



CASE REPORT

## Complete Disruption of the Left Main Bronchus due to Blunt Chest Trauma

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### Abstract:

Isolated tracheobronchial disruption is an uncommon injury usually associated with severe blunt thoracic trauma. We herein report a 14 year-old female a case with avulsion of the left main bronchus occurring after blunt chest trauma due to a down fallen wall. A successful surgical repair of the totally avulsed left main bronchus was carried out. The post-operative course was uneventful with improvement in the respiratory status. The patient regained wellness within days in the intensive care unit, and the diagnosis of traumatic rupture of the left main bronchus was approved by bronchoscopy and the computerized tomography (CT) scan of the chest. Surgical repair of the disrupted left main bronchus was accomplished 10 days from the admission and the bronchoscopic evaluation of the anastomosis and patency was achieved. The patient was discharged well with her lung fully expanded on chest X-ray. She is doing well during the follow-up period. The diagnosis and preoperative management of this uncommon post traumatic condition is discussed. We conclude that, in a patient with sustained severe blunt thoracic trauma, a high index of suspicion for trachea-bronchial disruptions must be maintained to detect these rare lesions. Skilful and early surgical treatments are required for proper management of such cases.

**Key words:** Bronchus, Avulsion, Blunt trauma

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## 1. Introduction

Tracheobronchial injuries are rare and occur in less than 1% of patients following blunt chest trauma, the incidence is low, and most patients with this type of injury do not survive to reach hospital care (1, 2). Thoracic injuries are the second leading cause of death in paediatric blunt trauma. The evaluation of children with blunt thoracic trauma in the emergency department usually includes physical examination and plain chest radiography (3).

## 2. Case Presentation

A 14-year-old female was admitted to our hospital, three days following blunt chest trauma. She was crushed at the level of her chest between the fallen wall and the floor. Immediately following the accident, she was admitted to a remote hospital while she was conscious, but unstable hemodynamically with hypoxia and hypercapnia indicating respiratory distress. After the resuscitation, the chest radiograph showed opacity in the left hemithorax and mediastinal emphysema, but no pneumothorax. The diagnosis of a haemothorax was assumed, and a chest tube drain (CTD) was inserted. However, there was neither any blood drainage, nor any air leak through the CTD. She was referred to our department after three days of conservative management without any evidence of improvement, with persistent left chest pain and shortness of breath. Clinical examination of the chest showed bruising on the anterior chest wall and lower left neck with totally restricted left chest respiratory movements, and absent air entry on the left side accompanied by subcutaneous emphysema. Plain chest radiograph (Figure 1) revealed a left sided opaque hemithorax with mediastinal shift to the right, and right clavicular and left scapular fracture.

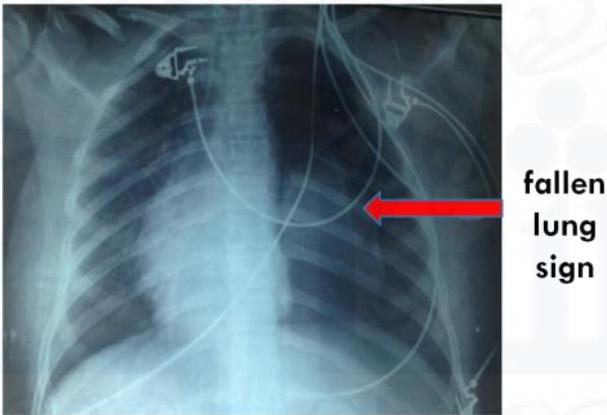


Figure 1. CXR showing mediastinal shift

The patient was ill, tachypneic and distressed. Thus, she was transferred to the intensive care unit in which the patient received oxygen by mask, antibiotics and analgesia. By the next day, she became better with normal O<sub>2</sub> saturation on room air. Dynamic computerized tomography (CT) scan was performed for the patient on the third day which showed no evidence of vascular injury, but there was complete collapse of the left lung. Although the evidence of discontinuation of the left main bronchus was present, the avulsion of the LMB was not reported (Figure 2). Our decision was to consult the pulmonologist to perform a flexible bronchoscopy. On bronchoscopy, a serious amount of gray-blackish secretion was aspirated from the left main bronchus, the bronchus was totally obstructed and the suspicion of a complete disruption was confirmed. Unfortunately the instrumentation of the blind-ended left main bronchus, tension pneumothorax developed and the lung collapsed revealing an apparent fallen lung sign (Figure 3). Reinsertion of a CTD was carried out for decompression, which resulted with the in stabilization of the patient. However, there was neither any continuous air leak, nor an expansion of the lung.



**Figure 2.** Discontinuation of the left main bronchus with complete collapse of the left lung

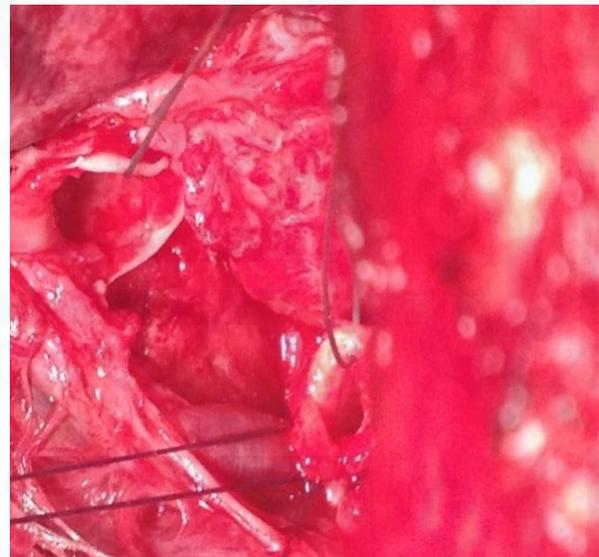


**Figure 3.** CXR after the diagnostic bronchoscopy

The decision of her family was to continue on conservative treatment and they postponed their consent for surgical intervention for few days during which the medical management was maintained including antibiotics, nebulizer bronchodilators, mucolytics, non-invasive continuous and intermittent positive airway pressure without clinical or radiological improvement.

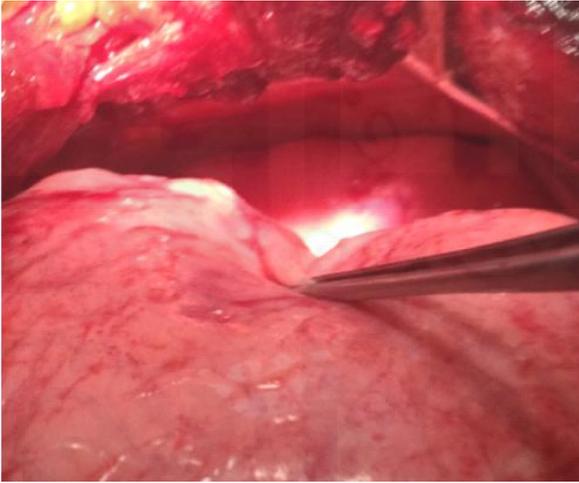
Several days later, exploratory thoracotomy was performed. A double lumen endotracheal tube was inserted to ventilate the right lung. She underwent a left postero-lateral thoracotomy through the fifth intercostal space. After incision of the mediastinal pleura, meticulous dissection of

the posterior and superior aspect of the hilum and the infero-medial aspect of the aortic arch to identify and mobilize the proximal and distal stumps was carried out. With the assistance of the anaesthesiologist by blowing the left lung, this manoeuvre confirmed complete separation of the left main bronchus at its distal part and the proximal stump displaced below the aorta and to the right side. After the identification of this injury, the dissection was continued to release and mobilize the both stumps of the left main bronchus in order to approximate both ends without tension (Figure 4).



**Figure 4.** Surgical field showing interruption of the left main bronchus and both stumps marked with stay sutures

After mobilization of the transected LMB, it was reconstructed primarily by end-to-end anastomosis with interrupted 2-0 polyglactin sutures. Blowing through the double lumen tube showing full expansion of the left lung (Figure 5), a watertight seal of the anastomosis was confirmed, and the pleura was closed over the anastomotic site. The CTD was secured in its place. Following haemostasis the thoracotomy wound was closed.



**Figure 5.** Surgical field after bronchial reconstruction with end-to-end anastomosis showing a fully expanded left lung

Immediate evaluations were made in the postoperative few hours. The clinical examination in the ICU confirmed good air entry and respiratory sounds. A chest X-Ray was done on the next postoperative day which showed left lung atelectasis. Thus, postoperative flexible bronchoscopy was necessary which revealed mucus plugs, retained secretions and debris obstructing the LMB which were removed by saline irrigation and suctioning. With use of bronchoscopy, the successful repair and patency of the airway was confirmed (Figure 6). Immediately, the O<sub>2</sub> saturation was raised and the air entry and breath sounds were well auscultated. On the second postoperative day, there was dramatic clinical improvement and the X-ray revealed good lung inflation (Figure 7). The patient was transferred to the ward, and was discharged on the seventh postoperative day in normal pulmonary status, with an excellent general condition and the Chest x-ray revealed complete inflation of the left lung (Figure 8).



**Figure 7.** CXR on 2ndPOD showing a well expanded lung



**Figure 8.** CXR on the day of discharge showing a fully expanded left lung

### 3. Discussion

This is a report of a 14-year-old female patient who suffered from blunt chest trauma that needed management in an intensive care unit. Tracheobronchial injuries are associated with a high degree of lethality (3, 4) which is related to

significant thoracic compression injuries, including fractures to the ribs and clavicle, as well as cardiac and pulmonary contusions (5). The highest incidence of airway injury occurs at the sites of mediastinal attachment within 2.5 cm of the carina as result of shear develops between restrained and unrestrained airways by rapid deceleration, leading to disruption of the bronchus (5). The most common presenting signs of airway disruption include subcutaneous emphysema, dyspnea, sternal tenderness, and hemoptysis. Radiographic findings are most commonly pneumothorax, pneumomediastinum, and clavicle or rib fractures (4, 6). In our case, beyond the acute stage, the presenting symptoms were subtle also the patient did not show pneumothorax or air leak either clinically or radiologically to suggest the presence of tracheo-bronchial disruption which was contained by the mediastinal pleura. The left main bronchus rarely rupture into the pleural space in contrast to the right main bronchus which have the potential to rupture into the right pleural space with prolonged or high-pressure ventilation (5). Associated injury; intrathoracic or extrathoracic is an important mortality factor (4, 6). The predictors that can be used to create a sensible clinical decision rule for the identification of children sustaining blunt torso trauma include; low systolic blood pressure, elevated respiratory rate, abnormal results on clinical thoracic evaluation, femur fracture, and a GCS score of less than 15 (1). However, failure of the lung to expand in our patient aroused the suspicion of a bronchial injury and bronchoscopy confirmed it. Significant bronchial injuries may occur in the absence of usual initial symptoms. Therefore, the patients of obvious chest trauma should be on follow-up in the early post-injury period for detecting these lesions to avoid unnecessary morbidity and possible mortality (6, 7). CT and flexible bronchoscopy are the major tools necessary for early diagnosis and treatment (6, 8, 9).

Surgical reconstruction of the ruptured left main bronchus was accomplished ten days from the admission by end-to-end anastomosis of the transverse bronchial rupture. Other types of bronchial ruptures are longitudinal (10) or complex, consisting of rupture of the distal trachea and both main bronchi. Complex lesions are very rarely seen, comprising 8% of all ruptures, and the use of cardiopulmonary bypass increases the margin of safety during operation (6).

Successful repair was confirmed by bronchoscopy .The patient was discharged well with the lung fully expanded on the chest X-ray. She was instructed to keep in touch for the next bronchoscopy to check the anastomotic site, the presence of bronchial stenosis and a possible need for dilatation. The patient is still well during her follow-up period.

We conclude that, in a patient with sustained severe blunt thoracic trauma, a high index of suspicion for trachea-bronchial disruptions must be maintained to detect these rare lesions. Skillful and early surgical treatments are required for proper management of such cases.

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