

Delayed re-implantation of the right main bronchus avulsion after blunt trauma

Abdulameer Mushin Hussein¹, Mohammed Al-Musawi², Ahmad Muhi³

ABSTRACT

Injury to the trachea and bronchi are not common in children after blunt chest trauma due to the pliability of the chest wall. However it has a high mortality and morbidity. High index of suspicion is always required to diagnose tracheobronchial injuries which may presented with persistent air leak, pneumothorax , pneumomediastinum, or subcutaneous emphysema. Thoracotomy as soon as possible is usually required to treat this potentially fatal injury.

Late repair of complete avulsion of main bronchus is a challenging surgical scenario in terms of diagnosis and management. We are reporting a 5 year-old girl with a blunt injury to the chest presented with tension pneumothorax. Diagnosis of avulsion of the right main bronchus was made early by bronchoscopy and CT chest. Surgical repair of the injury was delayed for one month from the accident and diagnosis because the family refused to accept the risk of complications that may occur after thoracotomy. The surgical repair was successful and the patient was doing well for a year of follow up.

Key words: Blunt injury, tracheobronchial injury, surgical repair.

Iraqi New Medical Journal July 2019;4(10)

INTRODUCTION

Tracheobronchial injuries (TBI) in children are rare with an incidence from 0.7% to 2.8% and a mortality rates of up to 30%.¹⁻³ A high index of suspicion must be maintained because significant intrathoracic injuries such as major pulmonary contusion or tracheobronchial disruption can be present with a little external evidence of injury because of the pliability of chest wall in children.^{4,5} Delay in the diagnosis increases the risk of mortality and morbidity and decreases the chance of success of bronchial repair.⁶ A delayed presentation is quite rare and its surgical correction is highly challenging.⁷ literature has reported a delay of repair from few days up to many years.⁸ High index of suspicion is the key for not missing bronchial injury when assessing children with blunt thoracic injury.³ The location

of tracheobronchial disruptions appears to be constant: 80% occur within 2.5 cm of the carina, 80% involve the main stem of the bronchi.^{5,9} Clinically, Bronchial trauma that leaves the connective tissue intact will lead to minimal pneumothorax and mediastinal emphysema,¹⁰ while bronchial trauma that damages the connective tissue and causes free communication between the site of injury and the pleural space may result in pneumothorax, mediastinal and subcutaneous emphysema, and a persistent large air leak from the thoracostomy tube.¹¹ Radiological findings are highly suggestive of tracheobronchial injury and they include deep cervical emphysema and fallen lung sign pathognomonic of total rupture of the main bronchus.¹² Bronchoscopy remains the gold standard of diagnosis and should be performed in all instances of suspected airway rupture in order to reach early



¹MBChB, FIBMS, FRCS. Consultant cardiothoracic surgeon at Ghazi Al Hariri Teaching Hospital. Baghdad, Iraq.

²MBChB, FIBMS, FRCS. Consultant cardiothoracic surgeon, Research Instructor, University of Colorado/School of Medicine, Department of Surgery/Clinical trials office. Colorado/ USA.

³MBChB. Resident in Cardiothoracic Surgery, Ghazi Al Hariri Hospital, Baghdad/ Iraq.

Corresponding Author: Abdulameer Mushin Hussein, Ghazi Al Hariri Teaching Hospital. Baghdad, Iraq.

diagnosis and prevent the associated mortality and morbidity.¹³

CASE PRESENTATION

A 5 year-old girl was admitted to Ghazi Al-Hariri Teaching Hospital following a road traffic accident. On admission, The patient was fully conscious, but unstable haemodynamically with hypoxia and hypercapnia. Clinical examination of the chest showed some anterior chest wall bruising, crepitus on palpation and decreased air entry on the right side. A chest radiograph

showed a surgical emphysema and right side tension pneumothorax with complete collapse of right lung (**figure 1**).

The patient was admitted to the emergency ward, an intercostal tube was inserted and a massive air leak observed. Post chest tube X-ray showed failure of lung expansion with continuous air leak; however, air leak stopped after three days but chest x-ray has shown that the lung was still collapsed as in **figure 2**.

Rigid bronchoscopy was done which showed a total occlusion of the right main bronchus just distal to the carina with oedematous bronchus. Chest CT scan confirmed the complete occlusion of the right main bronchus just below the carina as in **figure 3**.

The patient's father refused doing the surgery on her daughter despite our persistent advice about the importance of the surgery, because he was afraid of the potential complications of pneumonectomy that were explained to the patient's family. The decision was made to remove the chest tube because the air leak has stopped and patient discharged from the hospital on the fifth day post admission. The family was advised to bring the patient to the hospital every week for follow up and at any time she feels shorts of breath or other significant chest problems. After one month from the accident, the family of the patient has convinced to do the surgery and signed an informed consent of the surgery.

The patient was admitted to hospital and reassessed clinically and fully prepared for the surgery. On theatre, the patient was given a general anaesthesia by an experienced anaesthetist. Right posterolateral thoracotomy incision through 5th intercostal space was done, followed by careful dissection at the site of injury. Margins of the injured bronchus were released and trimmed, then the ends were mobilized without disruption of the blood supply. The gelatinous mucus material that was accumulated distal to the injury was carefully sucked.

Two layers primary repair was attempted; the first one was done by using an interrupted 3-0 Ethibond suture, while the second layer was done with an interrupted 4-0 proline suture. A patch of thymus gland was placed over the anastomotic site to prevent airway dehiscence

Figure 1:
Right tension pneumothorax.

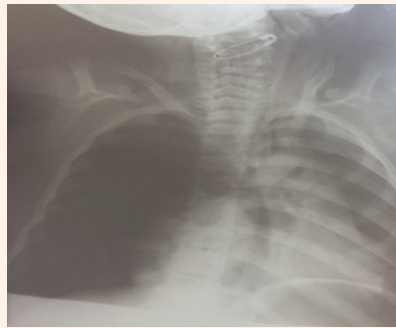


Figure 2:
post chest tube insertion.

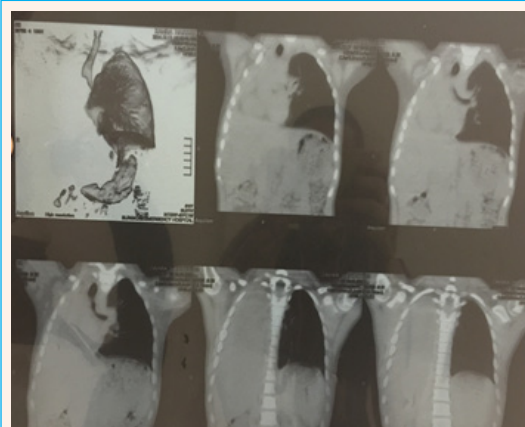


Figure 3: 3 CT scan shows complete occlusion of the right main bronchus just below the carina.

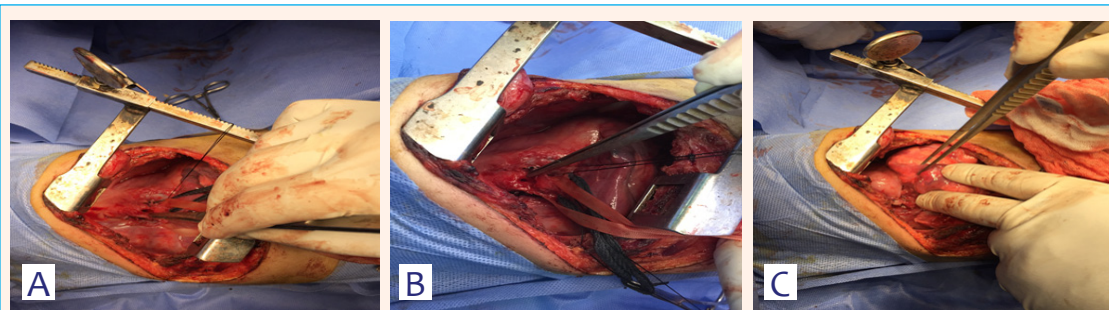
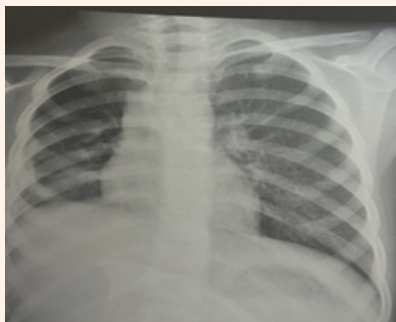


Figure 4: Intraoperative procedure. A: site of bronchial injury, B: repair of injured bronchus, C: thymus approximation on site of injury

Figure 5: Post repair CXR showing full expansion of right lung.



and fistula. (See [figure 4](#)) Every step in this procedure was meticulously performed and a watertight seal of the anastomotic region was confirmed after the operation.

The immediate post repair inflation of the lung proved a successful repair. The patient extubated immediately and transferred to intensive care unit for two days and then transferred to the ward. Chest x-ray was done immediately postoperative showing a complete expansion of the right lung (see [figure 5](#)). Patient's post-operative days went uneventful, and the drains were removed after three days. On the sixth day postoperatively, the patient was discharged home in a good general condition. The patient was followed up for a year after the surgery and she was doing well.

DISCUSSION

Injury of the bronchial tree is a rare condition that may be recognized after both a penetrating and mostly a blunt chest trauma. Many patients die before reaching to hospital and receiving emergency care from the associated injuries and in some cases the diagnosis may be delayed. There are several mechanisms by

which blunt trauma may injure the trachea and bronchus, including direct blows, shear stress, and burst injury.⁴ The presentation of bronchial injury depends on site of communication either with mediastinum or with pleura, if it confines to the mediastinum it usually presents with massive pneumomediastinum, while perforation into the pleural space usually creates an ipsilateral pneumothorax that may or may not be under tension. A pneumothorax that persists despite adequate placement of a thoracostomy tube and has a continuous air leak is suggestive of injury to the trachea or bronchus with bronchopleural fistula.¹ In our case, the presenting symptoms was right pneumothorax, this means the injury was confined to right pleura. Therefore, the intercostal tube was inserted to evacuate the air but, when the collapse lung continues, the suspicion of bronchial injury was elevated, so bronchoscopy and CT scan were indicated.

Bronchoscopy, whether rigid or flexible, is the best mean to establish the diagnosis and determine the site, nature, and extent of the bronchial disruption. Also, this injury may be well demonstrated on CT in some cases, there is no evidence that CT is adequate to exclude an injury and obviate the need for diagnostic bronchoscopy.³ Rigid bronchoscope in our case showed non visualization of the right main bronchus suggesting the injury which was confirmed that by CT scan after that. We decided to do surgical repair; the option which was not accepted initially by the family. Therefore, the management delayed one month later on.

In surgery, Intrathoracic tracheal, right bronchial, and proximal left main stem bronchus injuries are best repaired through a right posterolateral thoracotomy at the fourth or fifth in-

tercostal space. This approach avoids the heart and aortic arch.² In our case we preferred right posterolateral thoracotomy because right main bronchus was injured. Then after adequate debridement of devitalized tissue to prevent later on infection, mobilizing anteriorly and posteriorly to preserve the lateral blood supply and then primary end-to-end anastomosis of the clean bronchial ends. After that, thymus was put on anastomotic site to prevent later on leak and bronchopleural fistula.

CONCLUSION

Early diagnosis with proper surgical intervention is very important in tracheobronchial injuries in order to prevent complication; however, delayed surgical repair for any reason might lead to good results.

REFERENCES

1. Dib OS, Kasem EM. Bronchial injuries in children: single-center experience. *Asian cardiovascular & thoracic annals*. 2014;22(9):1084-7.
2. Juttner FM, Pinter H, Popper H, Ratschek M, Friebs GB. Reconstructive surgery for tracheobronchial injuries including complete disruption of the right main bronchus. *The Thoracic and cardiovascular surgeon*. 1984;32(3):174-7.
3. Beale P, Bowley DM, Loveland J, Pitcher GJ. Delayed repair of bronchial avulsion in a child through median sternotomy. *The Journal of trauma*. 2005;58(3):617-9.
4. Grant WJ, Meyers RL, Jaffe RL, Johnson DG. Tracheobronchial injuries after blunt chest trauma in children—hidden pathology. *Journal of pediatric surgery*. 1998;33(11):1707-11.
5. Heldenberg E, Vishne TH, Pley M, Simansky D, Refaeli Y, Binun A, et al. Major bronchial trauma in the pediatric age group. *World journal of surgery*. 2005;29(2):149-53; discussion 53-4.
6. Bagheri R, Afghani R, Haghi SZ, Fattahi Masoum SH, Sadrizadeh A. Outcome of repair of bronchial injury in 10 patients with blunt chest trauma. *Asian cardiovascular & thoracic annals*. 2015;23(2):180-4.
7. Dewan RK, Mishra AK, Lewate VK, Kaukab M, Arora VK. Delayed presentation and surgical management of a bronchial tear. *The Indian journal of chest diseases & allied sciences*. 2003;45(3):205-8.
8. Burke JF. Early diagnosis of traumatic rupture of the bronchus. *Jama*. 1962;181:682-6.
9. Singh N, Narasimhan KL, Rao KL, Katariya S. Bronchial disruption after blunt trauma chest. *The Journal of trauma*. 1999;46(5):962-4.
10. Kirsh MM, Orringer MB, Behrendt DM, Sloan H. Management of tracheobronchial disruption secondary to nonpenetrating trauma. *Ann Thorac Surg*. 1976;22(1):93-101.
11. Fagenholz SA, Hendren WH. Occult rupture of a main stem bronchus. *Journal of pediatric surgery*. 1977;12(4):509-12.
12. Oh KS, Fleischner FG, Wyman SM. Characteristic pulmonary finding in traumatic complete transection of a main-stem bronchus. *Radiology*. 1969;92(2):371-2 passim.
13. Wiener Y, Simansky D, Yellin A. Main bronchial rupture from blunt trauma in a 2-year-old child. *Journal of pediatric surgery*. 1993;28(12):1530-1.

Abbreviation list: Cut scan (CT scan), Tracheobronchial injuries (TBI)

Conflict of interest: Authors have nothing to declare.

Funding: Authors received no funds to complete this case presentation a part from self funding.