



The Characteristics and Surgical Approach in Post-Traumatic Diaphragmatic Hernia: A Single Center Experience

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► ABSTRACT

Objectives: The aim of this study was to evaluate the surgical approach in post traumatic diaphragmatic hernia

Methods: This prospective cross-sectional study was conducted in the Department of cardiovascular and thoracic surgery, Sher-i- Kashmir Institute of Medical Sciences (SKIMS), Kashmir, India. We included all patients with post traumatic diaphragmatic hernia undergoing operation in our center from May 2009 to November 2011. A detailed history was taken for each patient along with comprehensive general, physical, systemic and local examination of all cases. Operative findings included associated intra-abdominal injuries, and herniated intra-abdominal organs. Post-operative complications, mortality and survival were recorded and reported.

Results: The mean age of the patients was 32 ± 1 years and there were 16 (76.1%) men and 5 (23.8%) women among the patients. Thoracotomy was performed in 14 patients (66.7%), laparotomy in 6 patients (28.6%) and combined procedure was used in 1 patient (4.7%). The reduction of hernia contents with repair of diaphragmatic rent was done in 11 (52.2%) of the patients and splenectomy with repair of rent in 6 (28.6%). Traumatic diaphragmatic hernia had 81.8% survival rate, no pre-operative mortality and 14.3% post operative mortality rate.

Conclusion: Thoracotomy is the most common approach in post traumatic diaphragmatic hernia. Laparotomy is preferred in patients having acute trauma with associated intra-abdominal injuries.

Keywords: Post traumatic diaphragmatic hernia; Surgical approach; Thoracotomy.

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Introduction

Post-traumatic diaphragmatic hernias are commonly seen after blunt and penetrating trauma [1] called traumatic diaphragmatic hernia. The incidence of traumatic diaphragmatic hernia ranges from 0.8 to 1.6% in patients admitted to the hospital for blunt trauma, with male to female ratio of 4:1, Blunt and penetrating traumas account for 75% and 25% of ruptures respectively. Approximately 69% of traumatic hernias are left sided, 24% are right-sided and 15% are bilateral Rupture of the diaphragm can be the result of either penetrating or blunt injury of the abdomen as well as the thorax.

A relatively large perforation of the diaphragm with herniation of abdominal contents into the chest cavity usually is associated with respiratory distress and requires urgent operative correction. However, small defect of the diaphragm without significant injury to other intra-abdominal or intra-thoracic organs can be unnoticeable for a long time until the emergence of symptoms and signs of herniation of intra-abdominal viscera. Rupture of the hemidiaphragm occurs in approximately 3.0% to 8.0% of the patients undergoing celiotomy after blunt abdominal trauma [2-4] and occurs in 0.8 to 5.8% of patients with major blunt force thoracic injury [5-

7]. Motor vehicle accidents are responsible for up to 90% of all diaphragmatic injuries from blunt trauma [5]. Several factors explain the increased incidence of left hemidiaphragm rupture from blunt trauma. The left hemidiaphragm is relatively unprotected by abdominal viscera, such as the liver on the right side and it therefore represents an area of relative weakness. The right diaphragm is stronger than the left and consistently requires a greater force to rupture [8,9]. The left hemidiaphragm is weaker due to a line of embryonic fusion between the costal and lumbar parts and is predisposed to injury [10]. Finally, right hemidiaphragm injuries are under-diagnosed in non-surgical series [5]. A positive pressure gradient of 7 to 20 cm of water exists between the peritoneal and pleural spaces. This gradient facilitates herniation of abdominal viscera through left diaphragm tears. The central location of the diaphragm and its close proximity to other structures accounts for the frequent association of diaphragm rupture with other injuries that are present in 52% to 100% of cases [2,6,9,11]. Common concurrent injuries include pelvic fractures (40-55%), splenic injury (60%), and renal injury. Liver trauma occurs in 93% of patients with right and 24% of patients with left hemidiaphragm rupture. Intra-thoracic injuries commonly associated with diaphragm rupture include multiple rib fractures, pneumothorax and hemothorax and lung contusion [12]. The patients with diaphragmatic hernia may present with marked respiratory distress [12], decreased breath sounds on the affected side, palpation of abdominal contents upon insertion of a chest tube, auscultation of bowel sounds in the chest. Paradoxical movements of the abdomen with breathing, diffuse abdominal pain, chest pain and vomiting [5].

Materials and Methods

Study population

This study was a cross-sectional study being conducted in the department of cardiovascular and thoracic surgery of Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, India. This was a prospective study which comprised all patients with post traumatic diaphragmatic hernia undergoing operation in our department from May 2009 to November 2011. We excluded those with multiple injuries and those with decreased level of consciousness at presentation. The study protocol was approved by the SKIMS institutional review board (IRB) and the ethics committee of the university. All the patients provided their written consents after the study protocol was described to them by the attending physician.

Study protocol

A detailed history was taken for each patient along with comprehensive general, physical, systemic and local examination of all cases. This was done to rule out any associated injuries and to determine the involvement of other systems and type of injuries causing diaphragmatic hernia. Further investigations made included complete blood count, biochemical profile, chest x-ray, as well as conducting other diagnostic procedures including CT scan abdomen/chest and barium meal study. Operative findings included associated intra-abdominal injuries, and herniated intra-abdominal organs and all the patients were monitored during post-operative period in which chest x-ray was performed in all the patients to determine chest expansion. Post-operative complications were noted and managed. Preoperative mortality was defined as death before surgical intervention and operative mortality as death within 30 days of operation or during post operative hospitalization. Survival was defined as the interval between the date of surgery and time of death or the last follow-up. During follow-up all the patients were seen at the outpatients' clinic at intervals of two weeks during first three months, and in three to six months in the next three years. The patients were observed for any procedure-related complications or recurrence during their follow-up.

Statistical analysis

Data was analyzed by Statistical Package for the Social Sciences version 12.0 (SPSS Inc., Chicago, IL). Descriptive results are presented as mean \pm standard for 95% confidence interval (CI) or proportions wherever appropriate.

Results

All 21 patients with post traumatic diaphragmatic hernia underwent surgical operation. The mean age of the patients was 32 ± 1 years and there were 16 (76.1%) men and 5 (23.8%) women among the patients. Thoracotomy was most common approach in our patients, performed in 14 patients (66.7%), laparotomy in 6 patients (28.6%) and combined procedure was used in 1 patient (4.7%). In this study, the reduction of hernia contents with repair of diaphragmatic rent was done in 11 (52.3%) of the patients, splenectomy with repair of rent in 6 (28.6%), gastrectomy with repair of rent in 2 (9.6%) and resection anastomosis of gut and repair of rent were carried out in 2 (9.6%) patients. Hernial content was omentum and stomach in 13 (62.0%), stomach in 3 (14.3%), small gut in 2 (9.6%), large gut in 1 (4.7%) and spleen in 2 (9.6%) patients. Complications observed in our patients included pneumothorax in 5 (23.8%), septicemia in 3 (14.3%), anastomotic leak in

Table 1. The characteristics, surgical procedure and the outcome of 21 patients with traumatic diaphragmatic hernia being operated in our center.

Variable	Value (n=21)
Age (years)	Mean \pm SD
Sex	
Male (%)	16 (76.1%)
Female (%)	5 (23.9%)
Type of operation	
Laparotomy (%)	6 (28.6%)
Thoracotomy (%)	14 (66.7%)
Thoracolaprotomy (%)	1 (4.7%)
Surgical Procedure	
Reduction of Hernial content, and repair of diaphragmatic rent (%)	11 (52.3%)
Resection anastomosis of gut and repair (%)	2 (9.5%)
Splenectomy and repair (%)	6 (28.6%)
Gastrectomy and repair (%)	2 (9.6%)
Postoperative hernia content	
Omentum+ Stomach (%)	13 (62.0%)
Stomach (%)	3 (14.3%)
Small gut (%)	2 (9.5%)
Large gut (%)	1 (4.7%)
Spleen (%)	2 (9.5%)
Complications	
Septicemia (%)	3 (14.3%)
Pneumothorax (%)	5 (23.8%)
Intestinal obstruction (%)	0 (0.0%)
Anastomotic leak (%)	2 (9.5%)
Re-exploration (%)	2 (9.5%)
Recurrence (%)	0 (0.0%)
Outcome	
Survival rate (%)	18 (85.7%)
Preoperative mortality rate (%)	0 (0.0%)
Postoperative mortality rate (%)	3 (14.3%)

2 (9.6%) and re-exploration in 2 (9.6%) cases. Mean duration of hospital stay was 7.8 ± 1 days, ranging from 5 to 20 days. Traumatic diaphragmatic hernia had 81.8% survival rate, no pre-operative mortality and 14.3% post operative mortality rate. Table 1 summarized the demographic information and the surgical approach in 21 patients with post-traumatic diaphragmatic hernia operated in our center.

Discussion

Herniation of abdominal contents into the chest cavity cause respiratory distress symptoms and require urgent operative correction. Of 21 patients with post traumatic diaphragmatic hernia 16 (76.1%) were males and 5 (23.8%) females, and most (42.9%) patients aged from 40 to 60 years. Blunt and penetrating traumas accounted for 81% and 19% of cases respectively. Most common causes of trauma were fall from height (47.6%) followed by motor vehicle accidents (28.6%). The majority

of sustained injuries (90.5%) were left-sided and 9.5% were on the right side. Kishore GS *et al.*, [13] reported 85% left-sided and 15% right-sided traumatic diaphragmatic hernia in patients aged from 16 to 72 years. Etiology was blunt trauma in 81% and penetrating in 19% (median 35 years). Thomas J Tarney in 1968 reported left-sided diaphragmatic hernia in 95% and right-sided in 5% of the patients, with hearable bowel sounds in the chest in 51.5% of the patients. Most common chest X-ray finding was bowel loops and distortion of diaphragmatic margins in 81% of traumatic groups. On CT scan, herniation of abdominal contents into the chest cavity was seen in 90.5%, haemothorax in 61.9%, pneumothorax in 28% and lung contusion in 38% of the patients. Thoracotomy is most common approach in patients with isolated post traumatic diaphragmatic hernia, followed by laparotomy and combined approach in very few cases. The most common procedure needed in post diaphragmatic hernia is the reduction of the hernial contents followed by repair of the rent. In our study the reduction of hernial contents with repair of diaphragmatic rent was done in 11 (52.3%) patients. Splenectomy with repair of rent was done in 6 (28.6%), gastrectomy with repair of rent in 2 (9.6%) and resection anastomosis of gut and repair of rent in 2 (9.52%) of the patients.

Hernial content was omentum and stomach in 13 (62.0%) patients, stomach in 3 (14.3%), small gut in 2 (9.6%), large gut in 1 (4.7%) and spleen in 2 (9.6%) patients which were comparable with the study conducted by St Peter SD *et al.*, [14] Complications observed in our patients included pneumothorax in 5 (23.8%) of the patients who had undergone laparotomy, septicemia in 3 (14.3%) patients, anastomotic leak in 2 (9.5%), and re-exploration in 2 patients which were comparable with the study conducted by Simpson [4]. The mean hospital stay was 7.8 ± 1 days ranging from 5 to 20 days, which slightly differed from the study conducted by Simpson [4]. Traumatic diaphragmatic hernia had 81.8% survival rate with no pre-operative mortality and 14.3% post operative fatality rate, the findings consistent with the report of Simpson [4].

In conclusion, thoracotomy is the most common approach in post traumatic diaphragmatic hernia. Laparotomy is preferred in patients presenting as acute trauma with associated intra-abdominal injuries. Commonest procedure needed is reduction of the hernial contents followed by repair of the rent. Common hernial contents are omentum plus stomach followed by stomach. The common post operative complications were pneumothorax, septicemia, and anastomotic leak.

Conflict of Interest: None declared.

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