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## International Journal of Surgery Case Reports

journal homepage: [www.casereports.com](http://www.casereports.com)

## Surgical treatment of Bochdalek hernia incarcerated into the extra-pleural space: A rare case report

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## ARTICLE INFO

## Article history:

Received 17 May 2020

Received in revised form 30 June 2020

Accepted 3 July 2020

Available online 15 July 2020

## Keywords:

Bochdalek hernia

Surgical treatment

Extra-pleural space

Video-assisted thoracoscopic surgery

Incarceration

Retroperitoneal fatty tissue

## ABSTRACT

**INTRODUCTION:** Bochdalek hernias are a type of diaphragm hernia. Almost all occur in the neonatal period, only 5% of these hernias occurring in adults. We here present a rare case of adult Bochdalek hernia incarcerated in the extra-pleural space.

**PRESENTATION OF CASE:** An asymptomatic 51-year-old man was admitted to our hospital for a detailed examination after an abnormality had been detected on a chest radiograph. Chest computed tomography (CT) examination revealed findings consistent with a left Bochdalek hernia, which we repaired surgically. Intraoperatively, retroperitoneal fatty tissue was found to be incarcerated in the extra-pleural space. Thus, surgical repair required dissection of the parietal pleura and excision of the incarcerated fatty tissues.

**DISCUSSION:** The incarceration of the Bochdalek hernia in the extra-pleural space could not be identified on a preoperative chest CT examination. To the best of our knowledge, no reports of incarceration of a Bochdalek hernia in the extra-pleural space have been published; thus, this phenomenon is extremely rare.

**CONCLUSION:** Surgical treatment of a Bochdalek hernia incarcerated in the extra-pleural space requires dissection of the parietal pleura and repair via a transthoracic approach.

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## 1. Introduction

Bochdalek hernias (BHs) are congenital posterolateral diaphragmatic defects caused by the congenital failure of fusion of the posterolateral muscular portion of the diaphragm [1]. Almost all BHs occur in the neonatal period; however, but 5% occur in adults [2]. We here present a rare case of an adult BH incarcerated in the extra-pleural space and requiring surgical treatment. This work has been reported in line with the SCARE criteria [3]. The name of my Research Registry unique identifying number (UIN) is reserchrestry5604 (<https://www.researchregistry.com>).

**Abbreviations:** CT, computed tomography; VATS, video-assisted thoracoscopic surgery; BH, Bochdalek hernia.

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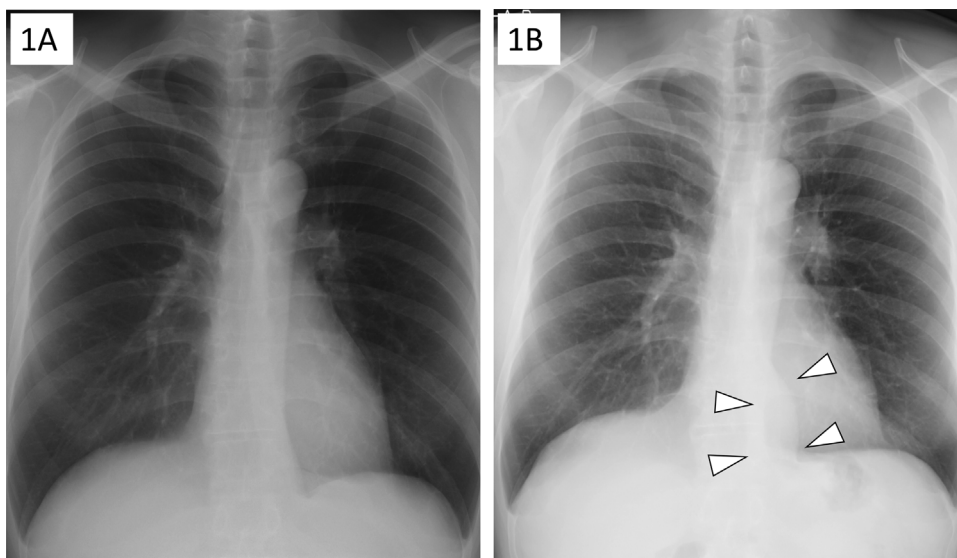
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## 2. Presentation of case

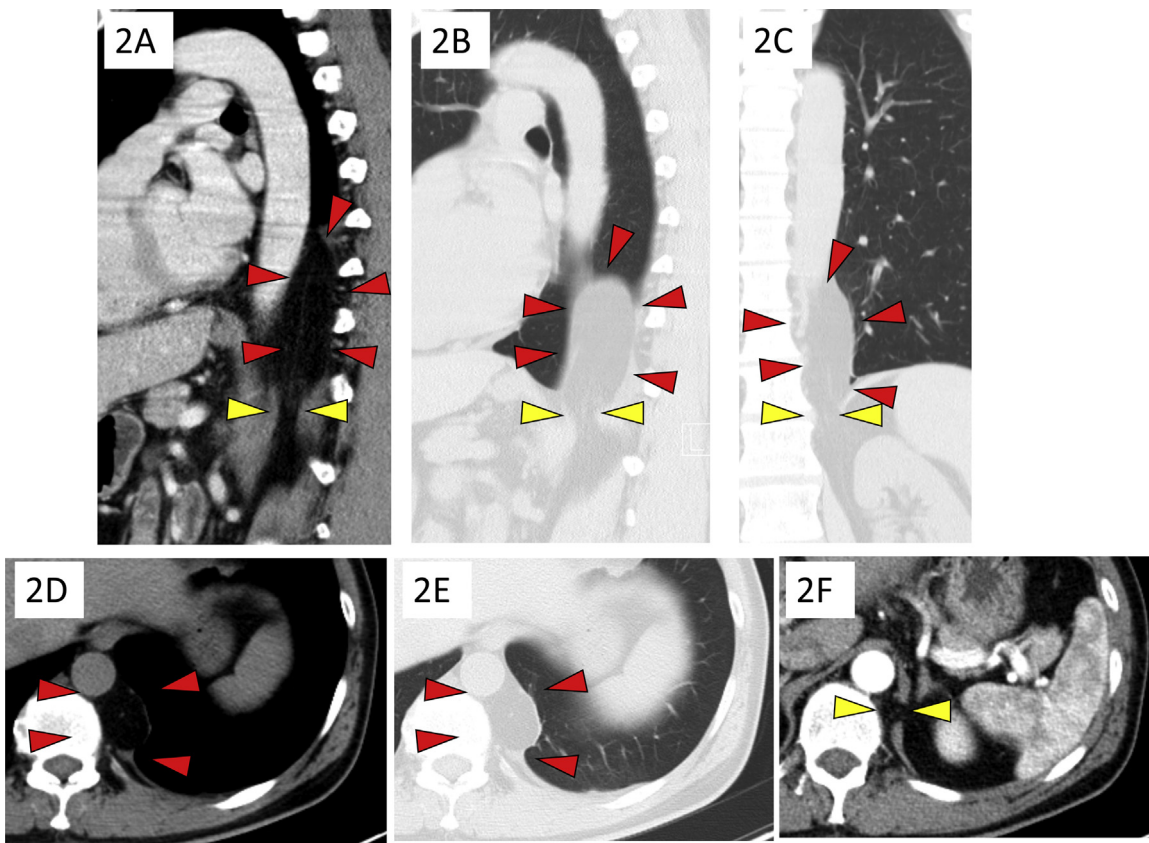
A 51-year-old man was admitted to our hospital for a detailed examination after detection of an abnormality on a chest radiograph. He had no relevant family history, drug history, psychosocial history or previous history of trauma or surgery. He was asymptomatic and his physical examination and laboratory findings were normal. A chest radiograph revealed an abnormal shadow in the left lower lung field (Fig. 1B) that had not been detected two years previously (Fig. 1A). Chest contrasted CT examination revealed herniation of 10 × 5 cm of retroperitoneal fatty tissue into the left thoracic cavity (Fig. 2). We diagnosed a left exacerbated BH, and the patient hoped to receive a radical surgical treatment. We performed surgical repair using video-assisted thoracoscopic surgery (VATS). After induction of general anesthesia, the patient was placed in a right lateral position. The VATS procedure was performed through three access ports inserted through two 1-cm incisions and one 1.5-cm incision without spreading of the ribs. Intraoperatively, we found that retroperitoneal fatty tissue had herniated into the extra-pleural space via a 2-cm diameter hernia orifice (Fig. 3). We first dissected the parietal pleura and then excised of the herniated retroperitoneal fatty tissue. After that, we repaired the defect in

<https://doi.org/10.1016/j.ijscr.2020.07.027>

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**Fig. 1.** Preoperative chest radiograph. A) and B) There was no abnormal shadow at the age of 49 (A), but two years later, there was an abnormal shadow (white arrows) in the left lung field (B).

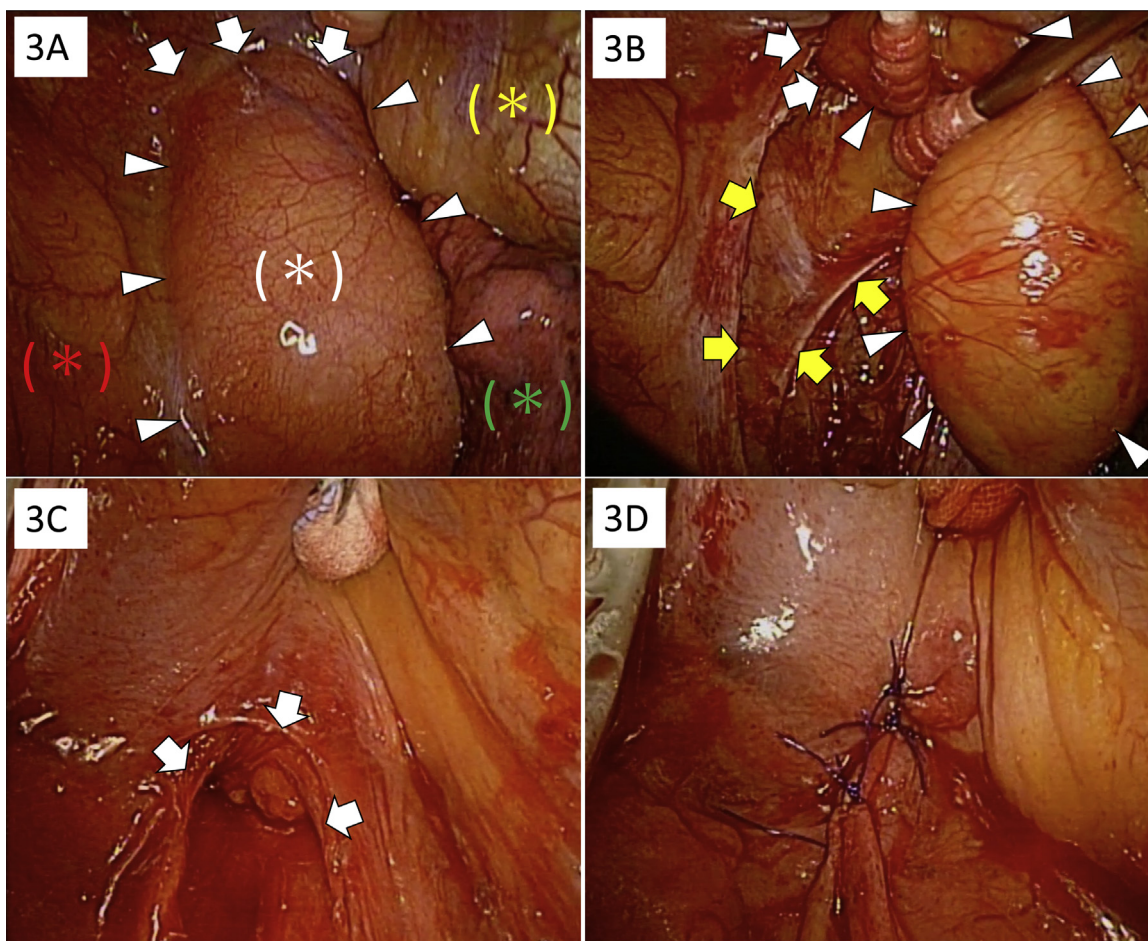


**Fig. 2.** Preoperative CT images showing hernia components (red arrows) and the hernial orifice (yellow arrows). A) and B) Sagittal CT images: mediastinal (A) and pulmonary (B) window settings, respectively. C) Coronal CT image: pulmonary window setting. D), E) and F) Axial CT images: mediastinal (D and F) and pulmonary window (E) settings.

the diaphragm by direct suturing. Thoracic surgery specialist performed the procedure, and the procedure took 152 min and there was no significant blood loss, and it was a treatable surgical treatment for him. The postoperative course was uneventful and the patient was discharged 11 days after the procedure. Pathologic examination of the excised tissue showed benign matured fatty tissue. There was no evidence of recurrence on chest CT examination at five months after the procedure.

### 3. Discussion

BH, a type of diaphragmatic hernias, occurs as a result of congenital failure of fusion of the posterolateral muscular portion of the diaphragm [1]. It was first described in 1848 by Bochdalek [4]. Almost all BHs occur in the neonatal period; however, 5% occurs in adults [1]. BHs in adults are likely caused by increased intraabdominal pressure as a result of obesity [5], trauma [6] or pregnancy [7].



**Fig. 3.** Thoracoscopic views of left chest cavity.

**A)** Abdominal tissue (white arrows) covered with parietal pleura (white asterisk) has herniated into the extra-pleural cavity through a left posterolateral diaphragmatic defect (white arrow heads). The hernia components are surrounded by the left diaphragm (yellow asterisk), left lower lobe (green asterisk), and vertebral body (red asterisk). **B)** The thoracoscopic findings after dissection of the pleural membrane (yellow arrows) showing a 5 cm that the hernia orifice (white arrows) and fatty tissue (white arrow heads). **C)** The hernial orifice (white arrows) was about 2 cm in size after resection of the retroperitoneal fatty tissue. **D)** Thoracoscopic findings after repair of BH by direct suturing.

Our patient’s weight had increased in recent years, likely causing his BH.

BH presents in adults with abdominal symptoms or respiratory symptoms in 40% and 27% of cases, respectively [7]; however, 16% of patients are asymptomatic the diagnosis is made incidentally by radiological examination [7]. CT scanning is the best definitive means of directly visualizing the hernia contents and orifice [8].

Surgery is indicated for adult BH because of the possibility of incarceration of the hernia and subsequent life-threatening complications such as peritonitis [9] or pancreatitis [10]. Several organs, including the colon, small intestines, liver, kidney, gall bladder, spleen, pancreas, stomach, appendix and omentum have been reported to herniate [11]. In particular, strangulation of the stomach (39%), colon (33%) or small bowel (28%) has been reported [7]. We therefore consider that surgical repair is indicated for both asymptomatic progressive BH and symptomatic BH. Most asymptomatic BHs contains only retroperitoneal fatty tissue [12,5]. However, high-grade renal obstruction reportedly occurs consequent to herniation of retroperitoneal fatty tissue in some cases [13,14]. Our patient’s BH had been progressing for some years.

Various approaches are possible, including transabdominal, transthoracic, and combined thoracoabdominal routes, each of which have advantages and disadvantages. Laparotomy is preferred in emergency cases [15], having the advantage of not only enabling reducing the hernia contents back into the abdominal cavity, but

also enabling management of complications such as obstruction, strangulation and perforation [7]. In contrast, the advantages of the transthoracic approach include direct observation and the convenience of dissecting adhesions between the pleura and hernia contents [7]. One remarkable advantage in our case was that it was very easy to dissect the adhesions between the fatty tissue and parietal pleura and repair the small diaphragmatic defect by direct suturing under VATS. Use of mesh graft may be indicated when the defect is  $\geq 5$  cm in size [16]. In our case, incarceration into the extra-pleural space had not been identified preoperatively. Dissection of the parietal pleura and repair of a BH is considered difficult via a transabdominal approach. To the best of our knowledge, there have been no reports of BHs being incarcerated in the extra-pleural space; thus, our case is extremely rare.

We achieved primary closure of the diaphragmatic defect by thoracoscopic surgery alone.

**Declaration of Competing Interest**

All authors declare no conflicts of interests or disclosures.

**Funding**

This work received no funding.

## Ethical approval

The present study was conducted in accordance with the ethical standards of our institution.

## Consent

Informed consent was obtained from the patient for publication of this case report and the accompanying images.

## Author contribution

AH wrote the manuscript. HK, AO, TH, TS, MK and KS supported in the writing of the manuscript. All authors read and approved the final manuscript.

## Registration of research studies

The name of my UIN is researchrestry5604.

## Guarantor

Akira Haro.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

## Acknowledgement

We thank Dr. Trish Reynolds, MBBS, FRACP, from Edanz Group ([www.edanzediting.com/ac](http://www.edanzediting.com/ac)) for editing a draft of this manuscript.

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