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International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Robotic repair of iatrogenic left diaphragmatic hernia. A case report

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ARTICLE INFO

Article history:

Received 2 September 2020

Received in revised form 6 October 2020

Accepted 6 October 2020

Available online 12 October 2020

Keywords:

Iatrogenic

Diaphragmatic hernia

Minimally invasive surgery

Robotic repair

Case report

ABSTRACT

INTRODUCTION: Iatrogenic diaphragmatic hernia after laparoscopic left adrenalectomy has been rarely reported in adults. Surgery is the preferred treatment because of the risks of incarceration, strangulation and pulmonary complications.

PRESENTATION OF CASE: An elderly woman with parasternal diaphragmatic hernia has been successfully treated by robotic repair with mesh placement. The short-term follow-up showed that there was no recurrence or any symptoms after the intervention.

DISCUSSION: Iatrogenic diaphragmatic hernia is a rare complication occurring after abdominal or thoracic surgery. The diagnosis could be challenging because of the presence of chronic symptoms. Computed tomography can be considered the gold standard technique to assess the correct diagnosis of diaphragmatic hernias in the majority of cases. Patients with chronic symptomatic hernia should undergo surgical repair of defect. Robotic technology because of its enhanced precision and the endowrist movement of the robotic arms, facilitates the dissection near the esophago-gastric junction and the other important adjacent structures.

CONCLUSION: Robotic technology seems to be a valid approach for the repair of diaphragmatic defects, even if this remains a high cost-related procedure.

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1. Introduction

Iatrogenic diaphragmatic hernia after laparoscopic left adrenalectomy has been rarely reported in adults [1]. Surgery is the preferred treatment because of the risks of incarceration, strangulation and pulmonary complications. Repair of diaphragmatic hernia can be achieved by thoracotomy, laparotomy, laparoscopy or thoracoscopy but the optimal strategy has not been well established.

We reported a case of an elderly woman with upper abdominal pain complicated by parasternal diaphragmatic hernia successfully treated by robotic repair with mesh placement.

The short-term follow-up showed that there was no recurrence or any symptoms after the intervention.

This work has been reported in line with the SCARE criteria, the checklist is available as supplemental material [2].

2. Case report

A 65-year old female underwent laparoscopic left adrenalectomy for pheochromocytoma in 2017.

The postoperative period was uneventful and the patient was discharged after 3 days.

Two months after the surgical intervention, the patient began to complain nausea and epigastric pain and was admitted at the emergency unit two times. She was discharged with the diagnosis of wide hiatal defect and a therapy with Protonic Pump Inhibitor (PPI).

The symptoms worsened in the last two years, so the patient was admitted again at the emergency unit in September 2019 and then she was transferred to our surgical department to obtain a conclusive diagnosis.

The patient was hospitalized for nausea, vomiting and impossibility to have a normal oral feeding. Furthermore, the patient also reported a weight loss of 10 kg in the last month.

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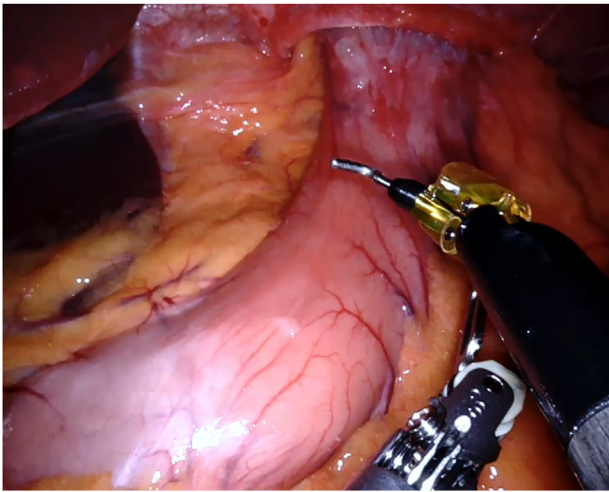


Fig. 1. Gastric herniation in the thorax through the diaphragmatic defect.

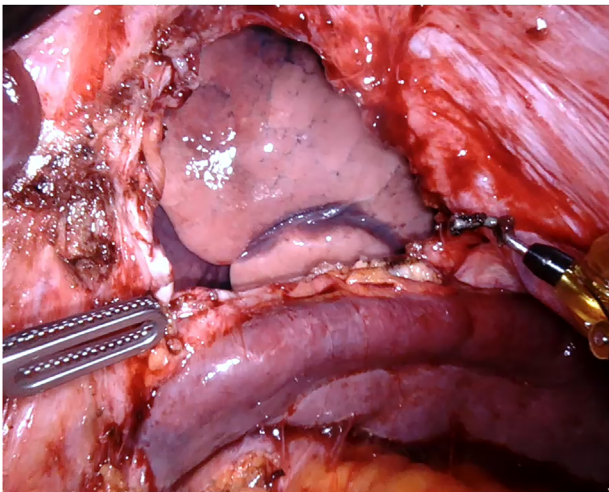


Fig. 2. Diaphragmatic defect after the repositioning of the stomach in the abdomen.

After the admission, the patient underwent a CT of the abdomen, that showed the presence of a hiatal hernia associated with a left diaphragmatic defect, with herniation of gastric fundus and body.

Thus, we decided to perform an elective robotic repair of the diaphragmatic defect.

The procedure was performed with the DaVinci Xi® platform (Intuitive Surgical, Sunnyvale, USA) under general anaesthesia with the patient in supine position with open legs. The patient was positioned in anti-Trendelenburg position with a minimal rotation (about 10°) to the left.

A robotic docking was performed and four arms were positioned in the abdomen. The robotic instruments used were the Permanent Cautery Hook®, Fenestrated Bipolar Forceps®, Cadiere Forceps® and 30° endoscope.

The preliminary laparoscopy confirmed the presence of a wide diaphragmatic defect with the complete herniation of the stomach in the thorax (Fig. 1) and showed the absence of a hiatal hernia. Furthermore, laparoscopy showed the presence of adhesions between the stomach and the diaphragmatic defect.

After an accurate adhesiolysis, the herniated stomach was repositioned in the abdomen. With the exposure of the diaphragmatic defect (Fig. 2), we noted that the spleen was attached to the diaphragm and it was impossible to position the mesh adequately. Thus, after the detachment of the spleen from the diaphragm, the

defect was closed with a running barbed suture. During the suture, an aspirator was used to eliminate all the CO₂ from the thorax. An absorbable mesh was applied on the closed diaphragm.

Total operative timing was 120 min. and no drains were applied neither in the abdomen nor in the thorax.

Considering the higher thrombotic risk associated with longer operative time among the elderly population [3], venous thromboembolism prophylaxis [4], perioperative antiplatelet and anticoagulant therapy [5] were managed according to validated criteria.

In the first postoperative day the patient underwent to a chest X-ray, that confirmed the absence of pneumothorax.

The postoperative period was uneventful and the patient was discharged in the third postoperative day.

The 3-months follow-up confirmed the absence of symptoms.

3. Discussion

Iatrogenic diaphragmatic hernia is a rare complication occurring after abdominal or thoracic surgery. Few cases have been reported after laparoscopic gastric interventions [6], nephrectomy [7], esophagectomy [8], laparoscopic left colectomy [9], laparoscopic cholecystectomy [10], laparoscopic hepatectomy [11], splenopancreatectomy [12] and adrenalectomy [1]. It occurs most commonly on the left side, because of the cushioning effect of the liver protecting the right hemidiaphragm [13].

The low incidence of iatrogenic diaphragmatic defect could lie in high rate of misdiagnosis or late diagnosis. In fact, in the majority of cases, the diaphragmatic defect remains small and asymptomatic or poorly symptomatic.

Considering the pathogenesis of the diaphragmatic hernia in our case, it could be related with grasping instruments and electrocautery during the previous surgical procedure. In fact, during the intervention of adrenalectomy the mobilization of the splenic flexure is mandatory to obtain the best exposure of the adrenal gland. During these manoeuvres, the energy generated by the ultrasonic scalpel could create a microperforation in the diaphragm [14]. This injury remains closed during surgery, as mechanic ventilation raises intrathoracic pressure and prevent the migration of abdominal structures. After the extubation the pressure gradient between abdominal and pleural cavities increases, causing a widening of the diaphragmatic defect and the migration of abdominal structures in the thorax. In fact, in our case, laparoscopy showed the migration of the fundus and the body of the stomach and a defect of about 10 cm wide.

Patients with large diaphragmatic defects can be critically symptomatic immediately after surgery, complaining dyspnoea and other cardiorespiratory disorders. Other patients can complain vague symptoms or can be asymptomatic for long time, such as in our case, in which the patient complained only nausea and epigastric pain, and the diagnosis was unknown for 2 years.

The diagnosis could be challenging, because the presence of chronic symptoms such as lower chest or epigastric pain, nausea and reflux after meals can focus the diagnosis on gastritis or gastro-oesophageal reflux, delaying the diagnosis of the real problem.

The radiological diagnosis is often complex and includes several imaging modalities. Chest X-Ray is a good screening examination, and it can assess the presence of abdominal organ in the thoracic cavity, even if its sensitivity is about 50% [15].

Due to its high sensitivity, specificity, availability and non-invasiveness [16], computed tomography can be considered the gold standard technique to assess the correct diagnosis of diaphragmatic hernias in the majority of cases, offering the opportunity to evaluate the presence, size and location of a diaphragmatic defect, as well as its contents [17]. The challenging diagnosis is confirmed

in our case, in which the patient was treated with PPI for two years for a hiatal hernia, diagnosed by chest X-Ray.

Patients with chronic symptomatic hernia should undergo surgical repair of defect [18]. The optimal management for this hernia is a repair via transabdominal approach, with the possibility to explore all the abdominal cavity to detect other misdiagnosed injuries.

Minimally invasive treatment is feasible and safe for various complicated procedures [19–21] and it is associated with a shorter recovery and better cosmetic results, improving the quality of life. These benefits have been demonstrated even in the elderly population [22].

The introduction of robotic technology facilitates the surgical approach to the esophago-gastric junction and to the adjacent structures [23,24].

In fact, robotic technology, because of its enhanced precision allows to perform an accurate dissection near important anatomic structures, such as spleen. Furthermore, the endowrist movement of the robotic arms allows wide instrument articulation for suturing in a confined space, which it is technically challenging to approach by laparoscopic instruments.

In our best knowledge, this is the first robotic repair of a diaphragmatic defect after laparoscopic adrenalectomy. Another case has been described in literature in which the repair was performed with a laparoscopic approach [1].

Our case differs from the case described above not only for the adopted surgical technique, but also for the positioning of the mesh, necessary in our case to reinforce the closure of the defect.

Our case is an important demonstration of the benefit of the robotic approach to this type of disease, even if this remains a high cost-related procedure.

4. Conclusion

Iatrogenic diaphragmatic hernia is a rare complication occurring after abdominal or thoracic surgery. Patients with chronic symptomatic hernia should undergo surgical repair of defect. Robotic technology, because of its enhanced precision allows to perform an accurate dissection near the esophago-gastric junction and the adjacent structures.

Declaration of Competing Interest

The authors report no declarations of interest.

Sources of funding

All authors received no financial support for the research, authorship, and/or publication of this article.

Ethical approval

No ethical committee approval is needed for this manuscript.

Consent

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

Author contribution

Vertaldi S: conception, design, interpretation of the data and drafting of the article.

Manigrasso M: acquisition, analysis and interpretation of the data.

D'angelo S, Servillo G: interpretation of the data and critical revisions.

De Palma GD and Milone M: critical revisions and final approval.

Registration of research studies

NA.

Guarantor

Vertaldi Sara, Milone Marco.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at <https://doi.org/10.1016/j.ijscr.2020.10.032>.

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