1950 and 9% after 1970,\(^3\) although the mortality of patients was strongly affected by associated injuries. They also reported that mortality was associated with the side of injury and the time from injury to diagnosis and treatment. Cassada et al. reported that a delay in diagnosis is the single most important factor influencing outcome, and early recognition of tracheobronchial injury followed by prompt surgical intervention is important.\(^4\)

Non-operative management of these injuries is reserved for patients with isolated, small tracheobronchial tears and no respiratory distress.\(^3,4\) Self et al. reported that non-operative management with positive end-expiratory pressure and low tidal volume ventilation was successful for the patient with severe tracheobronchial injury.\(^5\)

In this case, although the operation was performed in 20 hours after patient’s arrival, inflammatory change in the thoracic cavity was prominent around the bronchial laceration, which could potentially result in empyema. The surgical intervention was the optimal treatment for closing the large fistula opening to the right thoracic cavity, expanding the right lung for improving oxygenation, and preventing subsequent empyema. In spite of non-diagnostic CT and bronchoscope, early decision making for operation resulted in a good outcome with the present case.

In conclusion, when a complete atelectasis and massive air leakage remain despite appropriate chest-tube drainage in a blunt trauma patient, laceration of the tracheobronchial tree should be suspected.

Disclosure Statement

We have no conflict of interest.

References