



## **CT Findings of Incarcerated Diaphragmatic Hernia After Laparoscopic Roux-en-Y Gastric Bypass: A Rare Case Report**

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**Abstract**

**Background:** Diaphragmatic hernia following laparoscopic Roux-en-Y gastric bypass (LRYGB) is a rare but life-threatening complication. Diagnosis is challenging due to non-specific symptoms, and delayed recognition may result in intestinal incarceration, strangulation, ischemia, and respiratory compromise. Computed tomography (CT) is the primary imaging modality for timely diagnosis and surgical planning.

**Objective:** To report a case of incarcerated diaphragmatic hernia following LRYGB, highlighting the CT imaging findings, postoperative radiological follow-up, and the role of multidisciplinary management.

**Methods:** Case report following CARE guidelines. Clinical, laboratory, and radiological data were obtained retrospectively from the medical record of a patient treated at Bali Hospital in April–May 2024. Imaging evaluation included non-contrast abdominal CT, serial chest radiographs, and postoperative thoracoabdominal CT.

**Results:** A 59-year-old woman with a history of LRYGB (2019) developed acute epigastric pain and vomiting during hospitalization. Non-contrast CT revealed extensive herniation of the stomach, jejunum, ileum, mesenteric fat, and part of the spleen through the esophageal hiatus into the right hemithorax, resulting in significant pulmonary compression, leftward mediastinal shift, and obstructive ileus with suspected intestinal ischemia. Emergency laparotomy confirmed these findings, revealing dense adhesions. Postoperatively, CT demonstrated hemopneumothorax and bilateral pleural effusion, which were managed with chest drainage and video-assisted thoracoscopic surgery (VATS). Serial imaging confirmed successful hernia repair with no recurrence.

**Conclusion:** Multidetector CT with multiplanar reconstruction is essential for rapid diagnosis, operative planning, and postoperative monitoring of incarcerated post-LRYGB diaphragmatic hernia. A multidisciplinary radiological-surgical approach is critical for optimal outcomes in this rare emergency.

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### **INTRODUCTION**

Diaphragmatic hernia is a condition characterized by abnormal protrusion of intraabdominal visceral organs through a defect in the diaphragm into the thoracic cavity, which can interfere with the function of the respiratory and gastrointestinal systems. Diaphragmatic hernias can be congenital or acquired. Although the acquired type is most often related to trauma, surgical procedures on the upper abdomen are now increasingly recognized as a predisposing factor (Giuffrida et al., 2023; Spellar et al., 2025). Laparoscopic Roux-en-Y gastric bypass (Roux-627 | Glosains: Jurnal Sains Global Indonesia

en-Y) is one of the most frequently performed bariatric procedures in the world, but diaphragmatic hernias as a postoperative complication remain very rare. When they occur, diagnosis is often delayed because the symptoms are non-specific and overlap with other postoperative complications ([Abdelsalam et al., 2025](#); [Garcia et al., 2022](#)).

Diaphragmatic hernia following Roux-en-Y gastric bypass is exceedingly rare, with a reported incidence of approximately 0.1–0.2% of all LRYGB procedures in published case series ([Garcia et al., 2022](#); [Hany et al., 2022](#)). As bariatric surgery volumes continue to rise globally — with over 250,000 LRYGB procedures performed annually in the United States alone (American Society for Metabolic and Bariatric Surgery, 2022) even a 0.1% complication rate translates to a clinically significant absolute number of cases. The existing evidence base for this condition is limited to isolated case reports and small case series, with no large prospective studies available. This limits evidence-based guidelines for screening, diagnosis, and management. The current report therefore contributes to the growing but still sparse body of case evidence on this condition, with relevance for centers performing high volumes of bariatric procedures.

Most complications reported after Roux-en-Y gastric bypass include anastomotic leak, internal hernia, and small bowel obstruction, while diaphragmatic defects are a rarer finding ([Strong & Guerrón, 2022](#); [Trejo et al., 2024](#)). Computed tomography (CT) is the main modality in the evaluation of postoperative gastrointestinal complaints because it provides detailed visualization of the abdominal and lower thoracic structures simultaneously. CT plays an important role in identifying herniated organs, the size and characteristics of diaphragmatic defects, as well as associated findings such as obstruction or ischemia ([Chaturvedi et al., 2018](#); [Hassankhani et al., 2023](#)). Early radiological detection is crucial because delayed diagnosis is associated with increased morbidity due to incarceration, strangulation, and the possibility of visceral ischemia ([Kimario et al., 2025](#)).

The initial presentation of this patient was for an entirely different condition (bilateral chronic venous insufficiency requiring vascular surgery). The development of incarcerated diaphragmatic hernia was an unexpected inpatient event, highlighting that patients with a history of bariatric surgery carry ongoing risk for rare complications even years after the initial procedure. This case underscores the importance of including surgical history particularly prior bariatric procedures in the differential diagnosis of any acute abdominal or thoracic event. The 24-hour delay between onset of acute epigastric pain (April 27) and CT acquisition (April 28) in this case illustrates the real-world diagnostic challenge.

Clinical examination alone did not establish the diagnosis; CT was essential. Any further delay could have resulted in complete intestinal ischemia and perforation. This reinforces the message that CT should be obtained urgently without delay in post-bariatric patients presenting with acute abdominal symptoms. Optimal management of this case required coordinated involvement of internal medicine (initial admission), radiology (CT interpretation and serial imaging), general surgery (emergency laparotomy), thoracic surgery (VATS), and intensive care (postoperative monitoring). The absence of any one of these specialties could have altered the outcome. This case exemplifies the multidisciplinary model required for rare, complex post-surgical emergencies.

Reports in the literature show that postoperative diaphragmatic hernias after Roux-en-Y gastric bypass can occur through hiatal or para-hiatal defects, with hernia contents including the stomach, small intestine, omentum, or mesenteric fat. The defect can be detected incidentally or only discovered when the patient presents with acute symptoms due to obstruction ([Spellar et al., 2025](#); [Hany et al., 2022](#)). This variability of clinical manifestations confirms the importance of high clinical and radiological vigilance in post-LRYGB patients with abdominal or thoracic complaints. Worrisome radiological signs of incarceration and ischemia require immediate surgical intervention to prevent fatal outcomes ([Abdelsalam et al., 2025](#); [Garcia et al., 2022](#)).

Although rare, iatrogenic diaphragmatic hernias after bariatric or other abdominal surgery can be life-threatening and require prompt treatment. A number of case reports describe diaphragmatic hernias that appear years after the initial procedure, often preceded by vague complaints before progressing to an acute condition ([Jin et al., 2025](#)). Modern imaging modalities, particularly multidetector CT, have improved the ability to detect and characterize these hernias and influence early surgical decision-making. Therefore, radiology plays a central role not only in

diagnosis but also in surgical planning and postoperative evaluation ([Mishra et al., 2025](#); [Hassankhani et al., 2023](#)).

Garcia ([2022](#)) in a study in *Cureus* reported incarcerated diaphragmatic hernias post-LRYGB in two patients; both presented with epigastric pain and vomiting (consistent with our case). CT in their series showed herniation of gastric and intestinal contents. However, their report did not document the extent of thoracic involvement (mediastinal shift, pulmonary compression) seen in our case, nor did they present postoperative CT follow-up. Management was open or laparoscopic repair; no VATS was required. Abdelsalam ([2025](#)) in a study in *Obesity Surgery* reported a strangulated diaphragmatic hernia post-LRYGB with frank bowel ischemia. While highlighting surgical pitfalls, this case did not present comprehensive CT imaging analysis. Their case involved intestinal resection, suggesting a more advanced ischemic stage at the time of surgery compared to our case, where organ viability was maintained.

Hany ([2022](#)) in a study in *Obesity Surgery* reported an acute paraesophageal hernia after sleeve gastrectomy, a related but distinct procedure, with CT showing herniation through a paraesophageal defect. The post-LRYGB mechanism differs anatomically (hiatal vs paraesophageal defect), making direct comparison limited. Despite growing recognition of this complication, systematic documentation of comprehensive CT findings encompassing both preoperative characterization and serial postoperative imaging remains limited in the literature. Most published cases focus on either clinical management or a single imaging time point. This report fills this gap by documenting the complete radiological course, from emergency diagnosis through postoperative complication management.

In addition to detecting herniated viscera, CT can also show indirect signs of perfusion disorders, such as intestinal wall thickening, increased mesenteric fat density, and signs of obstruction in the form of intestinal dilatation with air–fluid levels ([Mishra et al., 2025](#)). These radiological findings correlate closely with intraoperative findings and help surgeons anticipate the degree of adhesion as well as possible ischemic injury. Structured CT reporting, including diaphragm integrity assessment and accompanying thoracic findings, can improve diagnostic accuracy and accelerate clinical decision-making. The use of multiplanar reconstruction also further increases the sensitivity of CT in detecting these abnormalities ([Monica et al., 2019](#); [Ederveen et al., 2020](#)).

As the number of patients undergoing bariatric surgery increases and life expectancy improves after successful weight loss, rare complications such as diaphragmatic hernias are expected to become more common. An understanding of the spectrum of imaging findings and their correlation with clinical manifestations allows for earlier surgical referral and reduces the risk of morbidity due to delayed treatment. Therefore, comprehensive radiological evaluation is essential in post-bariatric patients who present with abdominal pain, vomiting, or respiratory symptoms. A multidisciplinary approach between surgeons and radiologists improves clinical outcomes in complex cases such as post-LRYGB diaphragmatic herniation ([Çankal et al., 2022](#)).

This case report aims to document the clinical presentation, multidetector CT imaging findings, surgical management, and serial postoperative radiological follow-up of a rare case of incarcerated diaphragmatic hernia following laparoscopic Roux-en-Y gastric bypass, with specific emphasis on the central role of CT in guiding emergency surgical decision-making. The CT findings in this case directly determined operative strategy, confirming the extent of herniation, anticipating adhesion density, and ruling out perforation preoperatively.

This case report presents the following novel contributions to the literature on post-LRYGB diaphragmatic hernia: (1) CT documentation of simultaneous herniation of the stomach, multiple intestinal segments, mesenteric fat tissue, and partial spleen, a combination more extensive than described in most prior reports, representing a full spectrum of multi-organ thoracic herniation; (2) visualization of mediastinal shift with leftward cardiac displacement on CT, demonstrating the hemodynamic risk potential of large-volume herniation through quantifiable radiological signs; (3) comprehensive serial postoperative imaging documentation showing the development and resolution of hemopneumothorax, bilateral pleural effusion, and right lower lobe atelectasis following emergency laparotomy and subsequent VATS with mesh

repair, providing a complete radiological atlas of this complication's postoperative course.

## METHOD

This study is explicitly designed as a single case report following the CARE (Case Report) guideline (Riley et al., 2017), which provides a structured framework for individual patient case reporting. Clinical and radiological data were obtained retrospectively from the medical record of a single patient during the period of clinical care. The study is not classified as observational research because it does not enroll a sample, does not compare groups, and does not calculate population-level measures. It is a descriptive documentation of one patient's clinical and radiological course, supplemented by a narrative literature review to contextualize the findings.

Data were obtained retrospectively from the medical records of a patient treated in a hospital, including clinical data, laboratory test results, and radiological findings in the form of CT scans and chest radiographs. Data collection was carried out through review of documentation during patient care as well as extraction of results from supporting examinations performed before and after operative procedures. Clinical data collected include admission vital signs, symptom progression timeline, physical examination findings, laboratory results (CBC, metabolic panel, coagulation profile), and operative notes. All data were extracted from the patient's electronic medical record at Bali Hospital.

Radiological data include: (1) Non-contrast thoracoabdominal CT scan (April 28, 2024) evaluated on axial, coronal, and sagittal multiplanar reconstructions for diaphragmatic defect location, identification of herniated organs, signs of obstruction, signs of vascular compromise, and thoracic complications; (2) Preoperative chest radiograph (April 28, 2024) evaluated for mediastinal position, hemidiaphragm contour, and air-fluid levels; (3) Postoperative chest radiograph (April 29, 2024) evaluated for pneumothorax and pleural effusion; (4) Postoperative thoracoabdominal CT scan (May 3, 2024) evaluated for residual pneumothorax, pleural effusion, pulmonary re-expansion, and absence of re-herniation; (5) Serial chest radiographs through mid-May 2024 evaluated for progressive pulmonary improvement.

The analysis was carried out descriptively by examining clinical and radiological findings and then comparing them with relevant scientific literature to strengthen the interpretation and discussion of the case. In addition, a literature review was conducted using recent scientific journal sources to support the explanation of the pathophysiology, diagnosis, and management of diaphragmatic hernia after bariatric surgery. All data used in this report have been kept confidential in accordance with research ethics principles.

## RESULTS AND DISCUSSION

### Results

This case exhibits several features that distinguish it from previously reported post-LRYGB diaphragmatic hernias. While Garcia (2022) documented incarcerated post-LRYGB hernias with gastric and intestinal herniation, the CT in our case revealed a more extensive herniation pattern involving the stomach, multiple intestinal segments, mesenteric fat, and partial spleen — a multi-organ thoracic displacement not commonly described. Unlike Abdelsalam (2025), who reported frank bowel ischemia requiring intestinal resection, our case showed CT signs of vascular compromise (intestinal wall thickening, increased mesenteric fat density) without intraoperative evidence of irreversible ischemia — suggesting that the 24-hour diagnostic window, although delayed, was still within the therapeutic threshold for organ preservation. The development of hemopneumothorax as an immediate postoperative complication, documented radiologically and managed with VATS, has not been systematically reported in the post-LRYGB hernia literature, representing an additional contribution of this case. The mediastinal shift with leftward cardiac displacement visible on CT demonstrates that large-volume herniation through the hiatus can produce tension physiology analogous to tension pneumothorax, with potential hemodynamic consequences. Recognition of this CT pattern should prompt immediate surgical consultation.

### Case Report

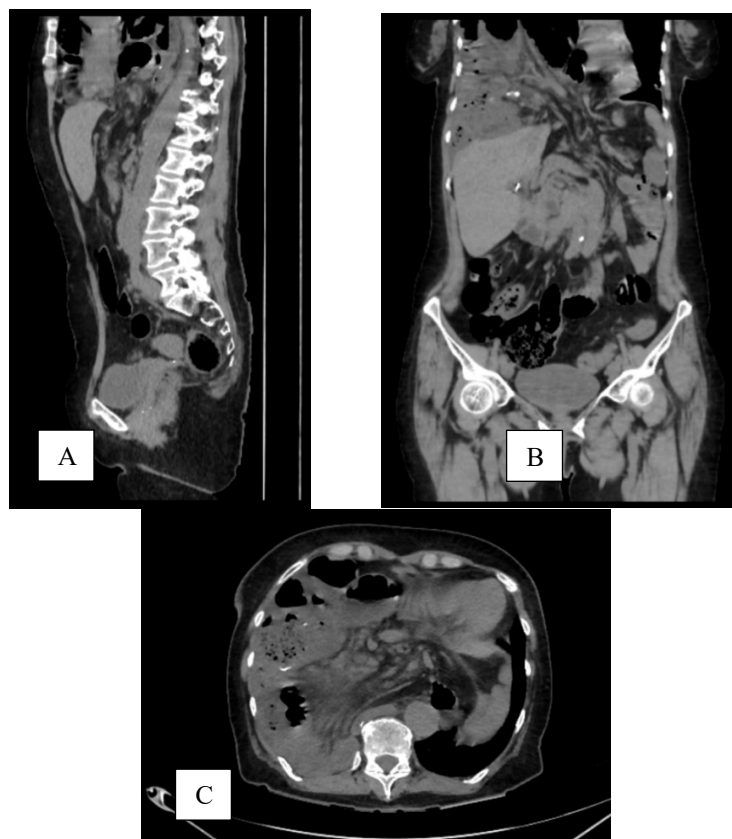
A 59-year-old woman was initially treated at Bali Hospital on April 26, 2024, with the main

complaint of pain and swelling in both lower legs, accompanied by limited walking. The patient has a history of bilateral grade III–IV chronic venous insufficiency (CVI) and was planned to undergo vascular surgery. There was no history of other systemic diseases, but the patient had a history of laparoscopic Roux-en-Y gastric bypass (LRYGB) in 2019. The patient has no history of drug allergies and routinely takes iron supplements due to anemia.

At the time of hospital admission, the patient was fully conscious and hemodynamically stable, with a blood pressure of 112/78 mmHg, a pulse rate of 101 beats per minute, a respiratory rate of 18 breaths per minute, a temperature of 37.4°C, and oxygen saturation of 99% on room air. Physical examination was within normal limits, except for edema in both lower extremities. Doppler ultrasound of the leg veins showed bilateral chronic venous insufficiency with no evidence of deep or superficial venous thrombosis. Preliminary laboratory examination showed mild normocytic, normochromic anemia with hemoglobin of 10.6 g/dL, while renal and electrolyte function were within normal limits.

During treatment in the ward, on April 27, 2024, the patient suddenly experienced severe pain in the epigastric region accompanied by recurrent vomiting. Vital signs showed an increase in blood pressure up to 160/106 mmHg with a pulse rate of 103 beats per minute. Abdominal examination revealed tenderness in the epigastric region without signs of peritonitis. Given the history of gastric bypass surgery, on April 28, 2024, the patient underwent further evaluation with a non-contrast CT scan of the abdomen.

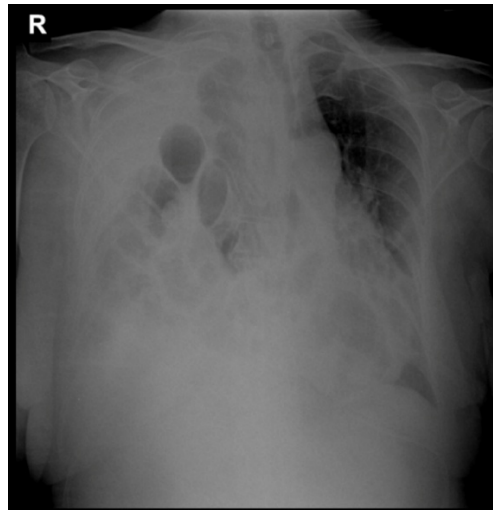
CT scan showed the presence of a diaphragmatic defect in the esophageal hiatus region with a large herniation of intra-abdominal organs into the right hemithoracic cavity. Within the thoracic cavity, the stomach, jejunal and ileal segments, and mesenteric fat tissue were visible, along with clear visualization of the gastrojejunostomy anastomosis and Roux-en-Y jejunojejunostomy, as well as surgical clips. These findings confirm that the herniated structures originated from the post-bypass gastrointestinal tract. This herniated mass caused significant compression of the right lung and a shift of the mediastinum, including the heart, to the left.



**Figure 1.** CT scan of thoracoabdominal without preoperative contrast (A) sagittal cut (B) coronal cut (C) axial

In addition, there was a dilation of the proximal small intestine with *multiple air–fluid levels*, consistent with obstructive ileus due to hernia incarceration. Trapped segments of the intestine show thickening of the walls and increased density of mesenteric fatty tissue, leading to vascular congestion and suspicion of intestinal ischemia. No signs of pneumoperitoneum were found in the results of the supporting examination. In the thoracic cavity, mild to moderate right pleural effusion is also seen, which is suspected to be the result of herniation and pleural irritation.

Preoperative thoracic imaging showed heterogeneous opacity of air and soft tissue in the right hemithorax resembling an intestinal image, accompanied by the loss of the normal contour of the right hemidiaphragm and a deviation of the mediastinum to the left, which reinforced the CT findings regarding abdominal visceral herniation into the thoracic cavity.



**Figure 2.** Preoperative thoracic photo

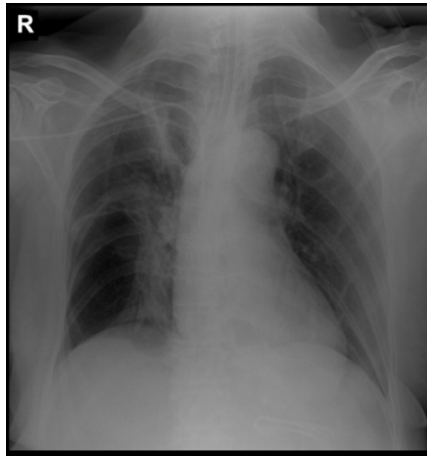
Based on the clinical and radiological findings, the patient was immediately transferred to the intensive care unit and underwent an emergency exploratory laparotomy on April 28, 2024. Intraoperatively it was found that extensive herniation of the stomach, jejunum, most of the small intestine, and part of the spleen into the thoracic cavity was found through diaphragmatic defects with heavy adhesions. Organ repositioning to the abdominal cavity, adhesiolysis, closure of diaphragmatic defects (*cruroplasty*), and fundoplication, as well as appendectomy due to acute appendicitis was found.



**Figure 3.** Intraoperative clinical findings

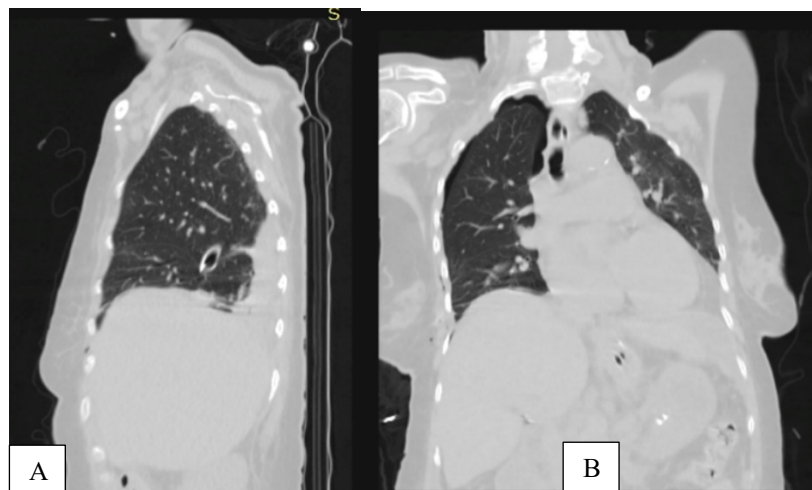
Postoperatively, radiological evaluation shows thoracic complications. Thoracic photos on April 29, 2024 show right hemopneumothorax, characterized by a visceral pleural line with a

peripheral hyperlucent area and fluid opacity at the base of the lungs, so a *drainage water seal* was installed. Evaluation of thoracic CT scans on May 3, 2024 showed bilateral pleural effusion, residual right pneumothorax, and atelectasis of the right pulmonary medialis lobe, with no evidence of re-herniation of the intraabdominal organs. These findings signal significant postoperative thoracopulmonary complications.



**Image 4.** Postoperative thoracic photo

On May 4, 2024, *video-assisted thoracoscopic surgery* (VATS) sinistra and extra milisthorachotomy were performed, which included fluid and blood evacuation, lung tear repair, and diaphragm repair with *mesh installation*. Thoracic photographs and post-operative thoracic CT scans show improved lung re-expansion, reduced pneumothorax and pleural effusion, as well as apparent mesh and surgical clips on the hemidiaphragm, with no signs of re-herniation. At the next serial radiological examination until mid-May 2024, the position of the diaphragm remained stable and there was no recurrent hernia. The lungs show good re-expansion with minimal pleural effusion remaining.





**Figure 5.** CT scan of thoracoabdominal without postoperative contrast (A) sagittal cut *Lung Window* (B) Colonel Cut *Lung Window* (C) Coronal Cut *soft tissue window*

## Discussion

The development of diaphragmatic hernia following LRYGB is attributed to several post-surgical factors that weaken the esophageal hiatus and surrounding diaphragmatic crura: (1) creation of the gastrojejunal anastomosis near the hiatus may alter the supporting structures of the hiatal ring; (2) creation of pneumoperitoneum during laparoscopy transiently weakens the crura; (3) progressive weight loss following bariatric surgery reduces the intra-abdominal fat pad that normally supports the gastroesophageal junction, increasing the risk of hiatal migration; (4) increased intra-abdominal pressure episodes (e.g., chronic cough, physical exertion) may gradually widen pre-existing hiatal defects over months to years ([Hany et al., 2022](#); [Strong & Guerrón, 2022](#)). In this case, the CT findings demonstrated predictive value for the intraoperative findings: the extensive herniation pattern on CT correctly anticipated the broad adhesion formation requiring adhesiolysis; the degree of intestinal wall thickening on CT correlated with the finding of viable but congested bowel intraoperatively; and the incidentally identified acute appendicitis, confirmed intraoperatively with appendectomy, was retrospectively appreciable on the preoperative CT.

Diaphragmatic hernia is a pathological condition characterized by an abnormal communication between the abdominal cavity and the thoracic cavity through defects in the diaphragm, allowing intra-abdominal organs to migrate into the thoracic cavity ([Spellar et al., 2025](#)). Computed tomography (CT) is currently considered the primary imaging modality for detecting diaphragmatic defects because it can display direct and indirect signs of herniation with high resolution. CT can demonstrate diaphragmatic discontinuity, herniated organs, and secondary changes such as mediastinal shift and pulmonary compression. Therefore, CT is especially important in acute conditions when clinical findings are often non-specific ([Chaturvedi et al., 2018](#); [Ji et al., 2025](#)).

The role of radiology in diaphragmatic hernias is not only to confirm the presence of herniation but also to assess complications such as intestinal obstruction and strangulation. CT can show indirect signs of obstruction, such as dilation of intestinal loops with air-fluid levels and thickening of the intestinal wall, which may reflect impaired flow or early ischemia ([Chaturvedi et al., 2018](#); [Taydaş et al., 2018](#)). The recognition of these findings is crucial to determine the urgency of intervention, particularly in incarcerated hernias where delay in treatment can worsen outcomes. Early identification through CT has been shown to contribute to improved clinical outcomes ([Mahir et al., 2024](#)).

Multiplanar CT reconstruction is helpful in evaluating the integrity of the diaphragm, as small defects can be difficult to recognize on axial slices alone. Coronal and sagittal reconstructions often clearly demonstrate focal discontinuities or herniations that may not be visible otherwise. The combination of direct and indirect findings increases diagnostic confidence ([Chaturvedi et al., 2018](#); [Craugh et al., 2025](#)).

In adult patients, diaphragmatic hernias can be traumatic or iatrogenic, with radiological

appearances that vary greatly depending on the size of the defect and the contents of the hernia. This variation requires radiologists to always consider the possibility of diaphragmatic hernia in patients with atypical abdominal or thoracic complaints ([Predescu et al., 2023](#); [Tomida et al., 2020](#)).

CT also plays a major role in postoperative monitoring, especially for detecting complications such as pneumothorax, pleural effusion, or recurrent herniation. Serial imaging allows evaluation of pulmonary re-expansion and successful diaphragmatic repair ([Mahir et al., 2024](#)).

The accuracy of CT is highly dependent on precise acquisition and interpretation techniques, including the use of thin slices and multiplanar reconstructions. Radiologists need to recognize typical signs such as the collar sign and the dependent viscera sign, which increase sensitivity in detecting diaphragmatic defects ([Hassankhani et al., 2023](#)). As the number of bariatric patients increases, rare complications such as diaphragmatic hernias are likely to become more common, so vigilance in imaging interpretation is especially important ([Çankal et al., 2022](#)).

### CONCLUSION

This case demonstrates that a diaphragmatic hernia occurring after a laparoscopic Roux-en-Y gastric bypass can present as a life-threatening emergency due to intestinal incarceration and thoracoabdominal physiologic disturbances. In this case, CT imaging plays a crucial role in rapidly identifying diaphragmatic defects, herniated gastrointestinal structures, and associated findings, including obstruction, mediastinal shift, and suspected ischemia, directly informing the decision to perform emergency surgery. These findings confirm that multidetector CT with multiplanar reconstructions has a central role not only in early diagnosis but also in postoperative evaluation for detecting complications such as pneumothorax, pleural effusion, and recurrent herniation. The ability of CT to demonstrate signs of incarceration and vascular compromise is very important in determining the urgency and direction of management. Therefore, comprehensive CT evaluation should be considered routinely in postoperative bariatric patients presenting with acute abdominal or respiratory symptoms. Further reporting of similar cases will be very useful for refining imaging protocols and optimizing multidisciplinary approaches to managing this rare but serious complication.

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### AUTHOR CONTRIBUTION STATEMENT

Ni Luh Putri Kresnasari contributed to the conceptualization of the case report, patient data collection, literature review, interpretation of radiological findings, manuscript drafting, and corresponding author responsibilities. Putu Ayu Winda Wirastuti Giri contributed to data analysis, manuscript editing, clinical interpretation, and review of the relevant literature. I Wayan Agus Murcahya contributed to clinical supervision, validation of diagnostic findings, critical revision of the manuscript, and final approval of the manuscript for publication. All authors have read and approved the final version of the manuscript.

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