

FIGURE 2 - Endoscopic retroflexion: bleeding GIST and endoloop placement

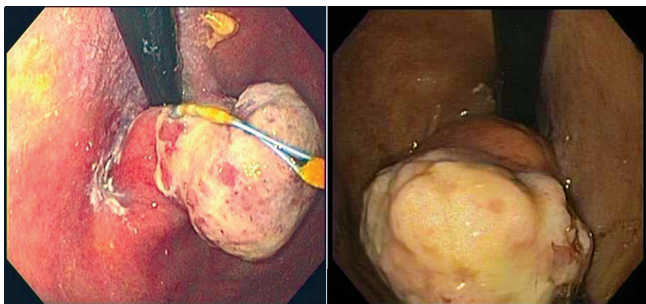


FIGURE 3 - Endoscopic follow-up: GIST looped, with ischaemic appearance and necrosis

## DISCUSSION

Endoscopic hemostasis of tumoral lesions is a challenging situation, since no endoscopic therapy has been proved to be superior<sup>3</sup>. Choice of therapy will be dictated by the tumor's appearance and the personal experience of the endoscopist. Reports show that hemoclips have been applied in both successful<sup>2</sup> and failed<sup>4</sup> attempts to achieve hemostasis. In the present case, the tumor appeared to be friable and an attempt to apply hemoclips could have led to mucosal tearing and recurrent bleeding. Endoloop ligation of such lesions has been described to treat bleeding tumors and also to resect lesions in patients deemed non-surgical candidates, through ischemic necrosis (loop-and-let-go)<sup>1</sup>. Although the surgical approach is considered the treatment of choice for such lesions, the endoloop technique is a useful, feasible, cheap and safe alternative for patients considered unsuitable for surgery or as a temporary measure to stabilize patients before the surgical treatment.

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## LAPAROSCOPIC REPAIR IN SIMULTANEOUS OCCURRENCE OF RECURRENT CHRONIC TRAUMATIC DIAPHRAGMATIC HERNIA AND TRANSDIAPHRAGMATIC INTERCOSTAL HERNIA

*Reparação laparoscópica na ocorrência simultânea de  
hérnia diafragmática traumática crônica recorrente e hérnia  
transdiafragmática intercostal*

Murat **YILDAR**<sup>1</sup>, Ismail **YAMAN**<sup>2</sup>, Hayrullah **DERICI**<sup>3</sup>

From the Department of General Surgery, Balıkesir University Faculty of Medicine, Balıkesir, Turkey

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### Correspondence:

Murat Yıldar

Email: muratyildar@hotmail.com

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## INTRODUCTION

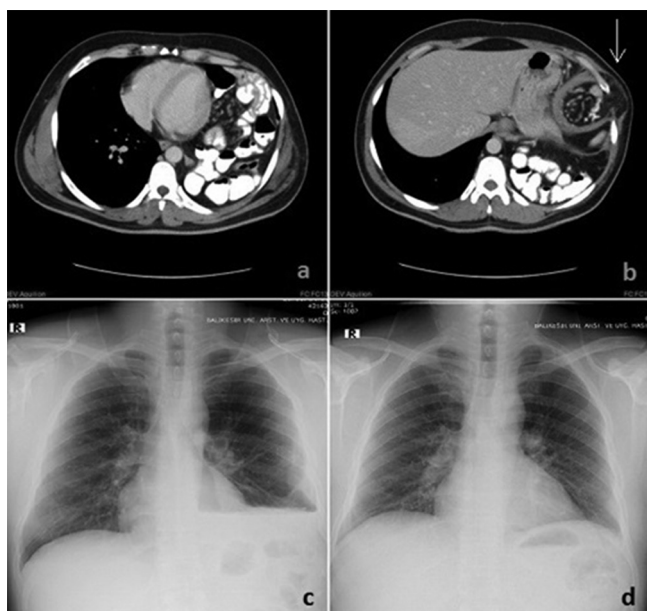
Traumatic diaphragmatic hernia (TIH) develops in association with blunt or penetrating thoracoabdominal injuries. Incidence levels between 0.8% and 42% have been reported, depending on the injury site<sup>1,9,12,13</sup>. TIH is a rare entity. It occurs either due to trauma-related diaphragmatic injuries which cause tears in the intercostal muscles between the fractured ribs, or due to recurrence of diaphragmatic hernia in which previous repair was performed using the transthoracic approach<sup>1</sup>.

Traumatic diaphragmatic injuries are generally asymptomatic when isolated, and frequently cannot be detected radiologically under acute conditions<sup>13</sup>. When accompanied by other organ injuries requiring surgical exploration, diagnosis is made during operation, and these can be treated concurrently. Laparoscopic repair is usually preferred in acute isolated diaphragmatic injuries, while chronic and recurrent cases are traditionally repaired using thoracotomy because of dense adhesions. With increasing experience of minimally invasive surgery in recent years, it has been reported that chronic and recurring cases can also be laparoscopically treated.

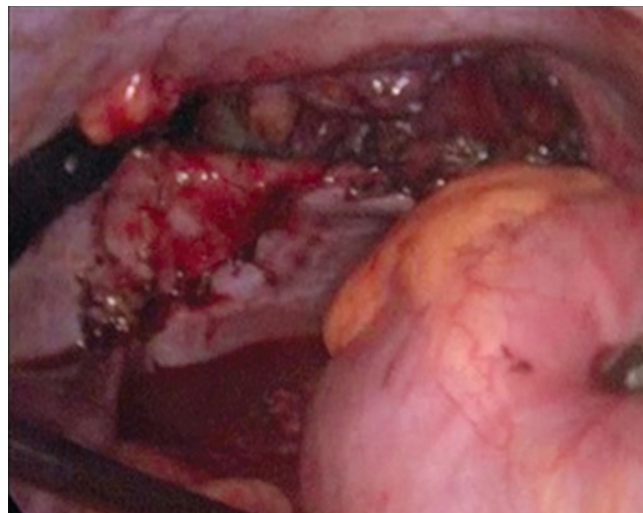
No cases of laparoscopic repair in simultaneous recurrent chronic traumatic diaphragmatic hernia (RCDH) and TIH have been reported to date. Here, is described the laparoscopic repair of this association.

## CASE REPORT

A 38-year-old man was diagnosed with diaphragmatic rupture eight months after being stabbed. Diaphragm repair was performed with left thoracotomy. The patient experienced no symptoms for six years postoperatively. However, severe abdominal pains extending to the chest, and dyspnea had started two years previously. The patient was diagnosed with recurring diaphragmatic hernia. However, he refused surgery and presented to hospital when the symptoms worsened. At physical examination, intercostal herniation increasingly marked with the Valsalva maneuver was observed in the left thoracotomy incision site. Intestinal sounds were heard in the left hemithorax. Computerized tomography (CT) of the thorax revealed hernia in the left hemithorax involving the transverse colon, omentum and small bowel (Figure 1a). Intercostal herniation in the old thoracotomy incision site at the 7<sup>th</sup> intercostal space was observed at the same time (Figure 1b). Laparoscopic repair was attempted. Intraoperatively a hernia defect 9x6 cm in size was determined, extending laterally from the center in the left hemidiaphragm (Figure 2). Dense adhesions between the hernia margins and the intestines were released with the LigaSure Vessel Sealing System (Valleylab, Boulder, CO, USA). The herniated intestines were easily reduced back to the abdomen with an atraumatic grasper. Primary suture was performed to the defect in the diaphragm was, and hernia repair was completed with C-core dual mesh. A dual mesh was identified with titanium tacker to the diaphragm. The thorax was drained with a No. 28 tube. Postoperative pain was controlled with 12 mg/h tramadol hydrochloride. The thoracic drain was removed on the 6<sup>th</sup> day. The patient was discharged on the 7<sup>th</sup> day. Pleural effusion was detected in the left hemithorax at the 14<sup>th</sup> day (Figure 1c). The patient was asymptomatic and was monitored conservatively. The pleural effusion was seen to have resorbed on the 21<sup>st</sup> day (Figure 1d). No recurrence has been detected at control imaging over the last 22 months.



**FIGURE 1** - Computed tomography scan of the thorax demonstrating transverse colon, omentum and small bowel in the left hemithorax (a) and the omentum at the subcutan tissue (white arrow) (b); chest roentgenogram showing pleural effusion in left hemithorax at the postoperative 14th day (c) which was resolved on the 21st day (d)



**FIGURE 2** - Recurrent hernia defect on the left hemidiaphragm

## DISCUSSION

Traumatic diaphragmatic hernias may be classified as immediate or delayed, depending on post-injury time of determination<sup>9</sup>. In the acute period, isolated diaphragmatic injuries are frequently asymptomatic, and accurate diagnosis is made in only 30-40% of cases<sup>9</sup>. With the exception of small injuries located on the right that are able to heal without herniation, diaphragmatic injuries may be herniated due to the difference between intrathoracic and intra-abdominal pressure<sup>9,13</sup>. The incidence of diaphragmatic injury on the left is greater than that on the right<sup>3,13</sup>. The main reason for the lower incidence on the right is the protective effect of the liver<sup>3</sup>.

Intercostal herniation may develop post-trauma in association with rib fracture or thoracotomy incision in recurrent diaphragmatic hernias. It is more frequently reported on the left. It may appear in the post-traumatic acute or delayed period. The most common finding is a reducible mass in the thoracic wall<sup>1</sup>.

Twenty to fifty percent of initial radiological examinations in patients developing post-traumatic diaphragm hernias are non-diagnostic<sup>2</sup>. Thanks to modern CT equipment (spiral CT scanners and the latest multilayer CT), the sensitivity of CT has been reported at 61-100%<sup>2</sup>. Small injuries are generally asymptomatic and produce no radiological findings. Murray et al.<sup>5</sup> performed laparoscopy on 57 out of 107 patients with penetrating left thoracoabdominal injury. Using laparoscopy they identified occult injury in 15 (26%) asymptomatic patients. Approaches such as laparoscopy or thoracoscopy are therefore essential in patients who are asymptomatic in the acute post-traumatic period but with suspected clinically diaphragmatic injury (due to the site of the injury) that is undetectable radiologically<sup>5</sup>. The diagnostic efficacy of thoracoscopy in occult injuries is close to 100% in both hemidiaphragms<sup>10</sup>. The visible area in laparoscopy is restricted on the right by the liver. However, laparoscopy does permit examination of both diaphragms and of the abdominal and thoracic cavity (through hernia defect). It also permits the detection of other accompanying intra-abdominal organ injuries. From that perspective, laparoscopy is superior to thoracoscopy, which only permits examination of the thoracic cavity, in acute trauma patients in particular<sup>13</sup>.

Traumatic diaphragmatic hernias must be repaired when they are detected. Isolated diaphragmatic injuries can be repaired safely with both laparoscopy and thoracoscopy. Repair with laparotomy is preferable in the presence of

accompanying organ injury, however. Due to the adhesions in chronic diaphragmatic hernias, these are repaired with laparotomy or thoracotomy. Recent advances in minimally invasive surgery now make it possible for chronic diaphragmatic hernias also to be repaired with laparoscopy or thoracoscopy. The thoracoscopic approach is difficult in the presence of severe adhesions<sup>10</sup>. It has been reported that repositioning of the herniated organ with laparoscopy is more easily performed than thoracoscopy in such cases<sup>7</sup>. The liver being beneath the right diaphragm makes laparoscopic treatment of injuries in the right posterior more difficult. The laparoscopic approach is more reliable in the treatment of injuries of the left hemidiaphragm and right anterior diaphragm. Thoracoscopy, however, is equally effective in both hemidiaphragms.

The number of cases of recurrent diaphragmatic hernias repaired with laparoscopy is limited because of dense postoperative adhesions. The first laparoscopic repair of recurrent chronic traumatic diaphragmatic hernia was reported by Frantzides et al. in 2003<sup>4</sup>. There have been no further case reports on the subject.

Laparoscopic or thoracoscopic repairs can be performed using primary suture, hernia staples or prosthetic material<sup>5</sup>. While primary suturation of small diaphragmatic hernias is recommended, prosthetic material is advised in large defects. Polypropylene mesh should not be used as it may cause digestive fistula. PTFE graft use reduces the risk of digestive fistula<sup>6</sup>. Hernia defect diameter and its relationship with esophageal hiatus are important for the security of the laparoscopic repair in acute or chronic injuries. Matthews et al.<sup>5</sup> recommended open repair for injuries more than 10 cm or with injuries associated with hiatus.

Some publications have reported the development of tension pneumothorax during laparoscopy in patients with diaphragmatic hernia. Gas desufflation and chest tube insertion are therapeutic in such cases<sup>8,11</sup>. The chest tube must be installed under direct visualization in order to avoid perforation of the herniated organ<sup>7</sup>.

In this case the hernia was located in the left diaphragm, as also reported by Frantzides et al.<sup>4</sup> Adhesions among the omentum, diaphragm and small bowel where the previous repair was performed were released with the help of LigaSure. Herniated organs in the thorax were easily reduced to the abdomen. Since the defect was 9x6 cm in size, repair was performed with dual mesh after primary suturing. No additional procedure was performed for intercostal

herniation. No tension pneumothorax developed. No tube thoracostomy was performed during surgery. No recurrence was identified at follow-up at the 22<sup>th</sup> month postoperatively.

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