

Right Main Bronchus Disruption Discovered after One Year of Blunt Chest Trauma

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Abstract

Central airway injury is a very rare entity during blunt chest trauma. It is serious and may be fatal. Usually, it has fundamental manifestations but in some cases, it is insidious and has been discovered lately. It's suspected when major air leaks from the chest tube and the lung fail to expand despite adequate chest drainage. Right main bronchus injuries are the most frequent. Diagnosis can be suspected clinically and confirmed by Ct scan and bronchoscopy. Conservative management can be applied in special cases but the majority of cases need surgical intervention which depends on primary reconstruction. An early diagnosis and treatment can avoid dramatic complications and provide complete recovery. Associated other organ injury is common and is an important mortality factor. Close cooperation with the emergency team and anesthesiologists is necessary. Here I presented a case of right main bronchus disruption discovered after one year of blunt chest trauma with complete lung atelectasis, managed successfully by resection of the fibrotic injured bronchus and primary reconstruction saving the lung.

Keywords

Blunt Chest Trauma, Tracheobronchial Injuries, Bronchial Reconstruction

1. Introduction

Central airway injury is a very rare entity during blunt chest trauma. During recent decades, an increase in traffic accidents has caused an increase in blunt TBIs [1]. Although emergency services and transport have improved, many patients still die before reaching the hospital [1].

Usually, there are concomitant other organ injuries (head, spine, orthopedic, vascular, abdomen) and that increase the mortality and may delay the diagnosis of TBIs. It is serious and may be fatal. Usually, it has fundamental manifestations

but in some cases it is insidious and has been discovered lately.

Hereby I present a case of right main bronchus disruption discovered after one year of traffic accident managed successfully by reconstruction of the disrupted bronchus and saving the lung.

2. Case Report

A 30-year-old patient was referred to a thoracic surgery clinic in our hospital as a case of a totally collapsed right lung. Pt complained of progressive breath shortness on exertion; he was a smoker but healthy and well-built without any co-morbidity. The pt had a history of traffic accidents one year ago and managed in a peripheral hospital by insertion a chest tube on the right side of the chest for a while then the pt discharged from the hospital. After that, the patient had progressive breath shortness on exertion. CXR revealed a right white shrunk hemithorax; the trachea shifted to the right side, compensatory hyperinflation of the left lung (**Figure 1**).

Ct scan revealed complete right lung atelectasis; the trachea shifted to the right side, complete disruption of the right main bronchus directly after the carina and compensatory hyperinflation of the left lung (**Figure 2**).

Bronchoscopy revealed complete right main bronchus obstruction without any other pathology.

General anesthesia applies through Double lumen endotracheal tube and Right posteriolateral thoracotomy has done through the fourth intercostal space; the lung was totally collapsed, the azygus vein was isolated and hung on a sling, the right main bronchus hardly isolated (**Figure 3**), it was severely stenotic, fibrotic and adhesive, directly after the carina (**Figure 4**), the right lung parenchyma appeared healthy but collapsed.

The stenotic part was resected, thick mucus plug suctioned from the distal bronchus (**Figure 5**), then the intermediate bronchus anastomosed end to end to the carina by 3-0 prollyn interrupted sutures (**Figure 6**).

A pleural flap is wrapped around the anastomosis for reinforcement and to prevent fistulization to the pulmonary artery which laying anterior to the bronchus (**Figure 7**).

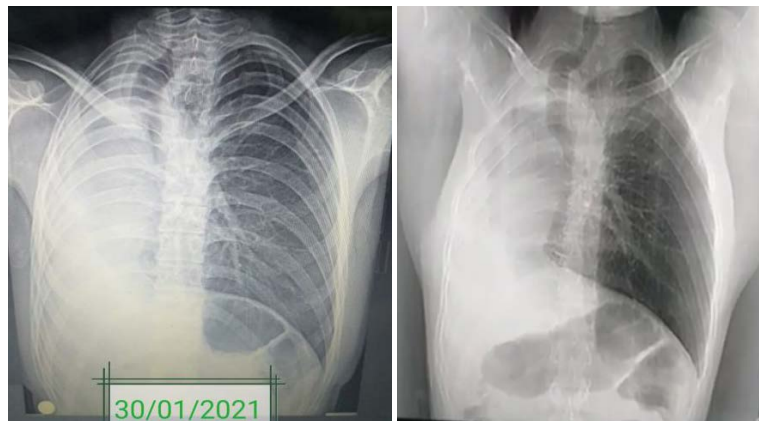


Figure 1. CXR: complete atelectasis of right lung.

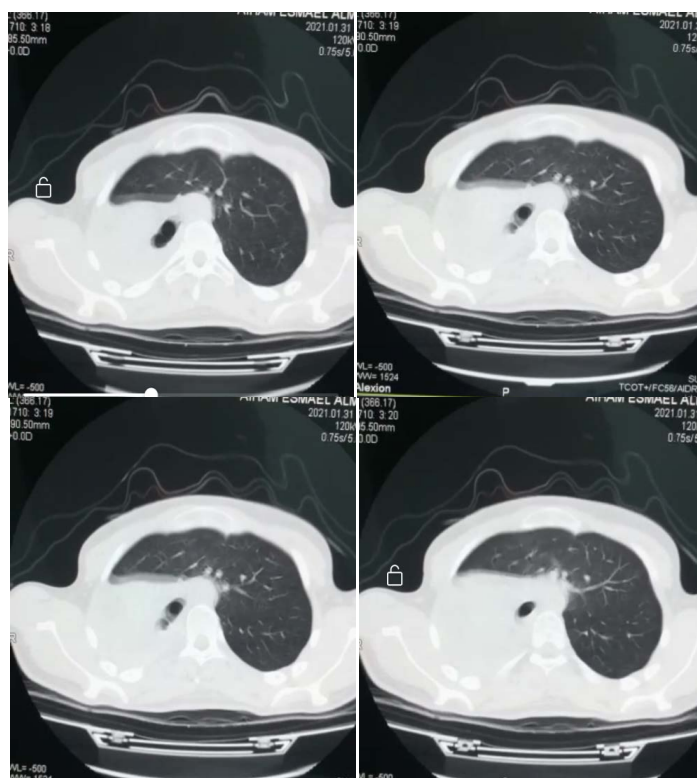


Figure 2. Ct scan: complete atelectasis of right lung.

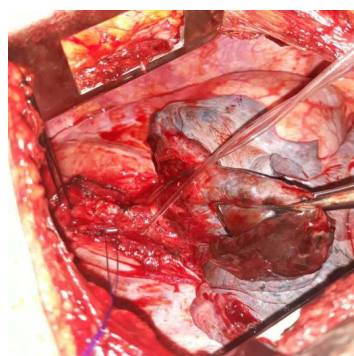


Figure 3. The RMB isolated and hanged on a sling.

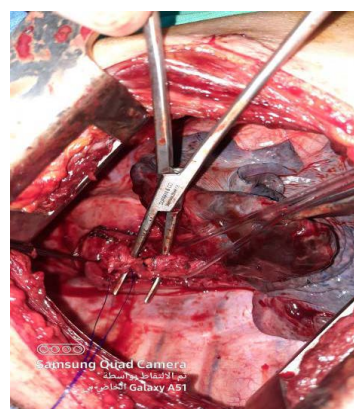


Figure 4. Fibrotic disrupted RMB.

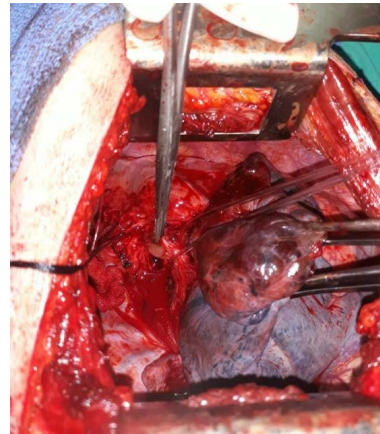


Figure 5. Thick mucus filled the distal bronchus.

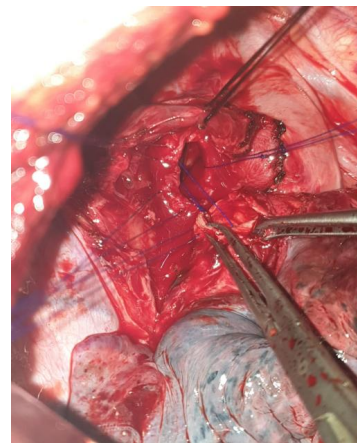


Figure 6. Broncheal anastomosis.

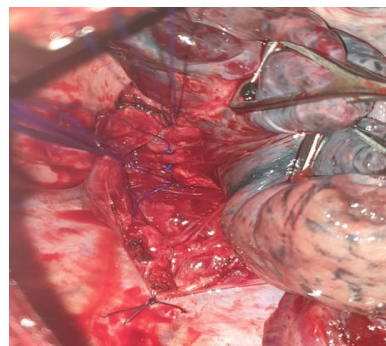


Figure 7. Pleural flap over the anastomosis.

Underwater air leak test was done, and the lung inflated and totally preserved (**Figure 8**).

Post operative period went without any event and the pt discharged from the hospital after one week.

Follow-up Bronchoscopy before discharge revealed patent RMB and the sutures (**Figure 9**).

Follow-up CXRs appeared to have good right lung expansion (**Figure 10**).

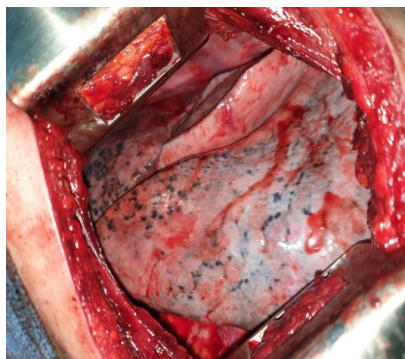


Figure 8. Right lung inflation after the bronchial anastomosis.

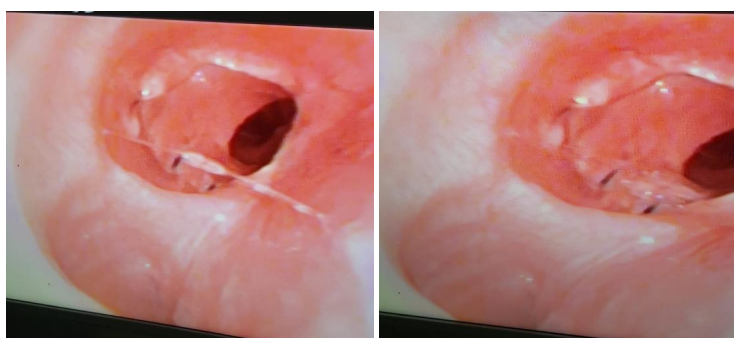


Figure 9. Bronchoscopy: Anastomosis line after one week.

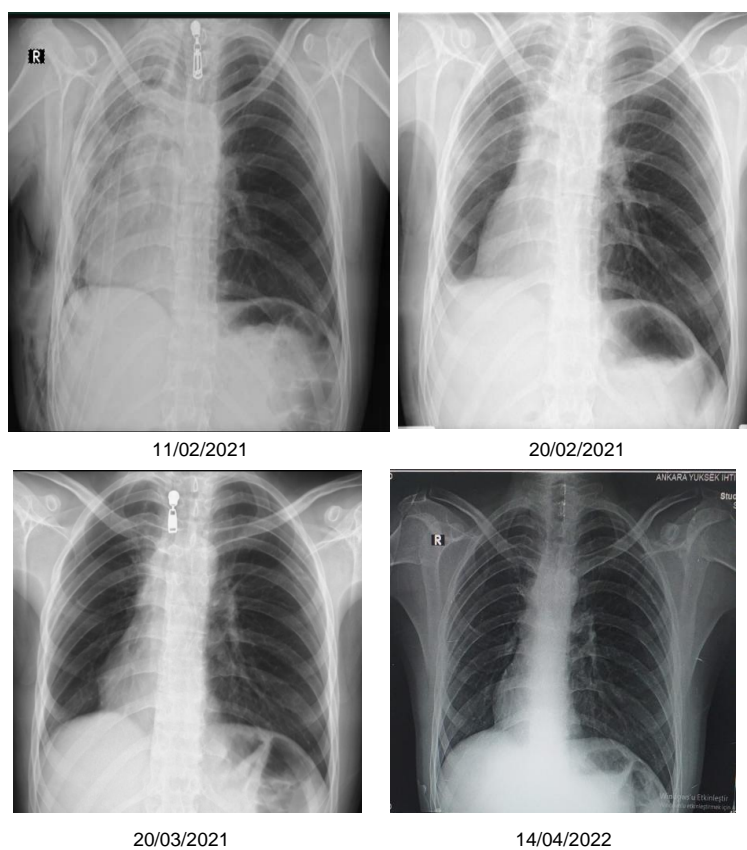


Figure 10. CXRs: Right lung expansion follow-up.

3. Review of Literature

Krinitzki reported the first long-term survivor in 1927 when trachea-bronchial injuries had been thought to be uniformly fatal [2]. TBIs is present in 3% of blunt chest trauma [3]. 81% of these patients died before arriving at the hospital [3] because of the inadequate airway, tension pneumothorax and associated injuries [2].

TBIs in blunt chest trauma can be due to one of these theories: 1) An Anterior-posterior compression pushes the lungs laterally from the trachea and carina leading to TB disruption or bronchus avulsion (crush), 2) chest compression against closed glottis lead to increasing the intrabronchial pressure resulting in rupture of the tracheobronchial tree, and 3) rapid deceleration generates Shearing forces between relatively fixed (carina and cricoids cartilage) and not fixed (lungs) points.

80% of TBIs are located within ± 2.5 cm of carina confirming Laplace's law. In 47% of the cases, the injury involves the right main bronchus; this is probably due to the major dimension, smaller length of the right main bronchus, lack of supporting structures around it and heavier right lung (due to the presence of middle lobe). The injury rates are as follows: cervical trachea 4%, distal trachea 22%, right main stem bronchus 27%, left proximal main stem bronchus 17%, complex injury of the trachea and main stem bronchi 8% and lobar orifices 16.8% [2]. Review of 19 articles between 1985 and 2016 for bronchial rupture after blunt chest trauma in adult patients, consisting of 155 patients, mean age was 28 years. The main bronchus was mostly injured in 81%, and in many cases was accompanied by severe damage to lung tissue. The injury rates were as follows: RMB 32%, LMB 23%, both 3%, with tracheal injury 5% and the lobar bronchi +/- main branches at 14% [4]. Bronchial rupture may be transverse from the carina or between the tracheobronchial rings or longitudinal through the membranous wall or complex [2]. In bronchial injury, when complete disruption occurs, the distal end retracts inferiorly by 1 to 4 cm, and within 5 - 7 days, granulations and secretions obliterate the bronchus. The distal bronchial tree remains sterile and continues to secrete mucus, and the air is rapidly absorbed. The lungs become atelectatic but without infection, abscess, or bronchiectasis [5].

Clinically there are three different scenarios: Tension pneumothorax, Peumomediastinum and subcutaneous emphysema, Insidious Incidental and late diagnosed. Only in one-third of the cases, a definitive diagnosis is made within 24 h [2]. TBIs is suspected when major air leaks from the chest tube and the lung fails to expand despite adequate chest drainage.

RMB injuries have a more acute presentation due to a higher incidence of associated injuries. In clinically suspected and heamodynamically stable patients we must proceed to Ct scan. Ct scan can reveal the presence of peumothrax, heamothorax, peumomediastinum, TBIs especially after three dimensions reconstruction and virtual Bronchoscopy. "falling lung sign" Suggests disruption of main bronchus [2]. Ct scan also reveals the associated injuries. Although Ct

scan is considered the investigation of choice for chest trauma nowadays, Bronchoscopy is still the corner-stone for the definitive diagnosis of an airway injury and should be done at the earliest even with mere suspicion of the airway injury. Bronchoscopy aids in the evaluation of the topography, the extension and depth of the tear and its margin status [2]. It is also can assist in oral intubation, positioning of the cuff distal to the injury in case of a proximal lesion and selective bronchial intubation [2]. Bronchoscopy should be performed in the operating room [2]. Fiberoptic bronchoscopy can be done easily and quickly even in accompanying neck, head or cervical spine injuries. If done in an intubated patient, the endotracheal tube must be carefully withdrawn otherwise the proximal tracheal injury may be missed.

In the chronic type, the patient presents with progressive exertional dyspnoea, stridor and complete atelectasis of the distal lung. On bronchoscopy, we usually find granulation tissue obtruding the bronchus. Later on the lung gets progressively filled by mucus [3].

Conservative treatment is reserved for short lacerations not involving the whole thickness of the trachea wall and for patients in poor general condition. It consists of antibiotics, intubation with positioning the cuff of the tube distal to the tear and eventually chest drain. High-pressure ventilation has to be avoided at any rate, and signs of pulmonary or mediastinal sepsis have to be carefully monitored.

Surgery is indicated in the following features:

- lesion 2 cm or more than one-third of the circumference;
- full wall thickness;
- injury involving the carina or paracarinal region;
- failure of the chest tube and residual pneumothorax;
- prolapse of the esophageal wall or associated esophageal injury.

The cervical approach can allow optimal exposure of the cervical trachea and the laryngotracheal junction. While postero-lateral right thoracotomy at the fifth intercostal space can allow a very good exposure of the thoracic trachea, carina and RMB.

The primary reconstruction is always preferred by bronchial anastomosis after trimming the borders of the injury and adding a flap to cover the suture. Otherwise, sleeve pulmonary resection is needed. Usually tracheotomy is not necessary [3].

Delayed tracheobronchial stenosis after blunt chest trauma is treated with bronchoscopic intervention (balloon dilation, laser ablation, and airway stents), surgical intervention, or a combination of these methods [6].

Mortality of the surgical approach is estimated at 9% in the literature (Kiser) [3].

Early complications include anastomotic leak or fistula (tracheovascular or tracheo-oesophageal). Late complications include anastomotic stenosis which may require endoscopic dilatation or re-intervention later on [2]. Stricture usually develops 1 to 4 weeks after primary injury or dehiscence of the suture line [2].

4. Conclusions

TBIs is a rare and serious entity after blunt chest trauma. It is often life-threatening. Diagnosis is difficult and can be missed. A surgical approach is required for most of the patients and particularly those with full wall rupture, associated oesophageal lesion, resistant pneumothorax and rupture involving the carinal region. Surgical management needs to consider the principle of bronchial surgery and damage control. If the diagnosis is delayed, the bronchial injury can lead to a recurrent pneumothorax, empyema, atelectasia, pneumonia, mediastinitis and respiratory failure. An early diagnosis and treatment can avoid dramatic complications and provide complete recovery [3].

Associated injury is an important mortality factor. Close cooperation with the emergency team and anesthesiologists is necessary.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Conflicts of Interest

The author declares that he has no competing interests.

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Abbreviations

TBIs: Tracheobronchial injuries; RMB: Right main bronchus; LMB: Left main bronchus; Pt: Patient; CXR: Chest x ray.