

Case study

Traumatic left hemi-diaphragmatic rupture with intra-thoracic herniation of abdominal viscera with iatrogenic gastric perforation – A Case Report

Abstract:-

Acute diaphragmatic injury (DI) is reported in less than 10% of all the patients with penetrating trauma to lower chest [1]. Rupture of the diaphragm mostly occurs following major trauma (blunt or penetrating) or iatrogenic injury, the latter being infrequently diagnosed earlier. The presentation often masquerades as haemothorax and is misleading and can lead to disastrous complications unless the surgeon has high index of suspicion.

Diaphragmatic injury, Penetrating trauma, Haemothorax, Iatrogenic Gastric Perforation, Chest Injury

Case Presentation

A 60 year old male was brought to surgical emergency with alleged history of run over by a motorcycle 2 days back. On arrival in the ER patient was conscious and complained of left sided chest and left upper quadrant abdominal pain. His BP was 110/70 mmHg and pulse of 90bpm and RR of 30 cycles per min with air entry significantly decreased on left side. Patient was received in the ER with an ICD in-situ draining 2000 ml of gastric content. Patient had been visiting various other hospital in the past two days where following investigations were done.

1. **AX-Ray chest** AP view (fig.1) showing 3rd to 7th rib fracture.
2. A **USG FAST** was done which was negative.
3. A **NCCT brain** showed age related changes.
4. A **CECT chest and abdomen** that showed :
 - a. Left sided diaphragmatic injury with herniation of stomach, spleen and splenic flexure of transverse colon.
 - b. Grade IV splenic injury.
 - c. Left sided hemopneumothorax and ICD tube in-situ.
 - d. Left sided 3rd to 7th ribs fracture and associated subcutaneous emphysema.

He also had associated bilateral tibia and fibulae fracture for which cast was given in an outside hospital. A nasogastric tube insertion was attempted but could not be placed in the stomach, so orally methylene blue dye was given. After

few seconds the dye was seen in the intercostal drain tube and its underwater container (fig.2).

Patient was immediately shifted to the OR. An 8 X 6 cms of transverse tear in the left dome of the diaphragm (fig.3.a) with the spleen, stomach and transverse colon, splenic flexure along with the mesentery was seen herniating into the diaphragmatic tear. On withdrawing the viscera into the abdominal cavity a 1 X 1 cm iatrogenic perforation with everted margins along the greater curvature of the stomach near the fundus was seen (fig.3.b). The spleen had 4 X 6 cms of tear on the anterior surface and approximately 750 cc of clotted blood and gastric content mixed with orally given methylene blue dye was evacuated from the left thoracic cavity through the diaphragmatic defect.

Rest all organs solid and hollow were normal. The diaphragmatic rent was repaired with no.1 polypropylene taking interlocking sutures and then the ICD tube was repositioned. The gastric perforation was repaired with absorbable sutures after freshening the contaminated margins. Two 28F intra-abdominal drains placed and abdomen was closed after thorough wash. The patient was shifted in the ICU and was uneventfully discharged on postoperative day.

Discussion

Historical aspect

- In 1541 Sennertus reported traumatic diaphragmatic hernia for the first time^[2].
- Ambroise Pare described the first case of diaphragmatic hernia during an autopsy in 1579.
- The first Ante mortem diagnosis of traumatic DH was made by Bowditch in 1853.
- In a patient with omental prolapse Riolfi did the first successful diaphragmatic repair in 1886^[3].
- In 1888 Naumann repaired the diaphragmatic defect with herniated stomach.

As per available data most of the cases of traumatic DH present in the third decade of life with the male to female ratio being 4:1.

Majority of the cases those who present to ER with diaphragmatic rupture have a history of severe grade blunt thoracic, abdominal or abdomino-thoracic road traffic accident (RTA) and injuries from penetrating injuries like gunshot or stab are less reported^[4].

Aetio-pathogenesis

Sudden increase in intra-thoracic or intra-abdominal pressure against a fixed diaphragm that occurs in RTA leads to its rupture^[5].

The Posterolateral surface of the diaphragm ruptures commonly as its the weakest part (embryonic line of fusion). Of all the reported cases to hospital around 70% are left sided with the right sided accounting for around 15% and with bilateral being the least common^[6]. The low incidence of right sided rupture is attributed to the placement of the liver on the right side abutting the right hemi diaphragm^[7-9].

Three phases of the diaphragmatic rupture according to time of presentation and diagnosis as it has been described by Grimes.

- a. **Acute phase** is when its diagnosed at the time of the injury to the diaphragm.
- b. **Delayed phase** is non-specific and because of transient herniation of the viscera.
- c. **Obstruction phase** due to long standing herniation, presenting as obstruction and strangulation^[10].

As in our case due to run-over by motorcycle there was sudden increase in the pressure gradient between thoracic and abdominal cavity thrusting the abdominal viscera in to thoracic cavity. The pressure difference can even rise to 100 cms of water in very severe impact.

Normally, in supine posture the diaphragm contributes to 2/3rd of tidal volume which is significantly affected in case of trauma. Post-trauma ruptured diaphragm with thoracic herniation of abdominal viscera leads to plethora of physiological changes on circulation as well as respiration which are life-threatening changes and are due to :

- compression of the lungs
- displacement of the mediastinum
- impaired venous return to the heart.

A very high index of suspicion is warranted by the clinician attending the patient in the ER as compression by the herniating abdominal viscera in the case of diaphragmatic rupture may mimic cardiac tamponade.

Radiological Signs

On a coronal or sagittal CT/ MR images and barium studies a waist-like or collar-like appearance of herniated organs at the level of the diaphragm is also called the **Collar sign** or the **hour glass sign** is seen in a case of diaphragmatic rupture. The ruptured hemi-diaphragm is elevated and gets distorted^[11,12]. The absent **Diaphragm sign** which is lack of visualization of the diaphragm (sharp discontinuation of the diaphragm) can also be appreciated^[13-16]. The nasogastric tube in stomach is seen above the level of the diaphragm in the thoracic cavity is strongly suggestive of gastric herniation through diaphragm^[17-19].

Role of Minimal Access Surgery (MAS):

Recently, Thoracoscopy has been used by Koehler and Smith^[20] with an excellent outcome in patients to repair penetrating diaphragmatic injury opening new avenues in the armamentarium of trauma management more accurately.

They advocated that tailored use of combined thoracoscopy as well as laparoscopy depending upon patients condition can dramatically improve the outcome.

In our case the case was of traumatic diaphragmatic rupture associated with gastric perforation and feco-pneumothorax.

Conclusion

Traumatic diaphragmatic rupture has to be diagnosed with high index of suspicion. In an attempt to overzealously treat respiratory distress in a chest trauma patient with suspected diaphragmatic rupture, the possibility of entering herniated hollow viscera has to be always kept in mind while placing an ICD.

The temporal presentation has a tremendous impact on initial management as well as future outcome.

Use of MAS has been advocated for management of traumatic DI which has an excellent outcome when used with results.

It's of utmost importance that the patient of diaphragmatic injury has to be treated as a whole according to ATLS guidelines to avoid missing other life-threatening injuries, which can be easily overlooked.

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Fig.1 X-ray showing opacity of the left hemithorax with intercostal drainage tube in-situ.



Fig.3 (a) Arrowhead showing diaphragmatic rent, (b) Methylene blue seen at gastric perforation site.



Fig. 2 Methylene Blue dye seen in Inter-costal drain immediately after giving it orally indicating gastric perforation communicating with left thoracic cavity.