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# Hybrid approach with composite mesh repair of a massive right-sided congenital Bochdalek's hernia in an adult: A case report

**Prem M. Shah[1], Akshat K. Vadaliya[2], Haryax V. Pathak[2]**

**Abstract**

Congenital diaphragmatic hernia (CDH) is a rare developmental anomaly typically observed in neonates but can occasionally present in adults. CDH results from incomplete diaphragm development, leading to herniation of abdominal organs into the thoracic cavity, causing respiratory and gastrointestinal issues. This report discusses a 23-year-old male diagnosed with a right-sided congenital Bochdalek's hernia. The patient presented with generalized abdominal pain, nausea, and respiratory symptoms. Imaging revealed a significant right diaphragmatic defect with herniation of multiple abdominal organs into the thoracic cavity. Initial laparoscopic attempts to reduce the hernia were unsuccessful due to dense adhesions, necessitating an open surgical approach. The herniated organs were reduced, and the diaphragmatic defect was repaired using non-absorbable sutures and a composite mesh. Postoperative recovery was complicated by transient abdominal compartment syndrome, which was managed conservatively. The patient recovered well and remained symptom-free during the 6-month follow-up period.

**Keywords:**

Bochdalek's hernia, composite mesh repair, congenital diaphragmatic hernia, hernia

## Introduction

Congenital diaphragmatic hernia (CDH) is a rare developmental anomaly, which is usually noted in neonatal or pediatric age groups. Very rarely, they may remain asymptomatic and present in adults. It occurs due to faulty or incomplete development of the diaphragm, leaving a defect that permits herniation of abdominal contents into the thoracic cavity, leading to a range of respiratory and gastrointestinal troubles for the patient. CDHs are classified into Bochdalek's (posterolateral, left > right), Morgagni (anteromedial), and hiatal (acquired > congenital).[1]

We present here a case of a 23-year-old male with a congenital Bochdalek's hernia with herniation of multiple abdominal viscera into the abdominal cavity.

## Case History

A 23-year-old male presented with a complaint of generalized, progressive abdominal pain for 10 days, associated with nausea for 3 days. The patient also complained of breathing difficulty, a burning sensation in the upper abdomen and chest, and regurgitation of ingested food contents on lying down. He had no history of vomiting or constipation. Upon examination, the patient's abdomen was flat, with no palpable mass or organomegaly and no tenderness. Digital rectal examination was normal. Respiratory system examination revealed severely reduced breath sounds on the right-side. The patient was hemodynamically

*[1]Department of Gastrointestinal Surgery, [2]Department of General Surgery, Shree Krishna Hospital and Pramukh Swami Medical College, Bhaikaka University, Karamsad, Anand, Gujarat, India*

**Address for correspondence:**
Dr. Haryax V. Pathak, Department of General Surgery, Shree Krishna Hospital and Pramukh Swami Medical College, Gokalnagar, Karamsad, Anand 388325, Gujarat, India.
E-mail: haryax0909@gmail.com

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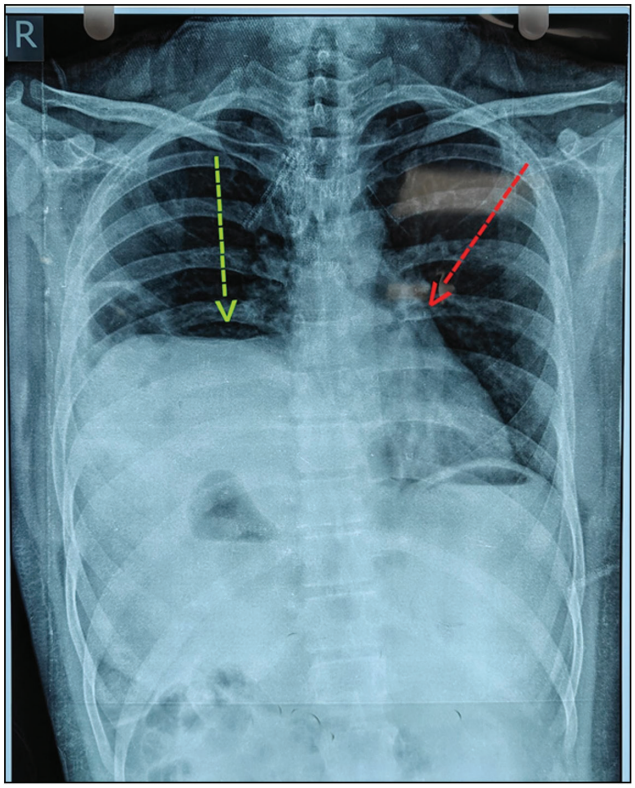


**Figure 1:** Chest radiograph showing elevated right hemi-diaphragm (green arrow) and mediastinal shift toward left (red arrow)

**Figure 2:** Computed tomography scan – coronal view – showing massive right-sided diaphragmatic hernia, with atelectasis of the right lung and shift of heart to the left

stable with a heart rate of 88/min, blood pressure of 126/78 mmHg, respiratory rate of 20/min, and maintaining oxygen saturation of 98% on room air, having a body mass index of 23.43 kg/m$^2$.

A chest radiograph was performed – Figure 1 – which showed a significantly elevated right hemi-diaphragm (green arrow) and a mediastinal shift toward the left side (red arrow). Abdominal ultrasound revealed the presence of liver and large bowel loops in the right mid-thoracic region, following which the patient underwent a contrast-enhanced computed tomography (CECT) scan of the abdomen and thorax. CECT was suggestive of a large defect at the right diaphragm measuring 9.6 cm. The gastro-esophageal junction was noted below the diaphragm, with herniation of the liver, gall bladder, antrum and pylorus of the stomach, 1st part of the duodenum, part of the ascending colon, hepatic flexure, and part of the transverse colon into the right hemi-thorax. There was a shift of the heart toward the left side, associated with passive plate atelectasis noted at the upper and lower lobe of the right lung, as shown in Figure 2.

The patient was diagnosed as having a congenital right-sided Bochdalek's hernia and was taken up for surgery.

An initial laparoscopic assessment was performed, and an attempt was made to reduce the contents laparoscopically. The complete liver, gall bladder, parts of ascending and transverse colon, part of the duodenum, antrum and pylorus of the stomach, and omentum were found to be herniating through the defect into the right thoracic cavity. The liver could not be reduced into the abdominal cavity, because of dense adhesions of the liver with the thoracic wall. A right-side thoracoscopy was performed [Figure 3] which showed the right lobe of the liver (black arrow) and the gall bladder (green arrow) in the right thoracic cavity, densely adherent. The right lung was also noted to be severely hypoplastic but viable, requiring one-lung ventilation for a substantial duration during the surgery. The decision was taken for open diaphragmatic hernia reduction and repair. A laparotomy was performed, and a large defect was found over the right dome of the diaphragm, as seen in Figure 4D. The duodenum, liver and gall bladder, and porta hepatis were visualized in the right thoracic cavity, as seen in Figure 4A–C. The right lobe of the liver was freed from the thoracic cavity by blunt dissection. All herniated organs were reduced into the abdominal cavity, and the margins of the defect were then visualized clearly. Figure 5 shows the liver reduced into the abdominal cavity (green arrow) and the right diaphragmatic defect measuring 15 × 10 cm in size (black arrow). The inferior edge of the

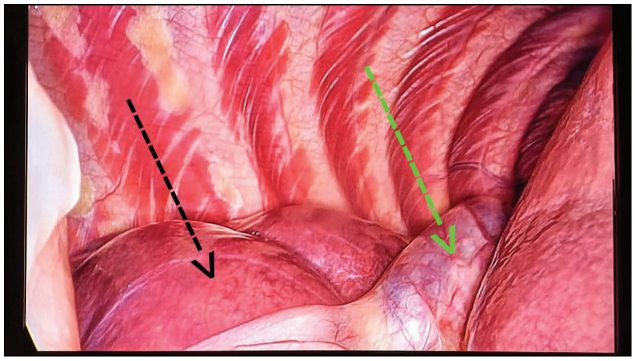

**Figure 3:** Right-sided thoracoscopic image showing complete liver (black arrow) and gall bladder (green arrow) in the right thoracic cavity

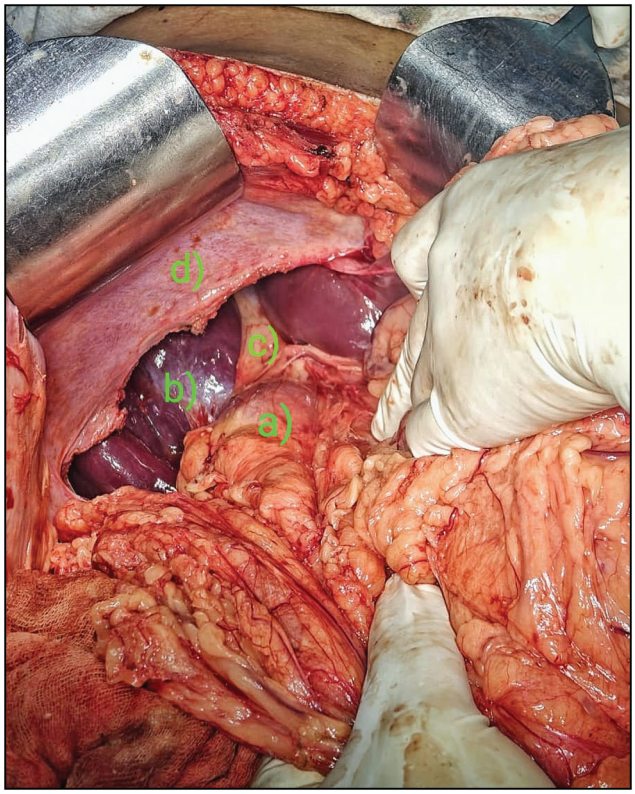


**Figure 4:** Laparotomy – abdominal approach – visualization of A duodenum, B liver, C porta hepatitis herniating in the right thoracic cavity, and D large right-sided posterolateral diaphragmatic defect

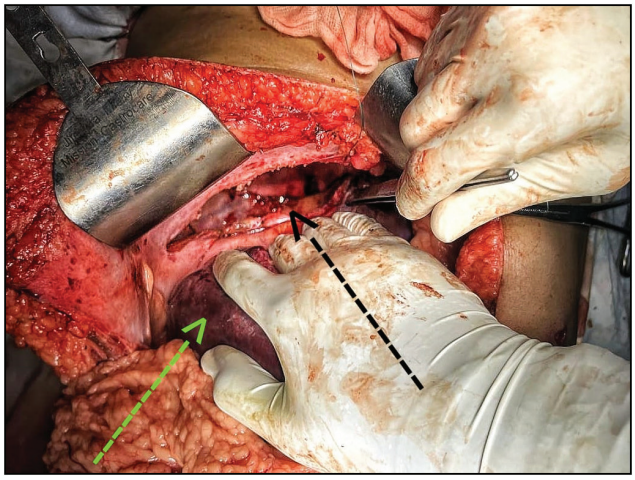

**Figure 5:** All contents reduced into the abdominal cavity, (green arrow – liver), and a clearly defined defect measuring 15 cm × 10 cm (black arrow)

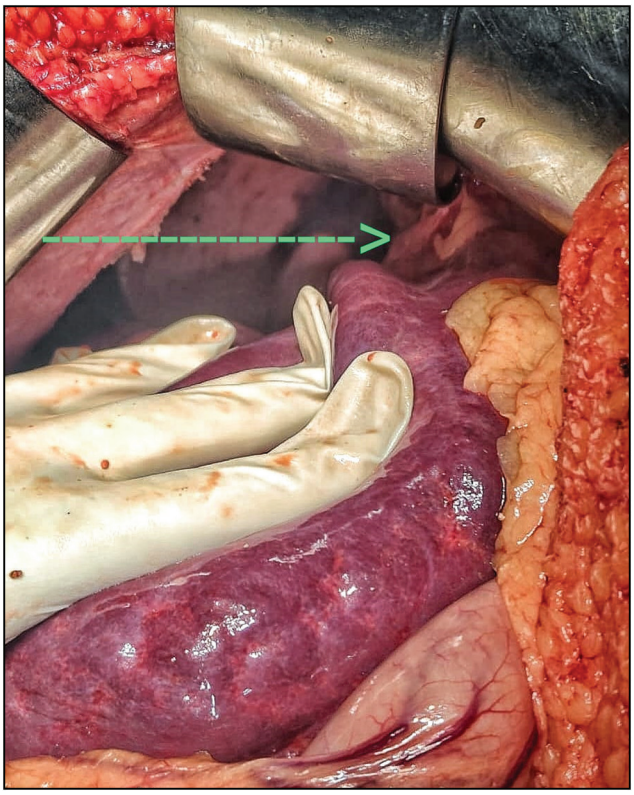

**Figure 6:** Medial margin of diaphragmatic defect formed by hepatic vein (green arrow), just adjacent to the IVC

defect was formed by the postero-superior aspect of the liver, bound medially by the hepatic veins and inferior vena cava (IVC), shown by the green arrow in Figure 6. The inferior edge was freed with from the structures taking extreme care to prevent any injury to the hepatic vein or IVC. The diaphragmatic defect was repaired primarily using non-absorbable sutures [Figure 7], and a 20 cm × 15 cm composite mesh with a collagen biofilm was placed over the defect, on the abdominal side [Figure 8]. An intercostal drainage tube was also placed in the right chest cavity.

The decision was made to go for an open approach via laparotomy instead of thoracotomy for multiple reasons: (a) greater exposure and field available for surgery, (b) to ensure proper anatomical reduction of the herniated viscera and once reduced, to evaluate them for signs of injury, (c) simultaneous thoracoscopic view of the right hemi-thorax was used for guiding the dissection, (d) repair of the diaphragmatic defect with a mesh from the abdominal

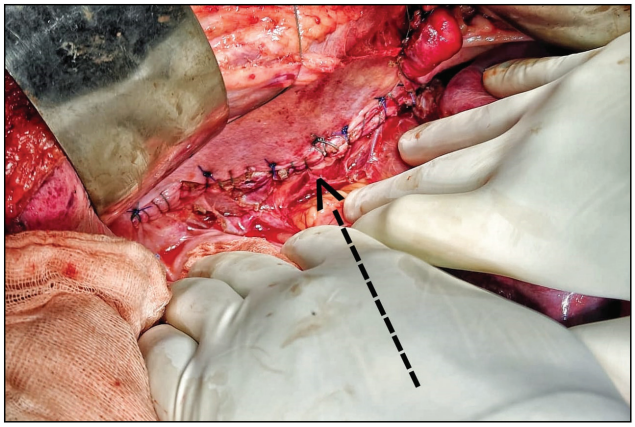

**Figure 7:** Primary repair of diaphragmatic defect using non-absorbable coated synthetic polyester sutures and non-absorbable polypropylene sutures (black arrow)

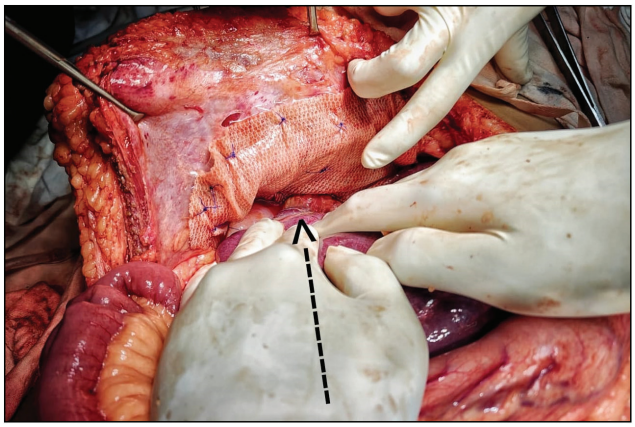

**Figure 8:** Reinforcement using a composite mesh with collage biofilm (black arrow)

side was technically easier and afforded broader placement of the composite mesh.

The complete procedure lasted for approximately 4 h. Following surgery, the patient developed transient abdominal compartment syndrome over the next 4–5 days, as evidenced clinically by with a significant reduction in urine output, sluggish bowel peristalsis and prolonged abdominal distension. Intra-abdominal pressure was not measured at the time. Conservative management was initiated with guarded fluid administration and daily monitoring, leading to subsequent resolution of abdominal compartment syndrome.

The patient made an uneventful recovery and exhibited no distressing signs on subsequent follow-up visits over a 6-month period.

## Discussion

CDHs are classified based on the anatomical location of the hernial defect. A Morgagni hernia is present on the anteromedial aspect of the diaphragm, making up 2%–5% of all CDHs, and is extremely rare in adults. A Bochdalek hernia is located on the posterolateral aspect of the diaphragm and is the most common type of CDH in neonates, but are equally rare in adults, with a prevalence of 0.5% in adults, occurring more on the left rather than the right-side, making right-sided Bochdalek hernias even rarer. A hiatal hernia occurs at the esophageal hiatus, with the herniation of the gastro-esophageal junction, more commonly seen in adults, usually asymptomatic. When symptomatic, patients present with features of gastro-esophageal reflux disease like regurgitation, heartburn, or dysphagia.[1-4]

CDHs may present at any time in adulthood, with nonspecific symptoms like reflux, regurgitation, dysphagia, breathing difficulties, or abdominal pain. Diagnosis is usually established on radiology, like chest radiographs, abdominal ultrasonography, or CT scans of the thorax and abdomen. Management is usually surgical, requiring reduction of herniated contents and repair of the hernial defect. A mesh may be placed for reinforcement and prevention of recurrence.

Al-Zayer *et al*.[5] report a case of a 27-year-old female with suspected pulmonary embolism following a cesarean section, diagnosed with a right-sided Bochdalek hernia, which was repaired via a right lateral thoracotomy with the use of a mesh. Rathod *et al*.[6] report another case with herniation of the liver into the right thoracic cavity, repaired with a right posterolateral thoracotomy and mesh placement. Ramspott *et al*.[7] describe the management of a complicated Bochdalek hernia due to intrathoracic bowel perforation. In another report, Paltaci *et al*.[8] talk of a patient presenting with ileus, due to a left-sided Bochdalek hernia, managed with a laparotomy and primary repair of the defect. Jawade *et al*.[9] also report of an adult right-sided Bochdalek hernia with a mere chronic cough, managed with a hybrid approach of a laparoscopic converted to open primary repair. Predescu *et al*.[10] report the presentation and management of a comprehensive series of 18 cases of adult non-hiatal diaphragmatic hernias, including acquired or post-traumatic hernias and report a variety of management methods like transthoracic or transabdominal open or minimally invasive techniques, or hybrid techniques or even endoscopic methods. In our case, we adopted a hybrid method, using a laparoscopic approach, followed by a thoracoscopy, and eventually an open abdominal laparotomy.

CDHs may have varying presentations in adults and at times, may even be complicated by afflictions of the herniated contents, requiring extensive surgical exploration and prolonged supportive care. Timely diagnosis and intervention can greatly improve patient outcomes.

## Author contribution

We certify that we have participated sufficientiy in the intellectual content, conception and design of this work or the analysis and interpretation of the data (when applicable), as well as the writing of the manuscript, to take public responsibility for it and have agreed to have our name listed as a contributor.

## Ethical policy and Institutional Review Board statement

Nil.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

## Acknowledgments

Nil.

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