

Case Report

Successful laparoscopic management of an isolated grade four traumatic diaphragmatic injury: A case reportKasun Gunathilaka^{1*}, Upul Indrajith¹, Jeewan Samarasena¹, Rajiv Rajendran²¹Postgraduate Institute of Medicine, University of Colombo, Colombo, Sri Lanka.²Colombo South Teaching Hospital, Kalubowila, Sri Lanka.**Abstract**

Traumatic diaphragmatic injuries (TDI) are indicators of severe trauma. Laparotomy or thoracotomy is the usual practice for repairing acute TDI. However, in hemodynamically stable patients with isolated TDI, laparoscopic management is a promising option. We report a case of successful laparoscopic management of an isolated, grade four TDI. A patient with left-sided diaphragmatic injury and the stomach within the left thorax due to trauma was successfully managed with laparoscopic reduction of stomach herniation and repairing the diaphragmatic defect.

Keywords: Trauma, Diaphragmatic injury, Laparoscopy, Laparotomy**Copyright:** © 2022 Gunathilaka K *et al.*  This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**Funding:** None**Competing interest:** None**Received:** 20.01.2022**Accepted revised version:** 21.05.2022**Published:** 15.07.2022*✉ **Correspondence:** mrkm.gunathilaka@gmail.com, <https://orcid.org/0000-0002-9975-7884>

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Introduction

Traumatic diaphragmatic injuries (TDI) may occur as a result of both blunt and penetrating thoraco-abdominal trauma [1]. The incidence of traumatic diaphragmatic injuries in abdominal trauma and chest trauma ranges from 0.8% to 8% [2]. Most of the TDI are associated with other thoraco-abdominal organ injuries such as liver, splenic and bowel injuries making diaphragmatic injuries an indicator of severe trauma [3]. Only a few cases of isolated large TDI without intra-abdominal solid or hollow viscus damages are reported in medical literature [3-6].

The most accessible and first-line imaging modality in trauma patients is the plain chest X-ray and Focused Assessment Sonography for Trauma (FAST) ultrasound, both of which have poor accuracy in diagnosing TDI. Therefore, Computed Tomography (CT) is considered the imaging modality of choice [7-8].

A midline laparotomy is the advocated approach for repair of acute TDI in most cases because it offers the possibility of diagnosing and repairing frequently associated intraabdominal injuries. In hemodynamically stable patients with isolated TDI, laparoscopic management is an option [6-9]. However, due to the lack of expertise and limited resources, the use of laparoscopy in the diagnosis and management of acute trauma is not popular in Sri Lanka. Here we report a case of successful laparoscopic management of an isolated complex TDI.

Case Report

A 49-year-old male was admitted to the accident service unit of Colombo South Teaching Hospital following high-velocity road traffic accident with blunt trauma to the abdomen, lower thoracic area and the left lower limb.

He was hemodynamically stable with a Glasgow coma scale score of 15 out of 15. The detectable clinical signs were tachypnoea with a slight reduction of air entry in the left side of the thorax with minor grazed abrasions over the left lower thorax and multiple scalp lacerations. The left lower limb was externally rotated, suggestive of a neck of femur fracture.

The FAST scan did not show any significant findings, and the chest x-ray revealed an elevated left hemidiaphragm with fractures of the 10th and 11th ribs, mediastinal shift and tracheal deviation (Figure 1). Elevated hemidiaphragm with a right shift and reduced air entry raised the suspicion of TDI and was proceeded to contrast enhanced CT (CECT) abdomen and chest, which showed left-sided diaphragmatic injury and the stomach within the left thorax (Figure 2). There were no other solid organ injuries. The non-contrast CT (NCCT) brain and cervical spine CT excluded traumatic brain and cervical spine injury.

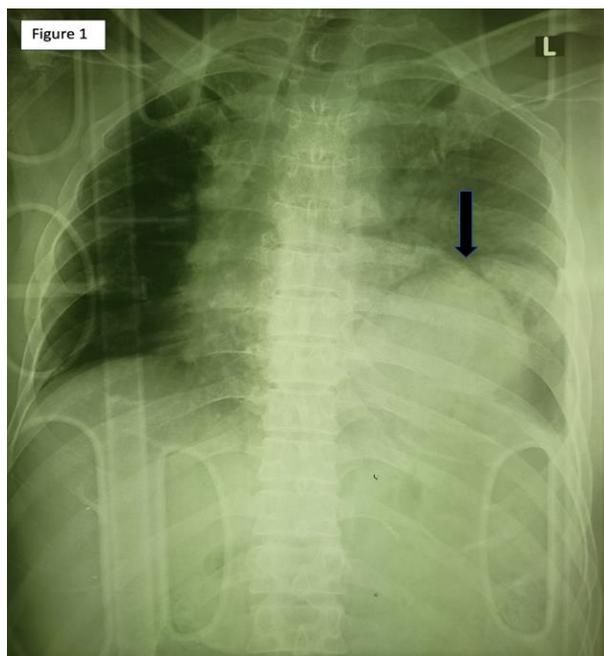


Figure 1: Supine chest x-ray showing elevated left hemi-diaphragm with a midline shift to the right side

A diagnostic laparoscopy was performed under general anaesthesia with the patient in a leg split position using a 10 mm peri-umbilical port for the camera and two lateral ports (5 mm port and 10 mm port) in the right flank. The laparoscopic abdominal survey showed a 12 cm left diaphragmatic defect with stomach herniating into the thoracic cavity (Figure 3) without any solid or hollow viscus injuries.

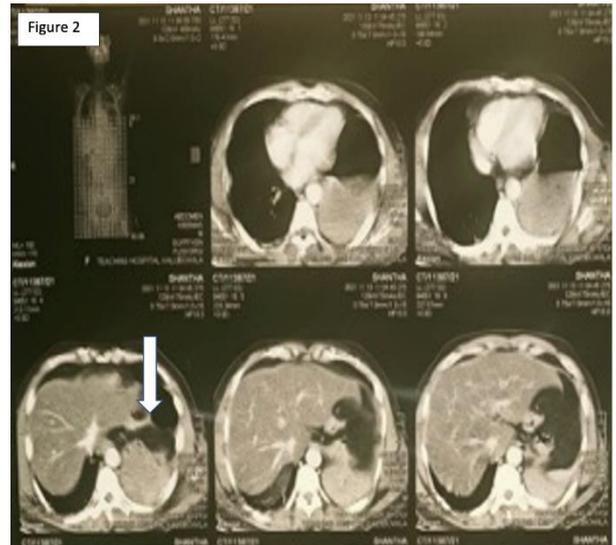


Figure 2: Cross-sectional CECT images showing left diaphragmatic defect with transthoracic gastric herniation

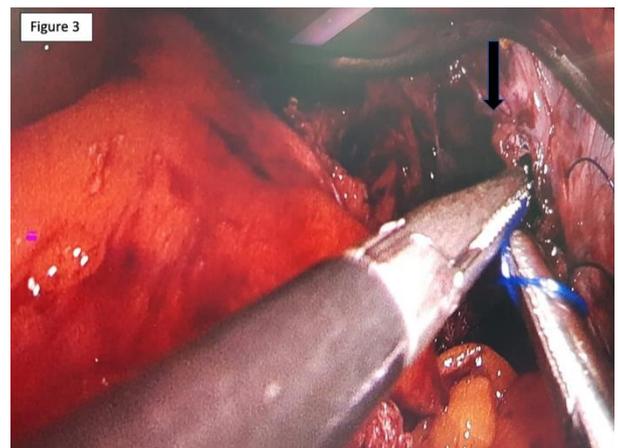


Figure 3: Intraoperative images during the repair of the diaphragmatic defect.

The hernia was reduced by gentle traction back and the defect was repaired with non-absorbable sutures in an interrupted manner. The patient was paralyzed and ventilated for 48 hours. He was discharged from the surgical unit on post-operative day 15 after the completion of orthopaedic management. At the follow-up clinic conducted after four weeks, the patient was fully recovered and back to his day to day activities.

Discussion

We present a rare case of an isolated large diaphragmatic rupture with transthoracic gastric herniation that was successfully repaired primarily with laparoscopic approach as an eye opener for Sri Lankan surgeons for

the use of laparoscopic approach in diagnosis and management in acute trauma.

Although diagnosing TDI can be challenging, early imaging studies in a background of clinical suspicion may lead to early detection and proper management. According to the American Association for the Surgery of Trauma (AAST), Organ Injury Scaling Committee classification system for TDI, this patient suffered a grade 4 diaphragmatic injury [11].

There are no defined indications for laparoscopic approach in the management of TDI, but the Eastern Association for the Surgery of Trauma (EAST) guidelines concludes that laparoscopy may be the preferred surgical approach over open repair in stable patients with isolated TDI [12].

The major principles in the management are reduction of herniated organs, and watertight closure of the defect with the placement of a chest drain on the affected side [11]. There are no recommendations based on randomized trials on the type of suture material or the suturing technique. Commonly non-absorbable sutures are used with simple interrupted, continuous or horizontal mattress sutures and some reports shows two-layered closure in defects more than 2 cm. AAST grade

4-5 injuries may require a prosthetic mesh to achieve tension-free repair [1,11].

For years, repair by open approaches such as laparotomy and thoracotomy has been the mainstay of management. However, a trend of using the laparoscopic approach for such management is observed in recent times [10]. The current Sri Lankan literature lacks reports on successful laparoscopic management of acute TDI.

In our case, we were able to successfully achieve watertight tension-free repair with simple interrupted sutures and without a prosthetic mesh. There were no procedure-related complications in both the immediate post-operative period or during follow-up.

Conclusion

A laparoscopic approach for diaphragmatic injuries would be of value as an excellent diagnostic and therapeutic procedure. It is safe and effective in repairing the diaphragm following rupture due to blunt abdominal trauma even with complex injuries in hemodynamically stable patients. However, the skill and experience of surgeons with advanced laparoscopic suturing techniques is the major requirement to promote this practice.

References

1. Hanna WC, Ferri LE. Acute traumatic diaphragmatic injury. *Thorac Surg Clin* 2009; 19: 485–9. doi: <https://doi.org/10.1016/j.thorsurg.2009.07.008>
2. Thiam O, Konate I, Gueye ML, Toure AO, Seck M, Cisse M, et al. Traumatic diaphragmatic injuries: epidemiological, diagnostic and therapeutic aspects. *Springerplus*. 2016;5(1):1614. doi: 10.1186/s40064-016-3291-1
3. Sangster G, Ventura VP, Carbo A, Gates T, Garayburu J, D'Agostino H. Diaphragmatic rupture: a frequently missed injury in blunt thoracoabdominal trauma patients. *Emerg Radiol*. 2007;13(5):225–30. doi: 10.1007/s10140-006-0548-y
4. Baloyiannis I, Kouritas VK, Karagiannis K, Spyridakis M, Efthimiou M. Isolated right diaphragmatic rupture following blunt trauma. *Gen Thorac Cardiovasc Surg*. 2011;59(11):760–2. doi:10.1007/s11748-010-0759-8
5. Antao B, Lansdale N, Shawis R. Traumatic rupture of right hemidiaphragm in a child. *Eur J Pediatr Surg*. 2006.5.352–4. DOI:10.1055/S-2006-924637
6. Sirbu H, Busch T, Spillner J, Schachtrupp A, Autschbach R. Late bilateral diaphragmatic rupture: Challenging diagnostic and surgical repair. *Hernia*. 2005 ;9(1):90–2. doi: 10.1007/s10029-004-0243-4
7. Iochum S, Ludig T, Walter F, Sebbag H, Grosdidier G, Blum AG. Imaging of diaphragmatic injury: a diagnostic challenge? *Radiographics* .2002;22:1

8. Chen HW, Wong YC, Wang LJ, Fu CJ, Fang JF, Lin BC. Computed tomography in left-sided and right-sided blunt diaphragmatic rupture: experience with 43 patients. *Clin Radiol.* 2010 ;65(3):206–12.doi: 10.1016/j.crad.2009.11.005
9. Matthews BD, Bui H, Harold KL, Kercher KW, Adrales G, Park A, et al. Laparoscopic repair of traumatic diaphragmatic injuries. *Surg Endosc Other Interv Tech.* 2003;17(2):254–8.doi: 10.1007/s10029-009-0596-9
10. Xenaki S, Lasithiotakis K, Andreou A, Chrysos E, Chalkiadakis G. Laparoscopic repair of posttraumatic diaphragmatic rupture. Report of three cases. *Int J Surg Case Rep.* 2014;5(9):601–4.
11. Shaban Y, Elkbuli A, McKenney M, Boneva D. Traumatic diaphragmatic rupture with transthoracic organ herniation: A case report and review of literature. *Am J Case Rep.* 2020;21:e919442. doi: 10.12659/AJCR.919442. PMID: 31896740.
12. McDonald AA, Robinson BRH, Alarcon L, Bosarge PL, Dorion H, Haut ER, Juern J, Madbak F, Reddy S, Weiss P, Como JJ. Evaluation and management of traumatic diaphragmatic injuries: A practice management guideline from the eastern association for the surgery of trauma. *J Trauma Acute Care Surg.* 2018;85(1):198-207. doi: 10.1097/TA.0000000000001924. PMID: 29613959.



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