

# Penetrating Thoracoabdominal Stab Injury with Diaphragmatic and Multiple Gastric Perforations Managed with Combined Laparoscopic and Open Repair: A Case Report

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## ABSTRACT

Penetrating thoracoabdominal injuries present significant diagnostic and therapeutic challenges due to the involvement of both thoracic and abdominal structures. We report the case of a 22-year-old male presenting with stab injuries to the left chest, resulting in diaphragmatic injury with herniation of fundus of stomach and 2 perforations over the herniated part. Clinical examination revealed decreased breath sounds over left hemithorax with soft nontender abdomen. Imaging revealed left hemopneumothorax with diaphragmatic hernia with no evidence of any pneumoperitoneum. Diagnostic thoracoscopy done which revealed 2 diaphragmatic perforations with herniation of perforated gastric fundus with spillage of food contents into thoracic cavity. Contents reduced and repair of diaphragmatic defect done thoracoscopically and gastric perforations repaired laparoscopically.

This case highlights the importance of early diagnosis, appropriate imaging, and use of hybrid and minimal invasive surgical approach in managing complex thoracoabdominal trauma in emergency settings wherever the facilities are available and patient is stable.

**Keywords:** Thoracoabdominal penetrating trauma; Traumatic diaphragmatic hernia; Gastric perforation; Hemopneumothorax; Thoracoscopy; Laparoscopy; Graham patch; Chest tube

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## INTRODUCTION

Penetrating chest trauma accounts for approximately 15–30% of trauma cases requiring operative intervention(1,4). Injuries involving the diaphragm are particularly critical due to the risk of associated intra-abdominal organ damage and delayed diagnosis(6,18,20,22).

Left-sided diaphragmatic injuries are more commonly associated with gastric involvement. Early identification is essential, as missed injuries may lead to herniation and strangulation of abdominal contents.

Advancements in minimally invasive surgery have allowed laparoscopic approaches in hemodynamically stable patients, offering both diagnostic and therapeutic

benefits. However, conversion to open surgery remains necessary in complex cases.

## Case Presentation

A 22-year-old male presented to casualty with an alleged history of 2 stab injuries to the left chest around 6 hours back, referred from a clinic where he was resuscitated with intravenous fluids. On examination, patient was tachycardic and tachypnoeic with borderline low blood pressure.

2 stab injury wounds noted in left chest one in 6<sup>th</sup> intercostal space and other in 8<sup>th</sup> intercostal space [Figure 1] both measuring about 4x1 cm with active air gushing through them with whistling sound and

# Penetrating Thoracoabdominal Stab Injury with Diaphragmatic and Multiple Gastric Perforations Managed with Combined Laparoscopic and Open Repair: A Case Report

minimal bleeding. There was decreased breath sound on left lower lung zone. Abdomen was soft to touch and was non tender.

Following ATLS protocol (1), patient was started on high flow oxygen and resuscitated with 1 L Ringer's lactate. 3 way dressing given to the stab wounds. Chest tube inserted(2) and around 300ml blood drained. Insertion of ryles tube revealed blood stained gastric aspirate.

Once his blood pressure stabilized he was shifted to CT imaging which demonstrated left hemopneumothorax with diaphragmatic herniation of gastric fundus [Figure 1(a)] with no evidence pneumoperitoneum/ fluid in abdomen.

The patient was taken for surgical exploration. Thoracoscope inserted through one of the stab wounds after thorough wash with one working port through other stab wound and herniated content visualised. There was herniation of gastric fundus through one defect in left dome of diaphragm around 2cm lateral to oesophageal hiatus. There were through and through perforations measuring about 1x1cm seen on anterior and posterior aspect of this herniated part of the fundus with spillage of food contents [Figure 3(c)]. There was one more defect measuring about 2x1cm over the diaphragm [Figure 3(b)] 1cm lateral to previously mentioned defect with omentum herniating. Herniated part is reduced into abdominal cavity under vision.

Thorough wash given in the thoracic cavity with suctioning of all food contents. Hemostasis ensured. Ports and stab site sutured keeping ICD in situ. Diaphragmatic defects sutured with PDS 2-0 simple sutures. Laparoscope introduced through umbilical port and gastric perforation sutured with modified Graham's repair laparoscopically(5,16,17) on both anterior and posterior side.

Patient had oxygen requirement for 3days.Patient subsequently developed empyema thorax on left side and was started on antibiotics as per culture sensitivity reports. ICD was removed after 2 weeks after empyema resolved. Patient was discharged on POD-20.

## Figures

**Figure 1: External Chest Wounds**



**Figure 2: CT Imaging**

(a) Stomach herniated through diaphragm rent.



(b) Stomach herniated through diaphragm rent.



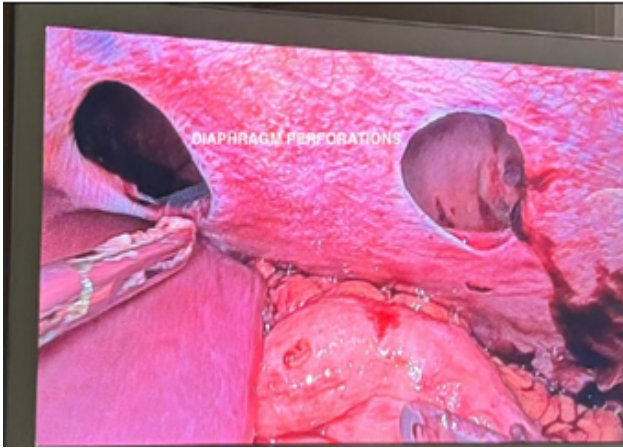
**Figure 3: Intraoperative Findings**

(a). Thoracoscopic view



# Penetrating Thoracoabdominal Stab Injury with Diaphragmatic and Multiple Gastric Perforations Managed with Combined Laparoscopic and Open Repair: A Case Report

(b). Laparoscopic view



(c). Laparoscopic view



## DISCUSSION

Penetrating thoracoabdominal injuries due to stab wounds represent a significant surgical challenge(6,18,19,22), as they may involve multiple organ systems and often present with subtle or misleading clinical findings. Gastric perforation in such injuries is relatively uncommon compared to injuries of the liver or small intestine, but it carries a high risk of morbidity(19,20) if not identified and managed promptly. In the present case, early diagnosis and timely surgical intervention were key factors contributing to a favourable outcome.

Management principles in such cases emphasise a systematic trauma approach, including adherence to Advanced Trauma Life Support (ATLS) protocols, early resuscitation, and timely decision-making regarding operative versus non-operative management(1,6). Indications for surgical exploration include signs of peritonitis, hemodynamic instability, and evidence of visceral perforation. Primary repair of gastric perforation is generally sufficient in most cases(5,17), provided the diagnosis is made early and there is minimal contamination like in our case. Adequate peritoneal lavage, drainage when necessary, and appropriate antibiotic therapy are essential adjuncts to reduce infectious complications.

Minimally invasive surgery (MIS), including laparoscopy and thoracoscopy, has increasingly become an important adjunct in the management of penetrating

thoracoabdominal trauma(7,8,9,23,24). Its role has evolved from purely diagnostic to both diagnostic and therapeutic in selected hemodynamically stable patients just as in our case. Higher diagnostic accuracy and thereby avoidance of Non-Therapeutic laparotomy in patients with blunt and penetrating thoracoabdominal injuries(7,8,23,24). Historically laparotomy was first line diagnostic and therapeutic management for patients with abdominal injuries which in turn resulted in an increased number of negative exploratory laparotomy, thereby increasing morbidity(24).

Penetrating injuries often present with equivocal clinical and radiological findings(15,18,22). In spite of increased availability and accuracy of diagnostic tools like CT/USG there are times when the injuries are missed or in doubt. MIS allows direct visualisation of intra-abdominal and thoracic structures, improving diagnostic precision which is particularly valuable in detecting diaphragmatic injuries/mesenteric injuries, which are frequently missed on imaging(9,10).By enabling accurate assessment, MIS significantly reduces the rate of non-therapeutic laparotomies, by minimising unnecessary morbidity.Compared to open surgery, it is associated with smaller incisions and reduced postoperative pain, lower risk of wound infection and incisional hernia, shorter hospital stay and earlier return to normal activity(5,6,17,23). These benefits are especially relevant in trauma patients, where reducing physiological stress can improve overall outcomes.In carefully selected stable patients, MIS can be used not only for diagnosis but also for definitive management, including:Repair of diaphragmatic injuries,Control of minor bleeding,Management of hollow viscus injuries etc.This expands its utility beyond exploration, avoiding the need for conversion to open procedures in many cases.Also in cases of thoracic trauma,Video-assisted thoracoscopic surgery (VATS) is particularly useful in:Evacuation of retained hemothorax, management of persistent pneumothorax, evaluation and repair of diaphragmatic injuries from the thoracic side(3,11,12,14,25).Early intervention with VATS has been shown to reduce complications such as empyema and fibrothorax(25).

Despite its advantages, MIS is not suitable for all trauma patients.Appropriate patient selection and availability of surgical expertise are critical for optimal outcomes.

Key limitations include:

Hemodynamic instability requiring immediate open intervention.

Extensive injuries with unclear anatomy.

Need for rapid haemorrhage control.

MIS complements modern trauma algorithms, including selective non-operative management (SNOM). It serves as an intermediate step between conservative management and exploratory laparotomy, particularly when imaging is inconclusive like in our case where gastric perforation was missed on the imaging which

was discovered on exploratory thoracoscopy(15,18). This facilitated early detection and timely repair of gastric perforation, thereby minimising toxic contamination of the pleural cavity and mediastinum, thereby reducing the likelihood of life-threatening septic complications.

Penetrating abdominal trauma due to stab injury can result in significant visceral damage, with gastric perforation being relatively uncommon but potentially life-threatening. In the present case, early recognition of the injury and prompt surgical intervention played a crucial role in achieving a favorable outcome. Timely repair of the gastric perforation limited the spillage of gastric contents, thereby preventing contamination of the pleural cavity and mediastinum, which is associated with severe toxic and septic complications. Delayed diagnosis in such cases can lead to mediastinitis, empyema, and sepsis, significantly increasing morbidity and mortality(18,19,20,21,22). This case highlights the importance of a high index of suspicion, thorough clinical evaluation, and early operative management in penetrating thoracoabdominal injuries to reduce complications and improve patient outcomes(6,18,22).

## CONCLUSIONS

Minimally invasive surgery plays a pivotal role in the contemporary management of penetrating chest and abdominal trauma. It enhances diagnostic accuracy, reduces unnecessary laparotomies, and offers therapeutic benefits in selected patients, ultimately improving clinical outcomes while minimizing morbidity.

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Penetrating Thoracoabdominal Stab Injury with Diaphragmatic and Multiple Gastric Perforations Managed with Combined Laparoscopic and Open Repair: A Case Report

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