



Late Diagnosis of Traumatic Diaphragmatic Rupture: Experience in Developing Country

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ABSTRACT

Diaphragm is a dome-shaped muscular structure that can be divided into right and left hemi-diaphragm. Rupture of diaphragm can be caused by penetrating trauma or blunt trauma to chest and abdomen. A 32 year-old man with sustained traumatic rupture of diaphragm due to blunt abdominal trauma because of traffic accident. Diaphragm repair was performed at the 6th day.

Keywords: Diaphragm, traumatic rupture of diaphragm

ABSTRAK

Diafragma adalah struktur otot berbentuk kubah yang dapat dibagi menjadi hemi-diafragma kanan dan kiri. Pecahnya diafragma dapat disebabkan oleh trauma tembus atau trauma tumpul pada dada dan perut. Seorang pria 32 tahun dengan trauma pecah diafragma karena trauma tumpul pada perut karena kecelakaan lalu lintas. Perbaikan diafragma dilakukan pada hari ke-6. **Heru Sutanto Koerniawan, Nengah Kuning Atmadjaya, Ketut Wiargitha. Diagnosis Terlambat dari Ruptur Diafragma Traumatik: Pengalaman di Negara Berkembang**

Kata kunci: Diafragma, trauma pecah diafragma

INTRODUCTION

Diaphragm is a dome-shaped muscular structure that can be divided into right and left hemi-diaphragm. Diaphragm divides thorax from the abdominal cavity and is one of the major respiratory muscle.¹

Rupture of diaphragm can be caused by penetrating trauma or blunt trauma to chest and abdomen.²⁻⁵ The incidence of diaphragmatic rupture due to injury is 0.8 – 5% and up to 30% cases are presented late.⁶⁻⁷ Ruptured diaphragm due to injury are usually associated with multi-injuries because massive force is required to rupture the diaphragm.

Incorrect interpretation of the x ray or intermittent hernial symptoms are frequent cause of missed diagnosis.⁸ In developing country, traumatic diaphragmatic hernias is frequently missed and diagnosis is delayed.⁹⁻¹⁰ Rarely, diaphragmatic rupture was associated with hemothorax without rib fracture or any thoraco-abdominal organ injury after blunt trauma¹⁰ High index of clinical suspicion is required because of potential missed

diagnosis.

CASE

A 32 year-old man suffered from moderate head injury, subarachnoid hemorrhage, cerebral contusion, closed fracture of right V - VII ribs, pulmonary contusion, and left fronto-zygoma fracture was brought to the hospital by medical emergency unit. He complained pain on his chest after traffic accident 5 hours prior admission. His GCS score was 9. Thoraco-abdominal examination revealed diminished breath sound on right chest without crepitation, and slight hypersonor on auscultation, saturation was 100% on room air with respiratory rate 20 times per minute, and hemoglobin level was 16.04 g/dl. He also had maxillary float, maxillofacial malocclusion and crepitation. Chest X ray revealed atelectasis of right superior lobe of lung with tracheal deviation to the right.

On the 3rd day, the patient suddenly complained shortness of breath and desaturation. He was intubated and put on full control ventilator with administration of oxygen fraction 60%

and PEEP 7. Chest examination revealed ronchi at both lungs; the chest expansion was equal. On the 6th day, his condition worsened, saturation plummeted, and consciousness was decreased. Follow up chest X ray revealed left massive hemothorax, CT scan examination was not available at the moment. Emergency insertion of chest tube drained 250 ml blood. Post insertion imaging revealed radiolucent cyst-like structure at the right basal segment. The following day, bowel sound noted on the auscultation of chest region while breath sound was still diminished at the right lung. Abdominal examination was within normal limit. Nasogastric tube was inserted to confirm the presence of abdominal viscera in the chest cavity.

An emergency laparotomy was performed with suspected herniation of abdominal viscera (stomach) to the chest cavity due to possible traumatic rupture of diaphragm. During operation, the spleen was lacerated (grade 1 AAST). Hematoma was found in the lacerated site at left diaphragmatic dome. Intra-peritoneal viscera including stomach and



transverse colon were herniated into thorax through the lacerated site of left diaphragm.



Figure 1a. Chest X ray on 1st day of admission

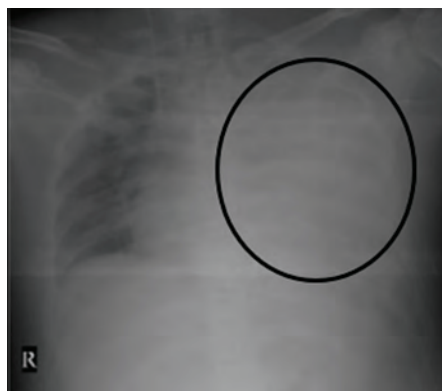


Figure 1b. Chest X ray on 6th day after admission showed left massive hemothorax



Figure 2a. Post Chest tube insertion on 6th day after admission (Arrow shows radiolucent cyst like appearance)

The intraperitoneal viscera were reduced and evaluated for its viability and vascular supply. The lacerated wound was repaired with non absorbable, interrupted simple sutures. Postoperative course was good. The patient was moved to intermediate ward next day. Maxillo-facial reduction and clavicle fracture

reduction were performed 4 day later.

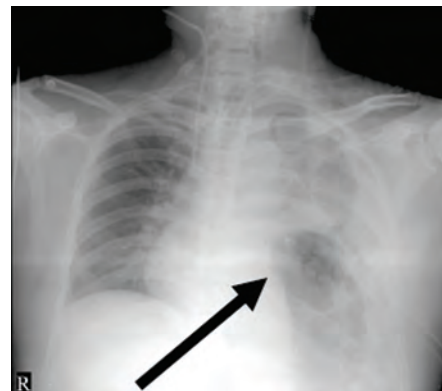


Figure 2b. Post NGT insertion 6th day after admission (Arrow shows the distal portion of NGT)



Figure 3. Lacerated wound over left side diaphragm repaired with interrupted simple sutures

The patient was discharged 7 days after laparotomy and repair of traumatic rupture of diaphragm without any complication.

DISCUSSION

Diaphragm is a dome-shaped muscular structure that divide thorax from the abdominal cavity; it is one of the major respiratory muscle.¹ First documented case of diaphragm rupture was described by Sennertus in 1541.¹¹ First successful repair of penetrating diaphragmatic injury was described by Riolfi in 1886.¹²

The incidence of diaphragmatic rupture due to injury is around 0.8–5%, and up to 30% diaphragmatic hernia presented late.^{6-8,13,18} Traffic accidents and falls are the most common causes of diaphragmatic rupture and blunt injuries to diaphragm occur in about 0.8%-1.6% of all trauma admissions.¹⁸ Traumatic diaphragmatic hernia is a frequently missed diagnosis and there is commonly a delay between trauma and diagnosis up to years.^{9,14}

Rupture of diaphragm can be caused by

penetrating trauma or blunt trauma to chest and abdomen, usually associated with multi injuries because massive force is required to rupture the diaphragm, and usually fatal. Rarely, diaphragmatic rupture was associated with hemothorax without rib fracture or any thoraco-abdominal organ injury after blunt trauma¹⁰

Most cases of rupture of diaphragm are initially overlooked in acute phase due to associated major injuries. Non specific signs and findings make the diagnosis is often difficult and easily missed. An overlooked diagnosis of rupture of diaphragm injury often presents as a hernia that may present years later with potentially fatal complications. Delayed rupture of diaphragm and diaphragm hernia should be taken into account in patient with blunt abdominal trauma and gastrointestinal or respiratory complaints especially patient with recent history of trauma. Rupture of diaphragm are usually managed via laparotomy access. The most common therapeutic approaches of rupture of diaphragm are thoracotomy, laparotomy, and thoracotomy + laparotomy. All visceral contents are reduced and the diaphragm is simply repaired with monofilament non absorbable suture. In some complicated cases due to adhesion and wide defect, sometimes MESH are needed to help close the defect. Common post surgical complications include pneumonia, atelectasis, and hemothorax.

Five signs of diaphragmatic rupture are prominence and immobility of respective half of chest, opposite shifting of cardiac dullness, tympanic on percussion, diminished breath sounds and presence of gut sounds on the respective side of chest on auscultation.¹⁵ If the diaphragmatic injury is not recognized during the immediate post-traumatic period, the patient may: 1) recover and remain symptom free; 2) suffer from chronic abdominal and/or chest symptoms, or 3) present with an acute crisis, often with signs of intestinal obstruction or strangulation.^{8,19}

Chest radiography is the first line or initial investigation for trauma workup and screening according to Advance Trauma and Life Support Protocol as part of primary survey.^{2,4,8,19,20} It can only screen 23%-73% traumatic diaphragm rupture and only 17% of right sided injuries.^{24,19-21} Incorrect interpretation of the



x ray or only intermittent hernial symptoms are frequent cause of potential incorrect and missed diagnosis.⁸

Chest X ray findings that can indicate traumatic rupture of diaphragm include : abdominal contents in the thorax with or without signs of focal constriction (Collar sign), nasogastric tube seen in thorax, elevated hemidiaphragm (>4 cm higher on left vs right), and distortion of diaphragmatic margin.^{19,20} Systematic review confirmed chest X ray findings of bowel loops in the left hemithorax, abundant hydropneumothorax, elevation of the left diaphragmatic dome, loculated left pneumothorax, mediastinal shift, free gas under the diaphragm, and subdiaphragmatic densities.⁸ Elevation of hemidiaphragm was the most sensitive finding of diaphragmatic rupture seen in 61% patient while the presence of air-containing viscera within the thorax was the most specific finding.²⁰ Barium meal can confirm presence of stomach above the diaphragm on left diaphragmatic injury,

but this procedure is contraindicated in patients with obstruction sign because the air and contrast introduced into the bowel can be trapped and transform the partial obstruction of herniated loop into a complete obstruction.^{8,19} Blunt traumatic rupture without any herniation is more difficult to diagnose.¹⁹ Helical CT Scan has been reported to be 71-100% sensitive for diagnosis of blunt traumatic rupture of diaphragm.¹² This patient was diagnosed with serial plain chest X ray. We did not perform CT scan since it was not available at the time.

Operative correction is the mainstay of the management of rupture of diaphragm.^{12,16} Surgery in delayed cases is technically more difficult as adhesion of related organs and infection risks are greater.¹² After reduction of the intraabdominal organ, simple primary repair with monofilament suture were performed as in this case. Common complications after operation include pneumonia, atelectasis and postoperative

hemothorax.¹¹ In chronic case, repair may be difficult or even impossible. Delay in detecting and repair can increase both morbidity as well as mortality. Mortality rate is 15%-18%, mostly due to another associated injury rather than direct diaphragm injury.¹¹

SUMMARY

Blunt traumatic rupture of diaphragm is often overlooked as it is mostly associated with multiple injuries. High index of clinical suspicion is required. Chest X ray as part of trauma workup can screen 23%-73% cases of rupture of diaphragm. Surgery is the mainstay of management of diaphragm rupture. Common postoperative complications include pneumonia, atelectasis, and hemothorax. We present case of a 32-year old with sustained traumatic rupture of diaphragm due to blunt abdominal trauma because of traffic accident. Diaphragm repair was performed on the 6th day.

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