Missed Traumatic Diaphragmatic Hernia: Presentation and Outcome of Surgery

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ABSTRACT

Background: Diaphragmatic insults are the most frequently overlooked injuries in trauma patients. Sometimes it is difficult for trauma physicians to detect diaphragmatic injuries because they are clinically silent. Nevertheless, the precise determination of this hernia is crucial, as missed traumatic diaphragmatic hernia (MTDH) may lead to serious complications. **Objective:** To comprehend MTDH more readily regarding the presentation and evaluation of surgical management outcomes. **Methods:** All patients diagnosed with MTDH admitted to the emergency department for surgery at the period from January 2010 to March 2018 were included in the study. We evaluated our cases as regard age, gender, clinical presentation, type of trauma, time since trauma, site of the hernia, surgical technique, complications, and mortality.

Results: 25 patients with MTDH were included, 76% were males, mean age was 33.3 years. 92% were left-sided, while 8% were right-sided. 56% of cases were detected within 20 to 40 years of age. Penetrating trauma was the cause in 76 % of cases, blunt trauma in 16%. The stomach and colon were the commonest herniated organs in 64% and 56 % respectively. Dyspnea, abdominal pain, and vomiting were the commonest presentation. Thoracotomy was performed in all patients. Chest infection, pneumonia, ARDS, and empyema were the commonest complications. 3 (12%) cases of mortality in our study.

Conclusion: every effort should be done to detect diaphragmatic injury in trauma patients, and surgeons should have a high index of suspicion, for early diagnosis, to prevent complications with subsequent high morbidity and mortality.

Keywords: Diaphragmatic hernia; Trauma; Missed diagnosis.

INTRODUCTION

Despite being a rare entity, diaphragmatic insults are the most frequently overlooked injuries in trauma [(1)]. The traumatic diaphragmatic hernia was detected in about 10% of thoracoabdominal injuries; either blunt, penetrating, or iatrogenic trauma [(2, 3)]. It is reported that missed diaphragmatic injuries in conservatively managed patients range from 12% to 66%, leading to late complications and considerably increased mortality and morbidity among the patients [(4,5)]. We aim to comprehend more readily missed traumatic diaphragmatic hernia (MTDH) regarding the presentation and evaluation of surgical management outcomes.

PATIENTS AND METHODS

This is a retrospective study that included 25 MTDH patients who underwent surgical management at Cardiothoracic and General Surgery Departments, Sohag University, Egypt, from January 2010 to March 2018. All patients diagnosed with MTDH admitted to the emergency department for surgery at this period were included in the study. After reviewing the medical files, the required data were collected and recorded in a prepared form. We evaluated our cases as regard age, gender, clinical presentation, type of trauma, time since trauma, site of the hernia, diagnostic modalities, surgical technique, complications, mortality, and hospital stay. Data analysis was performed using descriptive statistics in SPSS (Version 23), and a P-value of ≤0.05 was considered significant. This study was approved by the ethical Institutional Review Board of Sohag University Hospital.

ETHICAL APPROVAL

The study was approved by the medical research ethics committee of Sohag University, and informed patients' consent was fulfilled.

RESULTS

25 patients with MTDH diagnosed at least 8 months after trauma (8 to 50 months, mean= 24.48 months) were included, 19 of them were males, their mean age was 33.3 years (5-55 years). 23 (92%,) cases were left-sided, and 2 (8%) cases were right-sided. 14 (56%) cases were detected within the 20 to 40 years of age group. 19 (76%) cases were due to penetrating trauma; other causes were blunt trauma (MCA and falling from a height) in 4 cases (16%), iatrogenic in one case, and post-hernia repair in one case (4%) (Table 1). The stomach and colon were the herniated organs in 16 (64%) and 14 (56%), respectively. Other organs (small intestine, spleen, and liver) were also observed in 24%, 12%, and 8%, respectively (Table 2) (Figure 4).

Dyspnea was detected in 11 (44%) patients, abdominal pain in 6 (24%) patients, and vomiting in 3 (12%) patients. Three (12%) cases presented with an emergency in the form of colonic obstruction and

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distension with severe respiratory distress in one case, and 2 cases with gastric obstruction and severe vomiting (Table 1). A chest X-ray, CT scan, and abdominal sonography were done for all patients, and contrast studies were done when indicated (Figure 1, 2, 3). Thoracotomy was performed in all patients to repair the diaphragm. However, it was extended into a thoracoabdominal incision in two patients where gastrectomy and colonic resection were done. Gastrectomy was done in 2 cases; colonic resection in one case, devaluation of the herniated colon was done in 2 cases, and splenectomy in one case. The diaphragmatic tear was repaired in two layers with proline 1-0 sutures in all cases, first continuous layer, and second is an interrupted simple layer. A proline mesh was used in two cases.

Postoperative complications were observed in eight (32%) patients, chest infection, pneumonia, and ARDS in 4 (16%) cases, empyema in 3 (12%) cases, wound infection in 3 (12%) cases, and 2 cases with septic shock. Three (12%) cases needed prolonged ventilation (> 10 days). There were 3 mortality cases (12%) in our series, 2 cases with ARDS and the other case from septic shock didn't respond to treatment. The mean hospital stay was 14 days (6-40).

Table (1): Patient's data

Sex	Male 19 (76%) Female 6 (24%)
Age (years.)	5-55 (Mean = 33.3)
Time from injury to presentation (months)	8- 50 months (Mean= 24.48)
Etiology	Stab =14 Firearm = 5 Fall = 2 MCA = 2 Iatrogenic = 1 Post hernia repair = 1
Presentation	Asymptomatic = 2 (8%) Dyspnea=11 (44%) Dyspepsia=6 (24%) Vomiting= 3 (12%) Emergency =3 (12%)
Side	Left = 23 (92%) Right = 2 (8%)

Table (2): The herniated viscera

Viscera	No.	%
Stomach	16	64
Colon	14	56
Small intestine	10	40
Spleen	4	16
Liver	2	8

Table (3): Postoperative outcome

Item	No.	%
Chest infection:	4	16
Pneumonia	2	8
ARDS	2	8
Empyema	3	2
Wound infection	3	2
Septic shock	2	8
Prolonged ventilation (>10 days)	3	2
Hospital mortality:	3	2
ARDS	2	
Septic shock	1	
Hospital stay (days):	mean: 14 (6-40)	

FIGURES AND FIGURE LEGENDS:

Figure (1): Plain erect chest -X-ray show traumatic diaphragmatic hernia with colonic herniation

Figure (2): Plain erect chest -X-ray show traumatic diaphragmatic hernia with gastric herniation

Figure (3): CT chest of a patient with traumatic diaphragmatic hernia with gastric herniation

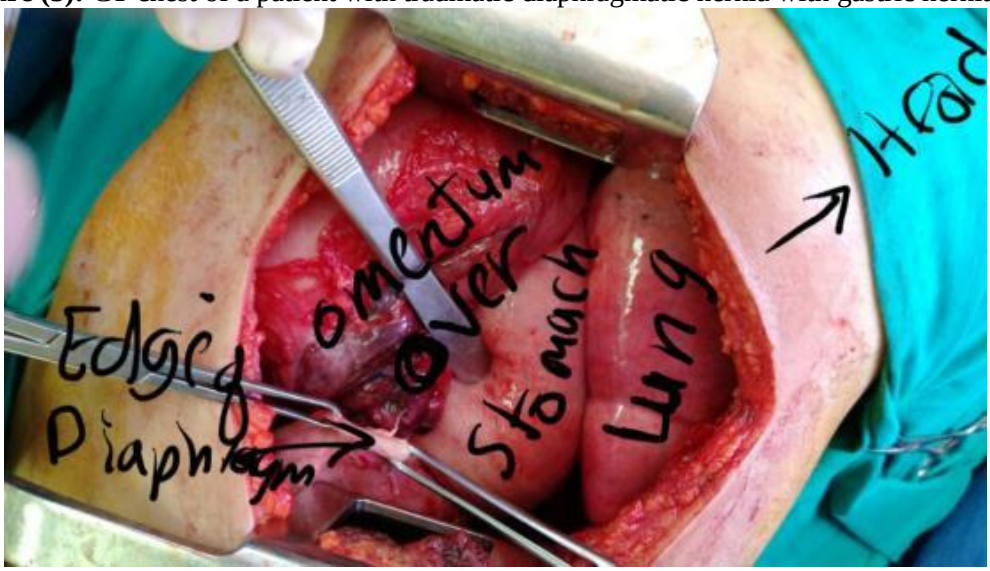

Figure (4): Intraoperative view of left thoracotomy show herniated stomach and omentum in the thoracic cavity through the diaphragmatic defect

DISCUSSION

Diagnosis of MTDH can be overlooked during initial trauma evaluation in the casualty. Sometimes it is difficult for trauma physicians to detect diaphragmatic injuries because they are clinically silent. MTDH remains challenging for clinicians. Nevertheless, the precise determination of this hernia is crucial, as MTDH may lead to serious complications due to gangrene of the herniated abdominal organs associated with respiratory distress [6].

Autopsy studies suggest an equivalent frequency of diaphragmatic injuries on both sides, but clinically, left-sided injuries may be seen more due to the protective impact of the liver on the right side [7,8]. Bilateral lacerations occur in 2% of patients [9,10]. We reported that MTDH was more common on the left side (92%) than on the right side (8%), while bilateral hernia was reported in none of our patients. Similarly, **Ganie *et al.*** [11] reported left-sided MTDH in 90.5 % of patients and right-sided in 9.5 %.

The etiology of MTDH largely depends on geographic and socioeconomic factors [7,8]**. Ganie *et al.*** [11] reported that blunt trauma was detected in 81% of patients while penetrating trauma in 19%, fall from a height (FFH) was reported in 47.6% of cases, followed by road traffic accidents (RTA) in 28.6 % of cases. **Kishore *et al.*** [12] reported left-sided MTDH in 85% of patients and right-sided in 15%, and blunt trauma was the cause in 81% of cases and penetrating trauma in 19% of cases. In our study penetrating trauma was the commonest cause of MTDH (76%), followed by blunt trauma (16%), stab and firearm were the commonest modes of trauma followed by fall from a height, and this is due to increase violence and the habits of taking revenge.

Clinical symptoms of an MTDH are associated with circulatory and respiratory dysfunction since the pulmonary and mediastinal contents are compressed by the abdominal pressure. Also, the herniated structure might be perforated, which could result in hydropneumothorax [13]**.** Most complications occurred between one and four years following the injury [14]**.** Almost 88% of the patients presented with complications between 9 and 12 months [15]**.** However, some studies reported longer time intervals up to 30 years, **Gu *et al.*** [7]**, Davoodabadi *et al.*** [16]**, and Okan *et al.*** [17]**.**

We found that the interval between trauma and MTDH diagnosis was 8 to 50 months (mean= 24.48 months), the stomach and colon were the most frequent herniated organs (64%) and (56%) respectively. The most common clinical presentation was dyspnea, abdominal pain, and vomiting in 44%, 24%, and 12% respectively. 3 (12%) cases presented to us in an emergency in the form of colonic obstruction and distension with severe respiratory distress in one case, 2 cases with gastric obstruction with severe vomiting. The MTDH can be approached surgically through either thoracotomy or laparotomy. Laparotomy was performed in 92% of cases by general surgeons [15] and thoracotomy was done in 78% of cases by thoracic surgeons [18,19]**.** Also, the surgical approach depends on the clinical and radiological findings and other associated injuries as in **Biegi′s** study [20]. In a study by **Davoodabadi** [16], thoracotomy was done in all cases, and one case needed a mesh insertion, herniated organ resection was performed in two cases due to perforation. However, **Okan *et al.*** [17]**,** reported that laparotomy was the approach in 7 out of 10 patients. Thoracotomy was done in all our cases, and it was extended to a thoracoabdominal incision in two patients where gastrectomy and colonic resection were done. Gastrectomy was done in 2 cases; in one of them splenectomy was done, colonic resection in one case, devaluation of the herniated colon was done in 2 cases. MTDH repair was done primarily with proline suture 1-0 in two layers first continuous sutures, and second is an interrupted simple sutures layer in all cases, however, a proline mesh was inserted in two cases.

The reported mortality rates of delayed diaphragmatic hernia have changed in recent decades due to the earlier diagnosis and improved postoperative patient care, decreasing from 25% to 10% [21, 22]**.** Recent case reports have reported low mortality rates in the treatment of delayed diaphragmatic hernias [23, 24]**.** However, the presence of strangulation with gangrene and perforation was related to increased morbidity and mortality [22]**.** Complications occurred in 32% (8 patients) in this study, by far the most common is an infection in the form of chest infection, pneumonia, and ARDS in 4 cases (16%), empyema 3 cases, and 2 cases with septic shock. 3 cases (12%) need prolonged ventilation (> 10 days). There were 3 mortality cases (12%) in our series, 2 cases with ARDS and the other case from septic shock didn't respond to treatment.

CONCLUSION

We conclude that every effort should be done to detect diaphragmatic injury in trauma patients, especially those with blunt or penetrating trauma to the upper abdomen and lower chest. And surgeons should have a high index of suspicion, for early diagnosis with the aid of modern radiologic diagnostic modalities, to prevent complications with subsequent high morbidity and mortality, since the symptoms are vague and trauma history is remote.

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