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CASE REPORT

## Left diaphragmatic eventration with gastric volvulus: Laparoscopic mesh repair of left diaphragmatic eventration

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### Abstract

**Background:** Eventration of diaphragm is defined as an abnormal elevation of an intact diaphragm and most often is characterized by a developmental abnormality of the diaphragm musculature. It usually remains asymptomatic in early life and presents later with respiratory and gastrointestinal complications. It is also seen in acquired conditions like phrenic nerve dysfunction in old age.

**Material and methods:** A 64 yr man came with abdominal discomfort and fullness with nonbilious intermittent vomitings for 20days and unable to take food. Chest roentgenogram revealed an elevated left hemidiaphragm and a shift of the lower mediastinum to right. Barium study showed gastric volvulus. CT scan showed eventration of left dome of diaphragm with gastric volvulus.

**Results:** The procedures were performed laparoscopically and follow up showed excellent results. Patient recovered well with symptomatic relief.

**Conclusion:** All cases of diaphragmatic eventration do not require surgical intervention if it is not associated with adverse symptoms. However treatment of laparoscopic mesh repair by abdominal approach is indicated if it is symptomatic. Laparoscopic approach has become an attractive alternative because of its association with less postoperative pain and better cosmesis.

**Keywords:** Gastric volvulus; Left diaphragmatic eventration; Laproscopic mesh repair

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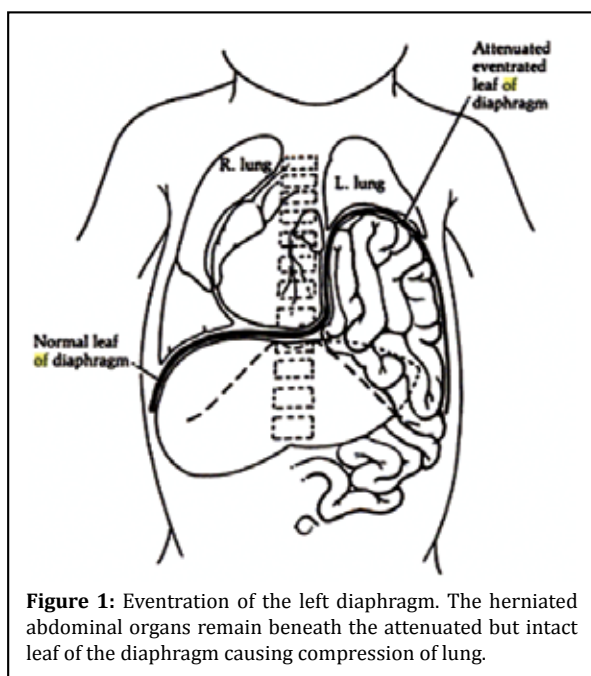
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### Introduction

Eventration of diaphragm is defined as an abnormal elevation of an intact diaphragm and most often is characterized by a developmental abnormality of the diaphragm musculature. It usually remains asymptomatic in early life and presents later with respiratory and gastrointestinal complications (Figure 1). It is also seen in acquired conditions like phrenic nerve dysfunction in adults and in old age. Gastric volvulus (GV) is a rare condition that presents with epigastric pain, retching and at times

vomiting. The abnormally wide subdiaphragmatic space provides the potential for abnormal rotation of stomach around itself. This abnormal rotation is known as gastric volvulus. There are two types of GV: organoaxial GV, where torsion occurs along the stomach's longitudinal axis; and mesenteroaxial GV, where torsion occurs along the vertical axis. Organoaxial GV usually occurs acutely and is associated with a diaphragmatic defect, whereas mesenteroaxial GV is partial (torsion < 180°), recurrent and not associated with a diaphragmatic defect.



**Figure 1:** Eventration of the left diaphragm. The herniated abdominal organs remain beneath the attenuated but intact leaf of the diaphragm causing compression of lung.

Gastric volvulus affects patients of all ages but most often occurs after the fourth decade of life. If undetected, gastric volvulus can lead to ulceration, perforation, hemorrhage or ischemia and full-thickness necrosis. Symptoms are variable and can range from anemia and weight loss to severe epigastric and/or chest pain sometimes associated with unproductive vomiting or upper gastrointestinal bleeding. Suspicion is heightened by a large air fluid level in the lower chest seen on chest radiography. Diagnosis is made with an upper gastrointestinal contrast study or esophagogastroduodenoscopy (EGD). Combination of eventration of diaphragm with gastric volvulus is very rare.

The first report of a surgical repair was published by Morrison in 1923 [1]. Gastrointestinal symptoms may be present due to dislocation of abdominal

viscera [2]. Recently, diaphragmatic plication has also been performed through minimally invasive techniques, either laparoscopic [3] or thoracoscopic [4, 5]. Gastric volvulus is an uncommon complication of eventration; perforation of the stomach in gastric volvulus can also be seen but very rare, with very few cases reported in the literature [6, 7, 8].

### Case report

A 64 year old man came with abdominal discomfort and fullness with nonbilious intermittent vomitings for 20 days and unable to take food. There was no history of constipation, fever or a prior surgery. On examination, there was fullness in upper abdomen but no tenderness. Bowel sounds were normal. There was decreased air entry in the left lower lobe. Rest of the examination was normal. Chest roentgenogram revealed an elevated left hemidiaphragm and a shift of the lower mediastinum to right. Rest of the bowel gas pattern was normal (Figure 2). Barium



**Figure 2:** Chest film shows elevated left dome with shift of heart to right



**Figure 3:** Barium study shows volvulus of stomach under elevated left dome

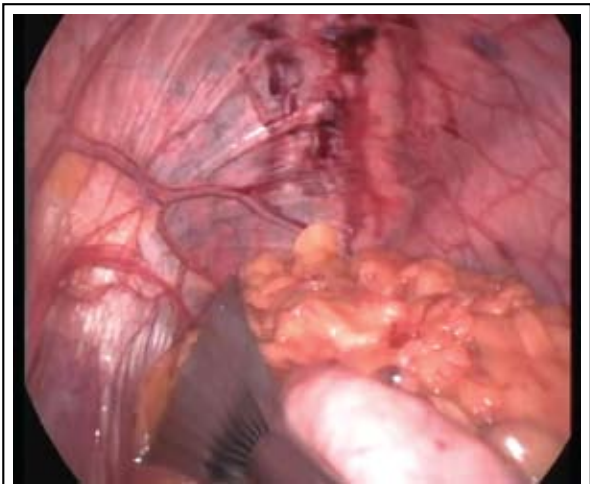
study showed gastric volvulus (Figure 3). CT scan showed eventration of left dome of diaphragm with gastric volvulus. A nasogastric tube passed with difficulty. About 500 ml gastric nonbilious fluid was aspirated with relief from distension. Eventration of diaphragm with volvulus in the diagnosis, in view of associated gastric volvulus, laparoscopic approach was used rather than thoracoscopy.

Under general anesthesia, with patient in supine position, 10 mm primary port was inserted by open technique. Pneumoperitoneum was created using 10 mm Hg pressure. Two working ports of 5 mm each were inserted in the right and left upper abdomen respectively. An epigastric port was inserted and fan retractor was used to keep the contents within the peritoneal cavity. The left side of the operative table was elevated to facilitate the operation. Floppy left diaphragmatic wall observed with displacement of stomach and omentum (Figure 4). Stomach and omentum were reduced with gentle pull and placed anatomically using fan retractor (Figure 5).

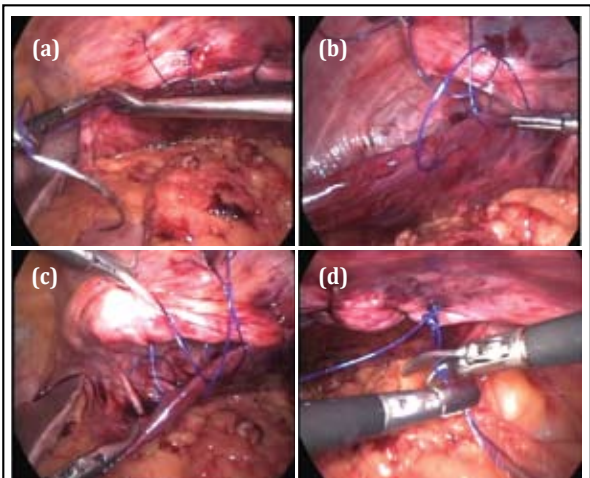
Anatomical repair was done by using 1 prolene and doublebreasting the floppy portion of the left dome of diaphragm (Figure 6). After the anatomical repair, defect was reinforced with Goretex mesh using tackers (Figure 7). Post operative chest roengenogram showed satisfactory profile of the left diaphragm and expanded lung (Figure 8). Schematic representation of laparoscopic repair of eventration was shown in diagrammatic outline (Figure 9). The nasogastric tube was removed on the 3rd day and normal diet started. The patient was discharged on the 3rd postoperative day in stable condition. He has remained asymptomatic during follow-up (Figure 10).



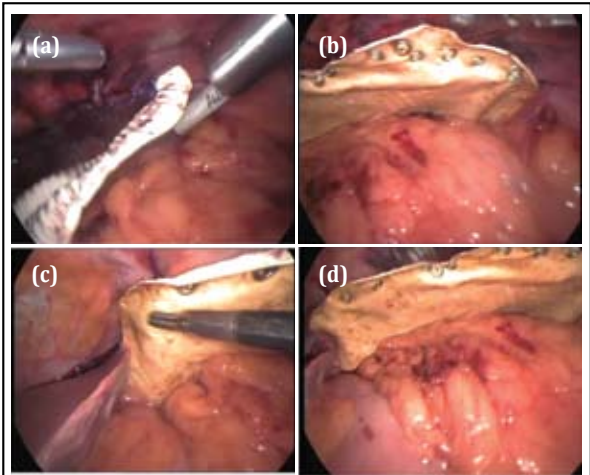
**Figure 4:** Displacement of stomach into the floppy left dome of diaphragm



**Figure 5:** Stomach and omentum were reduced using fan retractor



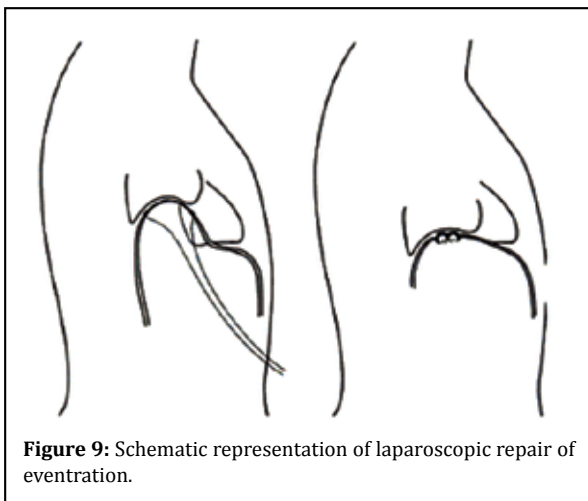
**Figure 6 a, b, c, d:** Anatomical repair done by using 1 prolene by double breasting the floppy portion of left dome of diaphragm.



**Figure 7 a, b, c, d:** Defect reinforced with Gortex mesh using tackers



**Figure 8:** Post operative chest film shows normal position of left dome with expanded lung



**Figure 9:** Schematic representation of laparoscopic repair of eventration.



**Figure 10:** Patient with port scars during follow-up

## Conclusions

The diagnosis of diaphragmatic eventration associated with gastric volvulus can be established by history and, in most cases, by chest films and either upper GI series or CT scan. Management of diaphragmatic eventration varies greatly depending on whether the diagnosis is made in infants or adults. Simple cases of diaphragmatic eventration may not require surgical intervention if it is not intruding significantly into the thoracic cavity and is not associated with adverse symptoms. However treatment of laparoscopic mesh repair by abdominal approach is indicated if it is symptomatic. The major advantages of an abdominal laparoscopic approach are that there is (a) no need for one-lung ventilation (nor lung retraction for exposure), (b) a larger operative field in which to work, (c) far less risk of injury to intra-abdominal viscera (Which cannot be directly seen thoracoscopically), and (d) a greater degree of freedom of trocar movement than is permitted with thoracoscopy (10). Laparoscopic approach has become an attractive alternative because of its association with less postoperative pain, better cosmesis, but demands good laparoscopic skills and expertise, while dealing with such cases. The procedures were performed laparoscopically and follow up showed excellent results, with good recovery and symptomatic relief.

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