

# A Case of Rupture of a Main Bronchus from a Closed Chest Injury and its Management in a Child

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## Introduction

THE INCIDENCE OF injuries resulting from accidents especially motor vehicles incidents is ever increasing and chest injuries are getting commoner too.

Severe crush injuries to the chest can result in a complete rupture or laceration of the trachea, main bronchus or the lobar bronchus.

The patient presents with a severe respiratory distress with signs of tension pneumothorax or alarmingly increasing subcutaneous surgical emphysema. Despite immediate drainage of the tension pneumothorax, large volumes of air-leak continues unabated and the patient remains distressed. Radiography of the chest shows a total atelectasis of the involved lung.

Confirmation of a rupture of a bronchus is readily obtained by bronchoscopy, either a rupture is seen or blood-stained secretions detected in the involved bronchus.

Prompt repair should result in saving the life and functioning of the lung. Delay could result in death or infection and fibrosis of the collapsed lung.

Surgical aim is in suturing of the laceration or end to end anastomosis of the transected bronchus or end to side anastomosis of an avulsed lobar bronchus.

## Case History

S. Bin. S., a four year old Malay boy was ad-

mitted on 21.6.1972 with a history of having been run over by a motor vehicle.

He was severely dyspnoeic, the respiratory rate 44/minute, BP 104/60, and the pulse rate 120/minute. He was drowsy. His pupils were equal and reactive to light.

He had the following external injuries:-

1. Laceration 3" long left parietal eminence of the scalp.
2. Contusion of the right eye-lids and the left Malar region.
3. Abrasion left lateral wall of the chest.
4. A broad hand of abrasion across the back of the chest wall.

## Clinical Examination:

The significant findings were in the respiratory system. The trachea was deviated to the left. There was no subcutaneous surgical emphysema. The right chest was hyperresonant on percussion. On auscultation vesicular breath sounds were absent in the right chest.

A clinical diagnosis of right tension pneumothorax was made. A plain radiograph of the chest showed complete atelectasis of the right lung. A large bore needle was immediately inserted in the right pleural cavity through the second intercostal space. There was continuous unabated leak of large volumes of air despite continuous suction.

Immediate bronchoscopy revealed blood-stained secretions in the right main bronchus. A rupture of a major right bronchus was strongly suspected.

### Pre-Operative

No premedication was given. On examination, the patient was slightly pale, conscious, restless and dyspnoeic. Respiration was 50/minute. BP 140/100, pulse rate 130/minute.

Induction was done in the semi-recumbent position with 50% oxygen and 50% cyclopropane followed by atropine and scoline intravenously. He was intubated with an endotracheal tube and respiration controlled with nitrous oxide, oxygen, d.tubocurarine and turned to the left lateral position.

Endotracheal suction was done and the patient ventilated. On opening the chest the flow rates had to be increased slightly to compensate for the leak. Endotracheal suction was done whenever necessary. Transfusion of a pint of blood was started and the parameters – the pulse rate, blood pressure and colour were maintained. Neostigmine and atropine were used for reversal.

### Operative Management

Right thoracotomy through the bed of the right 6th rib confirmed an oval defect in the wall of the right main bronchus with a completely avulsed right upper lobe bronchus from the right main bronchus. There was leak of air through the defect in the right main bronchus and the whole right lung was totally atelectatic. The apical portion of the right upper lobe was contused and lacerated with minimal bleeding.

The avulsed right upper lobe was sutured to the oval defect in the right main bronchus with interrupted silk sutures, and the laceration in the right upper lung was sutured. The whole of the right lung expanded immediately on suturing the avulsed upper lobe bronchus to the main bronchus.

Two drainage tubes were inserted in the pleural cavity – one at the upper end, and the other at the lower end of the right pleural cavity. The thoracotomy wound was sutured in layers.

### Post-Operative Care

1. For analgesia he was given Talwin (pentazocine) 5 mg q 4 to 6 hours p.r.n.
2. Physiotherapy was done by the physiotherapist as well as by the nursing staff.
3. Nasal oxygen.

4. Antibiotics. I/M Crystalline Penicilline and Streptomycin for one week followed by Penbritin (ampicillin).

### 1st to 2nd Post-Operative Day:

General condition: The patient was slightly febrile and respiratory rate increased from 26 to 50 per minute on the second post operative day. Pulse rate was about 120 per minute and BP 120/90.

### Blood Gas Report:

pH	7.45
PCO <sub>2</sub>	25 mm Hg.
PO <sub>2</sub>	50 mm Hg.
Base deficit	5 m Eq/L.

Standard Bicarbonate 22 m Eq/L. The patient was coughing satisfactorily during physiotherapy. The upper chest tube was removed on the second day. X-Ray of the chest showed a slow progressive collapse consolidation of the right upper lobe during the first two days.

### 3rd. Post-Operative Day:

Patient was still febrile, respiration slightly laboured – rate 50 per minute and the patient was not able to cough satisfactorily despite the physiotherapy. At this stage a P.V.C. Portex Nasoendotracheal tube was passed under L.A. The child was restless initially but was able to tolerate it subsequently. With this tube it was now possible to carry out endobronchial suction under strict asepsis – posturing and intermittent ventilation with oxygen after each endobronchial suction. Humidification – aerosol therapy was given effectively through the tube using a 'T' piece device. Oxygen tension of inspired air was maintained at about 40%. Endotracheal aspiration was sent for culture and sensitivity. Feeds were initially given through Ryles tube.

Blood gas report after the tube had been placed was as follows:-

pH	7.45
PCO <sub>2</sub>	29 mm Hg
PO <sub>2</sub>	137 mm Hg.
Base excess	3 m Eq/l

### 4th Post-Operative Day and Subsequent Progress:

The General condition improved slightly and the patient was less febrile, less dyspnoeic with a respiratory rate of about 40/minute. The X-Ray of the chest showed slight improvement in the area of consolidation.

Blood gas result on the 4th day:—  
 pH 7.465  
 PCO<sub>2</sub> 32 mm Hg.  
 PO<sub>2</sub> 86 mm Hg.  
 Base deficit 0 M Eq/l  
 Standard bicarbonate 23 Eq/l

On the fifth day the lower tube was removed as drainage was minimal. At the same time the child was able to take fluids orally and had progressed to take semi-solids. The tube was left in place for 9 days.

Daily X'Rays of the chest and blood Gas analysis were done. Subsequent progress was uneventful and on the 15th post operative day, the lung had expanded sufficiently but there was some residual consolidation in the hilar region. The nasotracheal tube was removed. The child did not have any stridor but had hoarseness of the voice. His voice improved over the next one week.

At the time of discharge laryngoscopy revealed no abnormality and the X'Ray showed minimal haziness around the hilar region (probably due to residual effects of scarring).

Blood Gas report on the day of discharge was as follows:—

pH 7.47  
 PCO<sub>2</sub> 30 mm Hg  
 PO<sub>2</sub> 71 mm Hg  
 Base deficit 0.5 m Eq/l

**Follow-up:** One month later Clinical examination revealed no abnormality. X'Ray of chest showed very minimal scarring around the hilar region. The right upper lobe had fully expanded. No other abnormality could be seen in the lung.

### Discussion

Use of a double lumen tube was not feasible in this age group and neither was a bronchial blocker necessary. This patient was adequately managed with an endotracheal.

The use of a nasotracheal tube is a useful method that can be employed in the management of cases where the patients are unable to co-operate fully or are unable to have adequate physiotherapy and I.P.P.V. This technique has been found to be useful not only for the removal of secretions, for providing adequate humidification but also in assisting the expansion of the lobe. Furthermore, this technique of prolonged nasotracheal intubation is more satisfactory in neonates, infants and children, as it produces less gagging and allows eating and

drinking. There is no danger of patient biting the tube. The larynx in children is funnel shaped up to the age of ten years with its narrowest part at the cricoid, whereas the adult larynx is narrowest at the cords. There should be a slight air leak when the tube is in position. For the past two years we have been using this nasotracheal route for our patient with respiratory problems with satisfactory results. In the case of adults this procedure was not used for more than three days.

The most likely cause for the progressive collapse of the upper lobe, besides being due to contusion of the apical segment is the oedema occurring at the anastomotic site causing narrowing of the lumen and thereby causing poor drainage and ventilation. Active measures had to be taken as one could not allow the lobe to progressively collapse. This problem becomes more obvious if one realises the cartilaginous and membranous airways in man receive systemic (bronchial artery) blood supply in contrast to the gas exchange ducts and alveoli which are supplied by the pulmonary circulation. Furthermore it is known that in the upper lobe (zone) alveolar perfusion is minimal and is dependent on an adequate pulmonary blood pressure, degree of vascular constriction and on gravity. Hypoxia and acidosis and hypocapnia cause both pulmonary precapillary vaso-constriction as well as the constriction of the respiratory bronchioles and gas exchange ducts. All these factors will lead to lung damage and infection resulting subsequently in a broncho-pleural fistula.

In these cases it is important therefore that besides frequent clinical examination one should also do daily X'Rays and blood gas analysis (arterialised capillary samples as in this case) especially in the initial stages, as it will give one a better guide to the progress of the lesion.

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