

RIGHT-SIDED SPONTANEOUS DIAPHRAGMATIC HERNIA WITH HYDROPNEUMOTHORAX – A DIFFICULT DIAGNOSIS?

Dr. Ashok Kumar Sethi¹ Dr. Anup Arora² Dr. Asha Tyagi³ Dr. Medha Mohta⁴

SUMMARY

Spontaneous rupture of diaphragm is rarely seen, and a right-sided tear is rarer still. Case of a 70 year old male COPD patient who developed right-sided spontaneous rupture of diaphragm with intrathoracic small bowel herniation, obstruction and perforation following episodes of paroxysmal violent coughing is presented. Correct diagnosis of diaphragmatic hernia could not be established until the laparotomy itself. Surgeons inability to establish the correct diagnosis preoperatively was blamed on the supposed rarity of right-sided spontaneous defect, along with a superimposed hydropneumothorax. The repercussions of missed diagnosis of a diaphragmatic hernia with intrathoracic visceral herniation may be fatal during the perioperative management of a case. Hence it is imperative for anaesthesiologists to be aware of the condition and its diagnostic dilemmas, independent of the surgeon's clinical diagnosis.

Keywords : Diaphragmatic, Hernia, Hydropneumothorax

Introduction

Diaphragmatic rupture following thoraco-abdominal injury is a fairly well known occurrence. However, spontaneous rupture of diaphragm is rare accounting for only about 1% of all diaphragmatic hernias, with right sided pathology being rarer still accounting for 10-20% of all diaphragmatic ruptures.¹ In this case, the rarity of the condition, along with a superimposed hydropneumothorax lead to a missed diagnosis of right sided spontaneous diaphragmatic rupture until the findings were revealed intraoperatively. The case is important to create awareness regarding the unusual pathology amongst anaesthesiologists, who are increasingly required to act as perioperative physician, such as to avert the potentially fatal perioperative sequelae of a missed diaphragmatic herniation.

Case report

Retrospective review of the preoperative management by the surgeons revealed a 70 year old male patient referred to surgical emergency from a peripheral hospital with complaints of respiratory distress and pain in right side of chest, along with symptoms of intestinal obstruction for about 10 days. Other significant past ailments included chronic obstructive pulmonary disease (COPD) associated with paroxysms of severe and violent cough, and an

episode of transient myocardial ischaemia eighteen months back. The patient was not taking any medications for either COPD or CAD since almost a year. There was no history of recent or remote trauma.

Vital parameters revealed tachycardia (HR 120/min), and tachypnoea (RR 25-30/min) with BP of 110/68 mmHg. On auscultation, breath sounds were absent in right lower lung field that was also dull on percussion, and there were bilateral crepitations and rhonchi. An urgent chest x-ray was done but turned out to be a poor quality film, based upon which an inference of right-sided hydropneumothorax was drawn by the surgeon due to presence of an air-fluid level (Fig. 1). Thoracic ultrasound also confirmed the

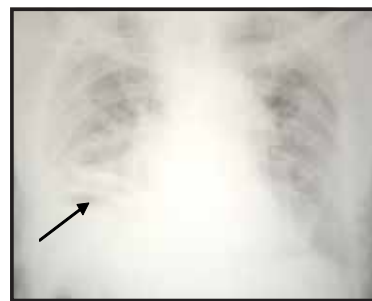


Fig. 1: Chest x-ray PA view, showing an air-fluid level in right intrathoracic cavity (marked with an arrow) prior to ICD insertion

presence of pleural fluid in the right hemithorax. Patient's PaO₂ was maintained at 150 mmHg with FiO₂ of 0.3 through face mask. Abdomen was distended and tender with increased peristaltic sounds. ECG showed old anteroseptal and inferior wall infarction

along with left anterior hemiblock. Other investigations revealed Hb 13.3 gm%, TLC 15,000/mm³, blood urea 119 mg%, serum creatinine 1.8 mg%, blood sugar 135 mg%, serum sodium 135 meq/L and serum potassium 4.1 meq/L.

The surgeons made a diagnosis of intestinal obstruction with right-sided hydropneumothorax and inserted an intercostal drain (ICD) on the right side, which

1. Professor & Head, Ex-Senior Resident
 2. Reader
 3. Department of Anaesthesiology and Critical Care, University College of Medical Sciences & GTB Hospital, Shahdara, Delhi-110095, India
- Correspond to :**
Dr. A. K. Sethi
E-mail : draksethi@gmail.com



Fig. 2 : Chest x-ray after ICD insertion: Raised right hemidiaphragm (marked with an arrow), bilateral infiltrates and ICD-in-situ.

drained minimal amount of air and 300 ml of pleural fluid. Chest x-ray repeated after ICD insertion showed the ICD tube-in-situ with bilateral infiltrates and a raised right hemidiaphragm (Fig. 2). The position of the hemidiaphragm was attributed by the surgeons to increased intra-abdominal pressure. Pleural fluid analysis report showed TLC 3250 cells/mm³, polymorphs 88%, lymphocytes 12%, sugar 13 mg/dl, proteins 4.2 mg/dl, and culture revealed no growth even after 48 hours of incubation.

Surgical decision was to manage the patient conservatively over next 48 hours in view of "poor" chest condition. During this time efforts directed at improving the chest condition included antibiotic and bronchodilator therapy, continued ICD drainage (further 100 ml pleural fluid) and chest physiotherapy. Despite this, the PaO₂ decreased from 150.8 mmHg to 72.6 mmHg. At this time, the chest x-ray (Fig. 2) was again reviewed by the surgeons, and a hesitant and fleeting diagnosis of right-sided diaphragmatic hernia with intrathoracic bowel herniation and obstruction was considered, with the possibility that the air-fluid level could have been due to presence of bowel loops in the thorax. However, given the absence of history of trauma and the documented rarity of spontaneous right-sided rupture the tentative diagnosis was considered too rare by the surgeons and discarded all too soon! Also, pleural air and fluid drainage gave credence to the air-fluid level being due to the hydropneumothorax rather than due to intrathoracic bowel herniation. Patient was scheduled for emergency laparotomy to relieve intestinal obstruction.

When first seen by the anaesthesiologist in immediate preoperative period, the patient had a heart rate of 110/min, BP of 120/72 mmHg and a respiratory rate of 24/min. He had productive paroxysmal cough with decreased breath sounds on the right side of chest, with coarse crepitations and rhonchi bilaterally. The abdomen was tense and distended. Blood investigations showed raised TLC (13,200/mm³), blood urea (107 mg %) and serum creatinine (2.0 mg %). The ABG analysis revealed hypoxia with normal metabolic and electrolyte status (PaO₂ 72.6 mmHg, PaCO₂ 39.7 mmHg, pH 7.33, SaO₂ 92.5%, base deficit 4.7 mmol/l, HCO₃ 20.5 meq/L, serum

sodium 146 meq/L and serum potassium 3.9 meq/L). Central venous pressure at this time was 9 cmH₂O. The diagnosis conveyed by the surgeons was that of an elderly COPD patient, with right hydropneumothorax and intestinal obstruction. After examination, the patient was accepted for anaesthesia under ASA III E.

Following optimization as possible, keeping in view the poor chest condition and renal impairment, the case was conducted under segmental thoracic epidural anaesthesia. To the anaesthesiologists and surgeons surprise, exploratory laparotomy revealed a 4 cm long tear in antero-central part of right hemidiaphragm along with herniation of 10 cm loop of perforated terminal ileum in the right thoracic cavity through the rent. The herniated bowel loop was oedematous, inflamed, but free of adhesions and viable, and was thus gently reduced back into abdominal cavity. The perforation was repaired and diaphragmatic tear closed with non-absorbable sutures. Intraoperative course was otherwise uneventful.

Patient was shifted to postoperative intensive care unit where he made good initial recovery. Chest x-ray done in immediate postoperative period showed clearly defined and lowered right hemidiaphragm with minimal hydropneumothorax (Fig. 3). However, patient subsequently developed septicemic shock and multiple organ dysfunction syndrome, and succumbed to cardiac instability despite adequate support on the third postoperative day.



Fig. 3: Chest x-ray after laparotomy: Return of raised right hemidiaphragm to a normal position, cough fracture in the 5th rib (marked with an arrow), ICD-in-situ and minimal remaining fluid collection

Discussion

The most concerning implication of this case, is that an anaesthesiologist needs to be aware of right-sided spontaneous diaphragmatic hernia, sans its rarity as a diagnostic indicator, to upkeep his expanded role of a perioperative physician who may be required to diagnose and manage the perioperative course of patient with diaphragmatic herniation.

The seemingly obvious reason to merit discussion of this case would also be to allay the belief that it is "too rare" to occur, given the fact that spontaneous diaphragmatic hernia account for only about 1% of all diaphragmatic ruptures^{1,2} and right-sided ruptures account for only 10 to 20 % of total diaphragmatic rents. Lower incidence of right versus left sided ruptures is probably due to the protective effects of liver which distributes the pressure evenly over the diaphragmatic surface.^{1,2} Literature search confined to English literature revealed only 6 cases of spontaneous rupture of right dome of diaphragm.¹⁻⁶ This publication however, serves to emphasize that reported "rarity" of any condition should not be a reason to discard a diagnosis! Rather, the condition has to be excluded by virtue of its absence, and not rely on quoted incidences.

At the same time, it is also to be conceded that the correct preoperative diagnosis in this case was made difficult by other factors besides its low incidence. The suspicion of diaphragmatic hernias is as it is a difficult task, since most of the clinical features are non-specific. In retrospect, certain features such as chest pain, dyspnea and signs of intestinal obstruction suggesting diaphragmatic hernia were present, but in the absence of a suspicion of the diagnosis, they were not viewed for intent of diagnosing diaphragmatic rupture. Also, presence of a superimposed hydropneumothorax on right side definitely added to the diagnostic inaccuracy. It masked intrathoracic signs such as bowel sounds in chest, and lent support to the surgeon's diagnosis of the air-fluid level being due to hydropneumothorax rather than being viewed as intrathoracic bowel loops (Fig. 1). A similar case of hydropneumothorax interfering with the diagnosis of diaphragmatic hernia could be located.⁷ Finally, it was misinterpretation of a poor quality chest x-ray by non-radiologist doctors that resulted in the diagnosis being missed, the intra-thoracic oedematous bowel wall being taken as lung infiltrates (Fig. 2).

Chest radiograph in diaphragmatic hernia may reveal several non-specific findings such as an arch-like shadow of raised hemidiaphragm, extraneous lucencies or densities above the diaphragm, mediastinal shifts to contralateral side and disc-like atelectasis adjacent to raised hemidiaphragm.⁸ When analyzed in retrospect, most of these findings were present in the radiograph of this patient, but absence of an expert radiologic opinion and any clinical suspicion made the diagnosis impossible. Further radiologic evidence such as barium contrast study and CT-scan can be used to confirm the diagnosis. However, these were not

done in this case as the clinical suspicion of diaphragmatic hernia was not entertained.

In hindsight, the presence of paroxysmal cough, with a probable cough fracture that was missed in the chest radiograph (Fig. 3) of this patient, would explain the occurrence of the rupture. The most common mechanism of spontaneous rupture of diaphragm involves sudden and forceful Valsalva manoeuvre that can cause an incoordination between expiratory muscles leading to the rupture.² Maneuvers including physical exercises,^{1,8} parturition⁵ as well as violent vomiting⁴ and coughing² have been claimed to be associated with spontaneous diaphragmatic rupture in the past.

To conclude, anaesthesiologists need to be aware of the presence of spontaneous diaphragmatic herniations. It should be remembered that even so called rare occurrences do occur, albeit rarely. Also, the problem due to concomitant hydropneumothorax in masking and delaying the diagnosis of diaphragmatic herniation should be acknowledged. It is reiterated that a high index of suspicion, along with expert radiological opinion is needed to reach the correct diagnosis of diaphragmatic hernia, such that early treatment can be instituted and potentially fatal complications avoided.

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