

Case report

Surgical repair for a paraesophageal hernia with an esophageal hiatal hernia: A case report and literature review



Yosuke Takahashi, Kazuhiro Noma^{*}, Masashi Hashimoto, Naoaki Maeda, Shunsuke Tanabe, Toshiyoshi Fujiwara

Department of Gastroenterological Surgery, Okayama University Graduate School of Medicine, Dentistry, and Pharmaceutical Sciences, 2-5-1 Shikata-cho, Kita-ku, Okayama 700-8558, Japan

ARTICLE INFO

Keywords:

Paraesophageal hernia
Esophageal hiatal hernia
Laparoscopic repair
Three-dimensional laparoscopy

ABSTRACT

Introduction and importance: A paraesophageal hernia (PH) is a rare diaphragmatic hernia (DH) adjacent to but separated from the esophageal hiatus. The surgical repair for PH needs primary suture closure or complicated hernioplasty and the addition of an anti-reflux procedure. This report describes a case of PH with a symptomatic esophageal hiatal hernia managed using three-dimensional (3D) laparoscopy.

Case presentation: A 65-year-old woman with back pain and breathlessness was referred to our hospital for a DH. Computed tomography showed a diaphragmatic defect on the left side of the esophageal hiatus. Upper gastrointestinal endoscopy and 24-hour esophageal impedance-pH monitoring showed a symptomatic esophageal hiatal hernia. Laparoscopic repair for both hernias was performed using 3D laparoscopy. The DH orifice was located in the left crus of the diaphragm, and it was separated from the esophageal hiatus. These findings showed that this DH was a PH. The PH was repaired with primary suturing, and a hiatoectomy was performed. Toupet fundoplication was performed with a 270° posterior wrap of the gastric fornix. The patient has remained asymptomatic a year after surgery without any complications.

Clinical discussion: 3D laparoscopy provides significant advantages in surgeries requiring precise suturing. PH repairs require complex procedures, including mesh repair or suturing. Approximately 44 % of PH cases also necessitate fundoplication. 3D laparoscopy was useful for the present case.

Conclusions: A rare PH and a symptomatic type 1 hiatal hernia were repaired with 3D laparoscopy, which is helpful for PH treatment in cases requiring complicated procedures.

1. Introduction

Diaphragmatic hernias (DHs) are characterized by the protrusion of any abdominal structure into the thoracic cavity through a diaphragmatic defect or dilated hiatus. DHs are classified into congenital hernias, including Bochdarec and Morgani, and acquired hernias, including hiatal hernias and traumatic hernias. Hiatal hernia is the most common type of hernia. On the other hand, a paraesophageal hernia (PH), another type of DH, is a rare DH, seen in 0.2 % to 0.35 % of patients undergoing surgical repair for a hiatal hernia [1,2]. A PH can be congenital or acquired, such as iatrogenic or traumatic, and is defined as having its orifice lateral to the crus of the diaphragm but separated from the esophageal hiatus by diaphragmatic tissue. Some reports recommend surgery because of the risk of lethal complications such as gastric

strangulation or perforation [3,4]. PHs need to be repaired with primary suture closure or complicated hernioplasty using a mesh and adding an anti-reflux procedure.

Recently, minimally invasive surgery has extended into gastrointestinal surgery. There are many reports of PHs repaired with laparoscopic surgery [5,6]. The devices used in laparoscopic surgery have progressed remarkably. Three-dimensional (3D) laparoscopy is a valuable tool. Here, a case of PH combined with a sliding esophageal hiatal hernia treated by 3D laparoscopic suturing closure and fundoplication is described. This manuscript has been reported in line with the SCARE criteria [7].

^{*} Corresponding author.

E-mail addresses: knoma@md.okayama-u.ac.jp (K. Noma), m_hashimoto1986@s.okayama-u.ac.jp (M. Hashimoto), stanabe114@cc.okayama-u.ac.jp (S. Tanabe), toshi_f@md.okayama-u.ac.jp (T. Fujiwara).

<https://doi.org/10.1016/j.ijscr.2024.109565>

Received 14 January 2024; Received in revised form 15 March 2024; Accepted 17 March 2024

Available online 20 March 2024

2210-2612/© 2024 The Author(s). Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2. Case presentation

A 65-year-old woman presented with back pain and breathlessness. A DH was suspected, and she was referred to our hospital. She had diabetes mellitus, hypertension, and a history of laparotomies for an ovarian cyst and acute appendicitis, but there was no history of trauma. Computed tomography (CT) showed a diaphragmatic defect 20 mm in diameter on the left side of the esophageal hiatus. It was separated by the left crus of the diaphragm, with prolapse of intra-abdominal fat tissue (Fig. 1 a). The upper gastrointestinal series showed that the esophagogastric junction slid over the diaphragm (Fig. 1 b). Gastrointestinal endoscopy showed a type 1 hiatal hernia of the esophagus with Barrett's esophagus (Fig. 1 c, d). On 24-hour esophageal impedance-pH monitoring, there was significant acid reflux, with a Demeester score of 15.5 and a high frequency of reflux (173 times). She was finally diagnosed as having a DH and a symptomatic type 1 hiatal hernia.

The patient underwent laparoscopic hernia repair and Toupet fundoplication using 3D laparoscopy (operation time: 157 min, blood loss: tiny). After mediastinal circumferential dissection of the lower esophagus for the type 1 hiatal hernia, a diaphragmatic muscular defect (25 × 25 mm²) with omental herniation was found in the left crus of the diaphragm (Fig. 2 a). The hernia orifice of the DH was separated from the esophageal hiatus and enclosed the muscular fibers. The hernia sac was located above the diaphragm adjacent to the left thoracic space and mediastinum without connection to either space (Fig. 2 b). These findings showed that the DH was a PH. The width of the parahiatal defect was only 10 mm. Thus, the PH was repaired with primary suturing using non-absorbable polyester thread (Fig. 2 c). Toupet fundoplication was performed with 270° posterior wrapping of the gastric fornix (Fig. 2 d). In the end, the endoscope confirmed that the esophageal lumen was free from stenosis. The patient had no surgical complications and was discharged 11 days after surgery. The Demeester score improved to 3.3, and the frequency of reflux was less than one-third. She has had no symptom for 1 year postoperatively and no recurrence of either hernia on CT. Gastrointestinal endoscopy showed no evidence of reflux esophagitis and no change of Barrett's epithelium.

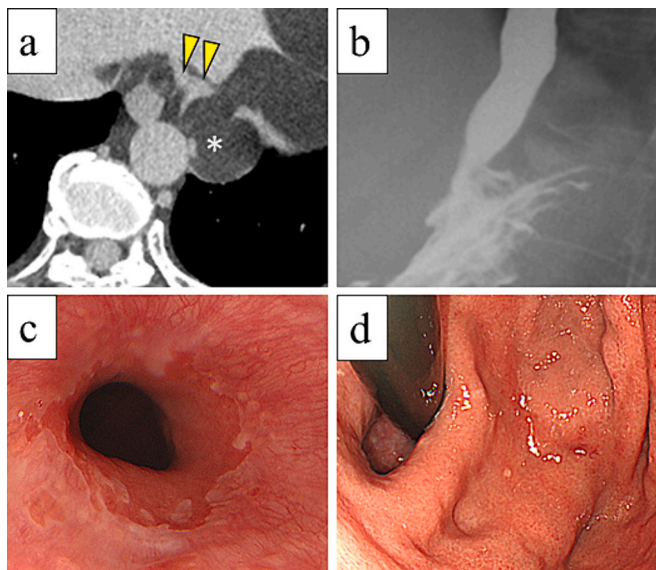


Fig. 1. Preoperative findings.

a: CT shows a defect, 20 mm in diameter, on the left crus of the diaphragm (arrowhead) with fat herniation (asterisk). b: Upper gastrointestinal series shows a type 1 hernia of the esophagus. c, d: Upper gastroendoscopy shows a type 1 hiatal hernia of the esophagus with a Barrett's esophagus.

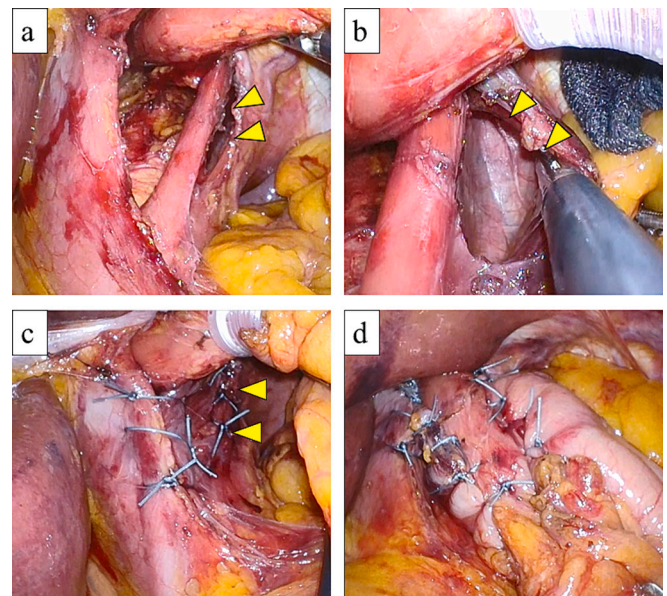


Fig. 2. Surgical findings.

a, b: After separating the esophagus and the crus of the diaphragm, the orifice of the PH (arrowhead) is the left side of the esophageal hiatus, enclosing the muscular fibers in the left crus of the diaphragm. The PH (arrowhead) is separated from the left thoracic cavity and mediastinal space. c, d: Primary suturing repairs for the esophageal hiatus and PH (arrowhead) and Toupet fundoplication are performed.

3. Discussion

A case of PH combined with a sliding esophageal hiatal hernia treated by 3D laparoscopic suturing closure and fundoplication was described. As in past reports, accurate preoperative diagnosis was difficult. However, surgical procedures using 3D laparoscopy enabled precise repair.

A search of PubMed using the terms “parahiatal hernia” [All Fields] OR “parahiatal hernias” [All Fields] OR “para-hiatal hernia” [All Fields] OR “para-hiatal hernias” [All Fields] was performed, and 28 articles published between 2000 and 2023 were identified. After excluding 4 articles (2 articles not referring to PH, 1 article not written in English, and 1 article including no PH case presentation), there were 38 PH cases reported, but 8 cases lacked sufficient details. For 26 cases treated with laparoscopy out of the remaining 30 cases and the present case, sex, age, defect size, surgical approach, repair procedure, and operative time were evaluated (Table 1) [1–6,8–17]. The advantages of the laparoscopic approach are mentioned in most of the reports about PH, including better visualization than with an open approach, which then enables mesh placement, gastropexy, or fundoplication more easily [5,6,16]. In 44 % (12/27) of cases, anti-reflux surgery was performed in cases of symptomatic reflux or a complicated hiatal hernia with reflux. The present case had a symptomatic hiatal hernia and underwent Toupet fundoplication. In 59 % (16/27) of the patients, mesh was used. Mesh reinforcement is generally recommended when a tension-free repair cannot be achieved by primary suturing alone [1,5,12]. However, the use of mesh around the hiatal area requires careful manipulation due to the risk of serious complications, such as cardiac tamponade caused by mesh fixation or gastroesophageal injury caused by mesh erosion. Although only a few articles reported operation time, the operation time was relatively short in cases in which only primary hernia suturing was performed, whereas it was relatively long in cases in which mesh was placed or fundoplication was added.

There have been no reports of laparoscopic treatment of PH by 3D laparoscopy. In this review, a patient was treated by a robot with 3D visualization [17]. Based on a meta-analysis and expert discussion,

Table 1

Reports of PH patients.

The table shows the cases with PH repair alone above the line and with fundoplication below the line.

Author	Year	Gender	Age	Hernia diameter (mm)	Hernia contents	Approach	Fundoplication	Hernia repair	Operation time
Ramalingam, G [8].	2006	F	42	30	Stomach omentum	Lap	No	Suturing	80
Palanivelu, C [1].	2008	M	32			Lap	No	Mesh	
Palanivelu, C [1].	2008	F	45			Lap	No	Suturing	
Palanivelu, C [1].	2008	M	55			Lap	No	Mesh	
Palanivelu, C [1].	2008	M	70			Lap	No	Mesh	
Palanivelu, C [1].	2008	F	56			Lap	No	Suturing	
Palanivelu, C [1].	2008	F	37			Lap	No	Mesh	
Ohtsuka, H [9].	2012	M	39	50	Stomach	Lap			
Takemura, M [3].	2013	M	70	30	Stomach omentum	Lap	No	Suturing	215
Main, W. P [4].	2015	F	24		Stomach	Lap	No	Mesh	
Koh, Y. X [10].	2016	F	40	50	Stomach	Lap	No	Suturing	
Calin, M. L. [17]	2016	F	45		Stomach	Robot	No	Mesh	
Akiyama, Y [6].	2017	M	73	80	Transverse colon	Lap		Mesh	157
Li, J [5].	2020	F	73		Stomach	Lap	No	Mesh	
Li, J [5].	2020	F	80		Stomach	Lap	No	Mesh	
Hany, M [11].	2022	F	36		Bowel	Lap	No	Mesh	
Scheidler, M. G [2].	2002	F	68		Stomach omentum	Lap	Nissen	Suturing	
Scheidler, M. G [2].	2002	M	57		Stomach	Lap	Nissen	Suturing	
Palanivelu, C [1].	2008	M	29			Lap	Nissen	Mesh	
Palanivelu, C [1].	2008	M	65			Lap	Nissen	Mesh	
Lew, P. S [12].	2013	F	51	30	Stomach duodenum	Lap	Anterior 180°	Mesh	
Koh, Y. X [10].	2016	F	51	30	Stomach	Lap	Anterior 180°	Mesh	
Staerkle, R. F [13].	2018	M	71		Stomach	Lap	Partial posterior	Mesh	
Preda, S. D [14].	2019	F	60	70	Stomach	Lap	Nissen	Suturing	150
De la Cruz Garcia [15]	2022	M	77		Omentum	Lap	Anterior 180°	Suturing	
Muramatsu, R [16].	2022	F	39	50	Stomach	Lap	Toupet	Mesh	232
Ours	2022	F	65	25	Omentum	Lap	Toupet	Suturing	157

Lap: laparoscopic.

several statements and recommendations regarding 3D endoscopy were presented at the 2018 EAES consensus meeting. The statement states, “3D laparoscopy shortens the operation time in all the analyzed surgical settings (general surgery, urology, and gynecology)”. Arezzo compared operative time with and without the 3D laparoscope in a meta-analysis. The report indicated that 3D laparoscopy provides particular benefits for operation time in surgeries that included sutures, such as hiatal hernia repair and transabdominal preperitoneal inguinal hernia repair (TAPP) [18–20]. PH repairs require complex procedures, including mesh repair or suturing. Furthermore, 44 % of PH patients need some fundoplication, as above. 3D laparoscopy was useful for the present case.

There is no consensus about the postoperative follow-up for PH. Consequently, CT scans and gastrointestinal endoscopy were performed one year after surgery. In this case, a short-segment Barrett's esophagus was identified, but it showed no signs of dysplasia. Given that Barrett's esophagus is a risk factor for adenocarcinoma, it's advised to undergo surveillance gastric endoscopy at least every five years. The surveillance schedule for this case includes annual follow-ups for the first three years, followed by checks every three to five years.

As a limitation, the preoperative diagnosis was DH and type 1 esophageal hernia, not a PH, and 3D laparoscopy was not set up for a PH. However, any DH repair needs suturing or plasty with mesh. The surgical procedure will be similar to in this case.

4. Conclusions

A rare case of a PH and a symptomatic type 1 hiatal hernia repaired was presented in which 3D laparoscopy was helpful for the complex suturing.

List of abbreviations

PH	parahiatal hernia
DH	diaphragmatic hernia
3D	three-dimensional
CT	computed tomography

EAES The European Association of Endoscopic Surgery
TAPP transabdominal preperitoneal inguinal hernia repair

Funding

None.

Ethics approval and consent to participate

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions. As this manuscript falls under the category of case reports, it is exempt from requiring ethical approval.

Consent for publication

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Authors' contributions

YT performed the literature review and wrote the manuscript. KN, MH, NM, ST, and YT were involved in the clinical management of the patient. TF, KN, and MH revised the manuscript. All authors read and approved the final manuscript.

Declaration of competing interest

All authors declare that they have no conflict of interest.

Data availability

None.

Acknowledgements

None.

References

- [1] C. Palanivelu, M. Rangarajan, P.A. Jategaonkar, R. Parthasarathi, K. Balu, Laparoscopic repair of para-hiatal hernias with mesh: a retrospective study, *Hernia* 12 (5) (2008) 521–525.
- [2] M.G. Scheidler, R.J. Keenan, R.H. Maley, R.J. Wiechmann, D. Fowler, R. J. Landreneau, “True” para-hiatal hernia: a rare entity radiologic presentation and clinical management, *Ann. Thorac. Surg.* 73 (2) (2002) 416–419.
- [3] M. Takemura, K. Mayumi, T. Ikebe, G. Hamano, Laparoscopic repair of secondary para-hiatal hernia with incarceration of the stomach: a case report, *J Med Case Reports* 7 (2013) 50.
- [4] W.P. Main, K.M. Tymitz, Iatrogenic para-hiatal hernia with gastric herniation and necrosis after robotic hiatal hernia repair, *Am. Surg.* 81 (12) (2015) E406–E407.
- [5] J. Li, C. Guo, X. Shao, T. Cheng, Y. Wang, Another type of diaphragmatic hernia to remember: para-hiatal hernia, *ANZ J. Surg.* 90 (11) (2020) 2180–2186.
- [6] Y. Akiyama, T. Iwaya, F. Endo, T. Chiba, T. Takahara, K. Otsuka, et al., Laparoscopic repair of para-hiatal hernia after esophagectomy: a case report, *Surg. Case Rep.* 3 (1) (2017) 91.
- [7] C. Sohrabi, G. Mathew, N. Maria, A. Kerwan, T. Franchi, R.A. Agha, Collaborators., The SCARE 2023 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 109 (5) (2023) 1136–1140.
- [8] G. Ramalingam, D.R. A. L. T, G.B. H, Laparoscopic adjustable gastric banding in a patient with an incidental para-hiatal hernia, *Obes. Surg.* 16 (1) (2006) 98–101.
- [9] H. Ohtsuka, K. Imamura, K. Adachi, An unusual diaphragmatic hernia. Para-hiatal hernia, *Gastroenterology* 142 (7) (2012) 1420 (623).
- [10] Y.X. Koh, L.W. Ong, J. Lee, A.S. Wong, Para-oesophageal and para-hiatal hernias in an Asian acute care tertiary hospital: an underappreciated surgical condition, *Singapore Med. J.* 57 (12) (2016) 669–675.
- [11] M. Hany, M. Ibrahim, A. Zidan, B. Torensma, Acute para-hiatal hernia after sleeve gastrectomy: a case report, *Obes. Surg.* 32 (9) (2022) 3210–3212.
- [12] P.S. Lew, A.S. Wong, Laparoscopic mesh repair of para-hiatal hernia: a case report, *Asian J. Endosc. Surg.* 6 (3) (2013) 231–233.
- [13] R.F. Staerke, R.J.E. Skipworth, S. Leibman, G.S. Smith, Emergency laparoscopic mesh repair of para-hiatal hernia, *ANZ J. Surg.* 88 (6) (2018) E564–e5.
- [14] S.D. Preda, Ș. Pătrașcu, B.S. Ungureanu, D. Cristian, V. Bințișan, C.M. Nica, et al., Primary para-hiatal hernias: a case report and review of the literature, *World J. Clin. Cases* 7 (23) (2019) 4020–4028.
- [15] I. De la Cruz Garcia, K. Chan, Gastric outlet obstruction secondary to omental fat in a para-hiatal hernia resulting in a gastric volvulus, *ANZ J. Surg.* 92 (9) (2022) 2320–2321.
- [16] R. Muramatsu, T. Nobuoka, T. Ito, T. Ogawa, T. Korai, I. Takemasa, Laparoscopic mesh repair and Toupet fundoplication for para-hiatal hernia complicated by sliding hiatal hernia: a case report, *Int. J. Surg. Case Rep.* 100 (2022) 107664.
- [17] M.L. Calin, G. Arevalo, K. Harris, R. Fuentes, A. Sadiq, B. Nasri, K. Singh, Large sized left inferior phrenic artery and para-hiatal type of diaphragmatic hernia generating confusion during robotic surgical repair, *J. Laparoendosc. Adv. Surg. Tech. A* 27 (3) (2017) 283–287.
- [18] A. Arezzo, N. Vettoretto, N.K. Francis, M.A. Bonino, N.J. Curtis, D. Amparore, et al., The use of 3D laparoscopic imaging systems in surgery: EAES consensus development conference 2018, *Surg. Endosc.* 33 (10) (2019) 3251–3274.
- [19] P. Leon, R. Rivellini, F. Giudici, A. Sciuto, F. Pirozzi, F. Corcione, 3D vision provides shorter operative time and more accurate intraoperative surgical performance in laparoscopic hiatal hernia repair compared with 2D vision, *Surg. Innov.* 24 (2) (2017) 155–161.
- [20] H.E. Koppatz, J.I. Harju, J.E. Siren, P.J. Mentula, T.M. Scheinin, V.J. Sallinen, Three-dimensional versus two-dimensional high-definition laparoscopy in transabdominal preperitoneal inguinal hernia repair: a prospective randomized controlled study, *Surg. Endosc.* 34 (11) (2020) 4857–4865.