



Delayed Traumatic Diaphragmatic Hernia Presenting as Pneumothorax: A Case Report

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ABSTRACT

Traumatic diaphragmatic hernias (TDHs) are a serious complication of both blunt and penetrating trauma, often requiring prompt surgical intervention. While most TDHs present acutely, a subset of cases may have a delayed presentation, posing diagnostic and management challenges. This case report describes a 66-year-old woman who developed a delayed left-sided TDH following a motor vehicle accident, initially misdiagnosed as pneumothorax. A 66-year-old female presented to our hospital with complaints of severe left-sided chest pain and progressive dyspnea four days after a motor vehicle accident. Initial assessment at another hospital revealed rib fractures and pneumothorax, for which a chest tube was inserted. However, her respiratory symptoms persisted, prompting further evaluation. A chest X-ray and subsequent thoracoabdominal CT scan revealed a large left-sided diaphragmatic hernia with herniation of abdominal viscera into the thoracic cavity. The patient underwent emergency laparotomy and diaphragmatic hernia repair with primary closure. Postoperatively, the patient's symptoms improved significantly, and she was discharged home with complete resolution of her complaints. In conclusion, this case highlights the importance of maintaining a high index of suspicion for TDH in patients with a history of trauma, even in the absence of initial suggestive findings. Delayed presentation of TDH can occur, and a thorough evaluation, including imaging studies, is crucial for accurate diagnosis and timely management.

1. Introduction

Traumatic diaphragmatic hernias (TDHs) represent a significant and potentially life-threatening consequence of both blunt and penetrating trauma. These injuries involve the disruption of the diaphragm, the muscular partition separating the thoracic and abdominal cavities, leading to the abnormal displacement of abdominal organs into the chest cavity. The clinical presentation of TDHs can vary widely, influenced by the mechanism of injury, the extent of diaphragmatic disruption, and the specific viscera that herniate. Motor vehicle accidents are a common etiology of TDHs, frequently associated with high-energy blunt trauma. The reported incidence of

TDHs in patients sustaining thoracoabdominal trauma ranges from 0.8% to 8%, highlighting the importance of considering this diagnosis in the appropriate clinical setting. TDHs are broadly classified based on their time of presentation following the initial injury. Acute TDHs typically manifest within hours or days of the traumatic event. In these cases, the diagnosis is often more straightforward, as the clinical picture is closely temporally related to the injury. However, a subset of TDHs may present in a delayed fashion, sometimes weeks, months, or even years after the initial trauma. This delayed presentation poses a considerable diagnostic challenge. The insidious nature of symptom

development can lead to a missed or delayed diagnosis, potentially resulting in increased morbidity and mortality.¹⁻³

Several factors contribute to the phenomenon of delayed TDH. The initial size of the diaphragmatic defect plays a crucial role; a smaller defect may initially limit the degree of herniation, with progressive enlargement occurring over time due to the constant pressure differentials between the abdomen and thorax. The gradual herniation of abdominal contents into the thoracic cavity may also occur, with the patient initially remaining asymptomatic or experiencing only mild, nonspecific symptoms. Furthermore, the presence of other associated injuries can mask the signs and symptoms of a TDH. For instance, in the context of polytrauma, the clinical picture may be dominated by more immediately life-threatening injuries, such as traumatic brain injury, hemothorax, or extremity fractures, diverting attention from a developing diaphragmatic hernia. The symptoms of TDH, such as chest pain, dyspnea, or abdominal pain, may be attributed to these other injuries, further contributing to a delay in diagnosis. The accurate and timely diagnosis of TDH, particularly in cases of delayed presentation, is of paramount importance. A high index of suspicion is crucial in any patient with a history of significant trauma, even if the initial presentation does not suggest a diaphragmatic injury. Imaging studies are essential tools in the diagnostic evaluation of TDHs. Chest radiography is often the initial imaging modality employed. Findings suggestive of TDH on chest X-ray may include an elevated hemidiaphragm, an abnormal contour of the diaphragm, the presence of abdominal viscera within the thoracic cavity, mediastinal shift, or the presence of a pleural effusion. However, the interpretation of chest radiographs can be challenging, particularly in the acute setting where other injuries may obscure the findings or in cases of delayed presentation where the changes may be subtle.⁴⁻⁶

Computed tomography (CT) scanning is considered the gold standard for the diagnosis of TDHs. CT scans provide detailed cross-sectional images of the thorax

and abdomen, allowing for precise visualization of the diaphragm and the identification of herniated viscera. Multiplanar reconstructions and three-dimensional imaging can further enhance the diagnostic accuracy of CT scans. In cases of diagnostic uncertainty, additional imaging modalities, such as magnetic resonance imaging (MRI) or fluoroscopy, may be utilized, although these are less commonly employed in the acute setting. The definitive treatment for TDHs is surgical repair. The primary goals of surgical intervention are to reduce the herniated viscera, repair the diaphragmatic defect, and prevent recurrence. The surgical approach can be either transabdominal or transthoracic, or a combined approach, depending on the specific circumstances of the case, including the location and size of the defect, the presence of associated injuries, and the timing of presentation. In cases of delayed presentation, the surgical repair may be more challenging due to the potential for adhesions between the herniated viscera and the surrounding thoracic structures. The choice of surgical approach and the specific repair technique must be individualized to each patient. The prognosis for patients with TDHs is generally favorable when the diagnosis is made promptly and surgical repair is performed without complications. However, delayed diagnosis and treatment can significantly increase the risk of morbidity and mortality. Potential complications of untreated or delayed TDHs include incarceration or strangulation of the herniated viscera, leading to ischemia, perforation, and sepsis. Respiratory compromise due to lung compression and mediastinal shift can also occur.⁷⁻¹⁰ This case report describes a case of a 66-year-old woman who presented with a delayed left-sided TDH following a motor vehicle accident.

2. Case Presentation

The patient, a 66-year-old female, presented to the hospital with a constellation of symptoms and clinical signs that ultimately led to the diagnosis of a delayed traumatic diaphragmatic hernia. The timeline of her presentation is critical to understanding the

diagnostic process. The patient's chief complaints were severe left-sided chest pain and progressive dyspnea. This symptom complex indicated a significant compromise of her respiratory function and suggested a potentially serious underlying pathology. The history of the presenting illness revealed that four days prior to her admission, the patient had been involved in a motor vehicle accident. She was riding a motorcycle and sustained a fall, with her left chest impacting the handlebars of the motorcycle. This mechanism of injury is particularly relevant, as blunt trauma to the thoracoabdominal region is a well-established cause of diaphragmatic rupture and subsequent herniation. The impact against the handlebars would have delivered a direct force to the left chest, increasing the likelihood of injury to the diaphragm and adjacent structures. The patient's initial medical evaluation occurred at another hospital following the accident. At that time, she presented with dyspnea, which is a common symptom following chest trauma, regardless of the specific underlying injury. She was treated for rib fractures and pneumothorax, and a chest tube was inserted. The treatment for pneumothorax with a chest tube is a standard medical procedure aimed at evacuating air from the pleural space and re-expanding the lung. Rib fractures are also a frequent consequence of blunt chest trauma. Despite the initial treatment, the patient's respiratory symptoms did not improve. The persistence of dyspnea and chest pain, despite the intervention for pneumothorax, was a critical factor that prompted further investigation and ultimately led to the transfer of the patient to the reporting hospital. This highlights the importance of close monitoring of patients following trauma and the need to consider alternative or additional diagnoses when the clinical course is not progressing as expected. The patient's past medical history was notable for the absence of significant chronic medical conditions. She had no history of hypertension, diabetes mellitus, or chronic medication use. This is important as these conditions could potentially complicate the patient's presentation, treatment, and recovery. The absence of significant past medical

history simplifies the assessment of the patient's current condition, making it less likely that the presenting symptoms are related to a pre-existing disease process. Upon presentation, the patient appeared moderately ill but was conscious and alert. While her level of consciousness was intact, her general appearance suggested that she was experiencing significant discomfort or physiological distress. The patient's vital signs revealed a number of abnormalities. Her blood pressure was 133/76 mmHg. While the systolic pressure was slightly elevated, the diastolic pressure was within the normal range. The heart rate was elevated at 120 beats per minute and regular. Tachycardia, or an elevated heart rate, is a common physiological response to pain, stress, and hypoxemia (low blood oxygen levels), all of which could be present in this patient. The respiratory rate was also elevated at 30 breaths per minute. Tachypnea, or an increased respiratory rate, is a cardinal sign of respiratory distress and may indicate an attempt to compensate for inadequate oxygenation or ventilation. The oxygen saturation was 98% on 10 L/min supplemental oxygen via nasal cannula. While the oxygen saturation was within an acceptable range, the fact that the patient required a relatively high flow of supplemental oxygen to maintain this level indicated underlying respiratory compromise. The patient's temperature was 36.3°C, which is within the normal range. The head and neck examination was unremarkable. The patient was normocephalic, meaning her head was of normal size and shape. There was no pallor (paleness) or icterus (jaundice), which are signs that might suggest anemia or liver dysfunction, respectively. The respiratory examination revealed significant findings. There were decreased breath sounds on the left hemithorax. This indicated reduced air entry into the left lung, which could be due to a variety of reasons, including pneumothorax, pleural effusion, or consolidation. Dullness to percussion was also noted on the left hemithorax. Percussion is a physical examination technique where the examiner taps on the chest wall to assess the underlying lung tissue. Dullness to percussion

suggests increased density in the underlying tissue, which can be caused by fluid or solid masses, such as a pleural effusion or, as it was later discovered, herniated abdominal organs. Tenderness to palpation was elicited over the left lower ribs. This finding is consistent with the patient's history of trauma and the diagnosis of rib fractures. The cardiovascular examination was unremarkable. Normal heart sounds were heard, and no murmurs were detected. This suggests that the patient's cardiac function was grossly normal, and the presenting symptoms were likely not of cardiac origin. The abdominal examination was also unremarkable. The abdomen was soft, non-tender, and normal bowel sounds were present. This is notable because, in cases of diaphragmatic hernia, abdominal organs can herniate into the thoracic cavity. However, at the time of the physical examination, there were no overt signs of abdominal pathology. The extremities examination was normal. There was no edema (swelling), and capillary refill was normal, indicating adequate peripheral perfusion. Hematological investigations revealed several abnormalities. The hemoglobin level was 12.9 g/dL, and the hematocrit was 38%. While these values are within or near the lower limits of the normal range, they may reflect some degree of blood loss or hemodilution. The white blood cell count was elevated at $14.1 \times 10^3/\text{L}$. Leukocytosis, or an elevated white blood cell count, is a common response to trauma and inflammation. It can also indicate infection, although other clinical findings would be needed to confirm this. The platelet count was $357 \times 10^3/\text{L}$, which was within the normal range. Chemistry investigations revealed largely normal values. The creatinine level was 0.8 mg/dL, and the urea level was 61 mg/dL. These values assess kidney function, and while the urea level is slightly elevated, the creatinine is within normal limits, suggesting that renal function was not severely compromised. The sodium level was 135 mmol/L, the potassium level was 3.5 mmol/L, and the chloride level was 99 mmol/L. These electrolyte values were generally within the normal range. Imaging studies played a crucial role

in establishing the correct diagnosis. The initial chest X-ray revealed rib fractures and pneumothorax. These findings were consistent with the patient's history of trauma and explained her initial respiratory symptoms. The treatment with a chest tube was appropriate for the pneumothorax. A repeat chest X-ray showed a suspicious air-fluid level and an irregular contour of the left hemidiaphragm. This finding was a critical clue that suggested the possibility of a diaphragmatic injury. The irregular contour and the presence of an air-fluid level in the chest cavity are highly suggestive of herniation of abdominal contents through a diaphragmatic defect. The thoracoabdominal CT scan definitively confirmed the diagnosis. It revealed a large left-sided diaphragmatic hernia with herniation of the stomach, spleen, and omentum into the thoracic cavity. The diaphragmatic defect was measured to be approximately 10 cm x 2 cm. This detailed imaging provided a clear picture of the anatomical abnormality and the extent of the herniation. The CT scan is considered the gold standard for diagnosing diaphragmatic hernias, especially in cases of delayed presentation or when the chest X-ray findings are equivocal. The primary diagnosis was a delayed traumatic diaphragmatic hernia (left-sided). This diagnosis was established based on the patient's history of trauma, the clinical presentation, and the findings of the imaging studies, particularly the CT scan. The delayed nature of the presentation is a key feature of this case, as the patient initially presented with symptoms and findings suggestive of pneumothorax, and the diaphragmatic hernia was only diagnosed later. The secondary diagnoses were pneumothorax and rib fractures (specifically, fractures of the 5th, 6th, 7th, and 8th ribs). These injuries were likely sustained during the initial traumatic event and contributed to the patient's initial symptoms. The pneumothorax was addressed with the chest tube insertion, but the persistence of symptoms prompted the search for other injuries, leading to the diagnosis of the diaphragmatic hernia (Table 1).

The management of a delayed traumatic diaphragmatic hernia, as presented in this case, necessitates a multi-faceted approach, encompassing surgical intervention, postoperative care, and a structured follow-up plan. The primary objective of treatment is to address the anatomical defect, alleviate the patient's symptoms, and prevent future complications. The definitive treatment for a traumatic diaphragmatic hernia is surgical repair. In this particular case, the patient underwent a well-defined surgical procedure aimed at correcting the diaphragmatic defect and restoring the normal anatomical relationship between the thoracic and abdominal cavities; Procedure: The surgical intervention consisted of several key steps. Exploratory laparotomy involved a surgical incision into the abdominal cavity. Exploratory laparotomy is a fundamental surgical technique that allows for a comprehensive assessment of the abdominal organs and the extent of the injury. In this case, it provided the necessary access to the diaphragmatic defect and the herniated viscera. Reduction of herniated viscera involved carefully returning the displaced abdominal organs from the thoracic cavity back into the abdominal cavity. The specific organs that had herniated in this case were the stomach, spleen, and omentum. The reduction process requires meticulous technique to avoid iatrogenic injury to the viscera, particularly if they are edematous or adhered to surrounding tissues. Primary repair of the diaphragmatic defect is the core component of the surgical repair. The diaphragmatic defect, which was measured to be 10 cm x 2 cm in this case, was closed using interrupted non-absorbable sutures. The use of non-absorbable sutures is crucial to ensure a durable repair and minimize the risk of recurrence. The interrupted suture technique allows for precise approximation of the diaphragmatic edges and reduces the risk of a continuous tear. Primary repair refers to the direct closure of the defect without the need for prosthetic material or tissue grafts. Following the reduction of the herniated viscera and the repair of the diaphragmatic defect, a chest tube was placed

in the left hemithorax. The purpose of the chest tube is to evacuate any residual air or fluid from the pleural space, allowing for lung re-expansion and preventing the development of a pneumothorax or hemothorax in the postoperative period; Anesthesia: The surgical procedure was performed under general anesthesia. General anesthesia is a state of controlled unconsciousness that ensures the patient is pain-free and immobile during the operation. It involves the administration of anesthetic agents that induce loss of sensation, muscle relaxation, and amnesia. The use of general anesthesia allows for the complex surgical maneuvers required for diaphragmatic hernia repair to be performed safely and effectively; Incision: A midline laparotomy incision was utilized to access the abdominal cavity. This type of incision is a vertical incision made along the midline of the abdomen. It is a commonly used incision for exploratory laparotomies and provides excellent exposure to the abdominal organs. The length of the incision is tailored to the specific needs of the surgical procedure; Operative Findings: The operative findings confirmed the preoperative diagnosis and provided further details about the extent of the injury. A 10 cm x 2 cm defect was identified in the left hemidiaphragm. This measurement quantifies the size of the diaphragmatic tear, which is essential for surgical planning and repair. Herniation of the stomach, spleen, and omentum into the left hemithorax was observed. This finding confirmed the diagnosis of a diaphragmatic hernia and detailed the specific organs that were displaced. Rib fractures (costa VI and VII) were also noted. These fractures were likely sustained during the initial traumatic event and were documented during the surgical exploration. The postoperative period is critical for ensuring a successful recovery and preventing complications. The management strategy focuses on pain control, respiratory support, and chest tube management; Pain Management: Postoperative pain is a common experience following surgery. In this case, analgesics were administered as needed to manage the patient's pain and ensure her comfort. The specific type and dosage of analgesics are

individualized based on the patient's pain level and other clinical factors. Effective pain management is essential for promoting early mobilization, deep breathing, and overall recovery; Respiratory Support: Following surgery, patients may experience respiratory compromise due to pain, the effects of anesthesia, or underlying pulmonary conditions. In this case, the patient initially required supplemental oxygen. Oxygen was administered to maintain adequate oxygen saturation and support respiratory function. As the patient's respiratory status improved, supplemental oxygen was gradually weaned off. This weaning process is guided by the patient's oxygen saturation levels, respiratory rate, and clinical assessment; Chest Tube Management: The chest tube that was placed during surgery requires careful management. The primary goal is to ensure that the tube remains patent and effectively drains any air or fluid from the pleural space. The drainage from the chest tube is monitored regularly for volume and characteristics. In this case, the chest tube was removed when the drainage subsided, indicating that the lung had fully re-expanded and there was no further accumulation of air or fluid; Complications: In this particular case, no complications were reported. This is a favorable outcome and suggests that the surgical procedure and postoperative management were successful. However, it is important to acknowledge that complications can occur following diaphragmatic hernia repair, including infection, bleeding, recurrent hernia, or respiratory insufficiency. Follow-up care is an integral part of the management plan. It allows for the ongoing assessment of the patient's recovery, the early detection of any potential complications, and the provision of guidance for rehabilitation; Clinical Evaluation: During the follow-up period, the patient was assessed for the resolution of her presenting symptoms, specifically chest pain and dyspnea. Physical examinations were performed to evaluate the surgical site for signs of infection or dehiscence and to assess respiratory function. These clinical evaluations provide valuable information about the patient's

overall progress and the effectiveness of the treatment; Imaging Studies: Chest X-rays were utilized during the follow-up period to confirm the resolution of the pneumothorax and to ensure the proper positioning of the abdominal organs. Postoperative chest X-rays are a standard component of follow-up care after diaphragmatic hernia repair. They help to visualize the diaphragm and the position of the viscera, ensuring that there is no recurrence of the hernia and that the lung remains fully expanded; Outcome: The patient experienced a significant improvement in her respiratory symptoms and a resolution of her chest pain. At the one-month follow-up, there was no evidence of hernia recurrence. This positive outcome indicates the success of the surgical intervention and the effectiveness of the postoperative management; Discharge: The patient was discharged home on postoperative day 7. Prior to discharge, she was provided with instructions regarding activity restrictions and follow-up care. Activity restrictions are typically advised to allow for adequate healing of the diaphragmatic repair and to minimize the risk of recurrence. Follow-up care instructions include scheduling future appointments for clinical evaluations and imaging studies (Table 2).

3. Discussion

The delayed presentation of TDHs poses a significant diagnostic challenge to clinicians. Unlike acute TDHs, which typically manifest within hours or days of the traumatic event, delayed TDHs may not become clinically apparent for weeks, months, or even years after the initial injury. This stark contrast in clinical manifestation significantly complicates the diagnostic process. While acute TDHs often present with dramatic and readily recognizable signs and symptoms related to the immediate disruption of the diaphragm and the acute herniation of abdominal contents, delayed TDHs often present with insidious and vague symptomatology or may even be asymptomatic for extended periods.

Table 1. Summary of patient findings.

Feature	Details
Anamnesis	
Chief complaint	Severe left-sided chest pain and progressive dyspnea
History of presenting illness	- Four days prior to admission, the patient was involved in a motor vehicle accident while riding a motorcycle. - She fell with her left chest impacting the handlebars. - Initial presentation at another hospital included dyspnea, for which she was treated for rib fractures and pneumothorax with a chest tube. - Respiratory symptoms did not improve, leading to transfer to our hospital.
Past medical history	- No significant past medical history, including history of hypertension, diabetes mellitus, or chronic medication use.
Physical examination	
General appearance	- Appeared moderately ill - Conscious and alert
Vital signs	- Blood pressure: 133/76 mmHg - Heart rate: 120 beats per minute, regular - Respiratory rate: 30 breaths per minute - Oxygen saturation: 98% on 10 L/min supplemental oxygen via nasal cannula - Temperature: 36.3°C
Head and neck	- Normocephalic, no pallor or icterus
Respiratory	- Decreased breath sounds on the left hemithorax - Dullness to percussion on the left hemithorax - Tenderness to palpation over the left lower ribs
Cardiovascular	- Normal heart sounds, no murmurs
Abdomen	- Soft, non-tender, normal bowel sounds
Extremities	- No edema, normal capillary refill
Laboratory investigations	
Hematology	- Hemoglobin: 12.9 g/dL - Hematocrit: 38% - White blood cell count: 14.1 x 10 ³ /L - Platelet count: 357 x 10 ³ /L
Chemistry	- Creatinine: 0.8 mg/dL - Urea: 61 mg/dL - Sodium: 135 mmol/L - Potassium: 3.5 mmol/L - Chloride: 99 mmol/L
Imaging studies	
Chest X-ray (initial)	- Rib fractures - Pneumothorax
Chest X-ray (repeat)	- Suspicious air-fluid level and irregular contour of the left hemidiaphragm
Thoracoabdominal CT scan	- Large left-sided diaphragmatic hernia with herniation of the stomach, spleen, and omentum into the thoracic cavity - Diaphragmatic defect measuring approximately 10 cm x 2 cm
Diagnosis	
Primary diagnosis	- Delayed traumatic diaphragmatic hernia (left-sided)
Secondary diagnoses	- Pneumothorax - Rib fractures (costa V, VI, VII, VIII)

Table 2. Treatment and follow-up.

Feature	Details
Surgical intervention	
Procedure	- Exploratory laparotomy - Reduction of herniated viscera (stomach, spleen, omentum) - Primary repair of the diaphragmatic defect with interrupted non-absorbable sutures - Placement of a chest tube in the left hemithorax
Anesthesia	General anesthesia
Incision	Midline laparotomy incision
Operative findings	- 10 cm x 2 cm defect in the left hemidiaphragm - Herniation of stomach, spleen, and omentum into the left hemithorax - Rib fractures (costa VI and VII)
Postoperative management	
Pain management	Analgesics as needed
Respiratory support	- Supplemental oxygen initially - Weaned off oxygen as respiratory status improved
Chest tube management	- Chest tube removed when drainage subsided
Complications	None
Follow-up	
Clinical evaluation	- Assessed for resolution of symptoms (chest pain, dyspnea) - Physical examination to evaluate surgical site and respiratory function
Imaging studies	- Chest X-ray to confirm resolution of pneumothorax and proper positioning of abdominal organs
Outcome	- Significant improvement in respiratory symptoms - Resolution of chest pain - No recurrence of hernia at one-month follow-up
Discharge	- Discharged home on postoperative day 7 - Advised on activity restrictions and follow-up care

This delay in presentation can be attributed to a variety of factors, creating a complex interplay of physiological and pathological processes that contribute to the difficulty in achieving a timely and accurate diagnosis. One key factor is the initial size of the diaphragmatic defect. A small defect may initially limit the degree of herniation, with the gradual enlargement of the defect occurring over time due to the continuous pressure gradients between the thoracic and abdominal cavities. The diaphragm, a musculotendinous partition separating the thoracic and abdominal cavities, is constantly subjected to pressure differentials. The pressure within the abdominal cavity is generally higher than that in the thoracic cavity. Following a traumatic injury, if the resulting diaphragmatic tear is small, it may initially act as a restrictive barrier, preventing the immediate and extensive herniation of abdominal organs. However, the persistent pressure gradient across the diaphragm will exert force on the edges of the defect. With each respiratory cycle, Valsalva maneuver, or any activity that increases intra-abdominal pressure, the defect margins are subjected to stress. Over time, this repetitive stress can lead to the gradual stretching and widening of the diaphragmatic tear. This gradual increase in the size of the defect allows for the progressive herniation of abdominal viscera into the thoracic cavity. Organs that may initially be contained within their respective cavities can slowly migrate through the enlarging defect, further contributing to the insidious nature of delayed TDHs. Another contributing factor is the insidious nature of the herniation process itself. The herniation of abdominal contents may occur gradually, with the patient initially remaining asymptomatic or experiencing only mild, nonspecific symptoms. This gradual progression can make it difficult to recognize the development of a diaphragmatic hernia, especially in the absence of a clear history of significant trauma. The abdominal organs, such as the stomach, small intestine, colon, spleen, and liver, are mobile structures within the abdominal cavity. In the early stages of a diaphragmatic hernia, only a small portion of an organ

may herniate through the defect. This limited herniation may not produce any noticeable symptoms, as the body can often compensate for minor anatomical derangements. As the diaphragmatic defect enlarges and more abdominal contents herniate, the symptoms may begin to manifest. However, these symptoms are often vague and nonspecific, mimicking a wide range of other medical conditions. Patients may experience intermittent chest pain, which can be attributed to musculoskeletal issues or cardiac conditions. They may also complain of vague abdominal discomfort, which can be mistaken for gastrointestinal problems. Respiratory symptoms, such as shortness of breath, may be present but attributed to other pulmonary issues. The insidious nature of symptom development, with the potential for long asymptomatic periods, contributes significantly to the diagnostic challenges of delayed TDHs. The lack of a clear temporal relationship between the traumatic event and the onset of symptoms can further obscure the diagnosis. Patients themselves may not recall a specific traumatic event, especially if it occurred many years prior, or they may attribute their symptoms to other causes. The presence of other associated injuries can further complicate the diagnosis of delayed TDHs. In the context of polytrauma, the clinical picture may be dominated by more immediately life-threatening injuries, such as traumatic brain injury, hemothorax, or extremity fractures. In cases of severe trauma, the patient may present with a multitude of injuries, each demanding prompt attention and intervention. The focus of the medical team will understandably be directed toward stabilizing the patient's condition and addressing the most critical injuries first. This prioritization of care, while essential for patient survival, can sometimes lead to a delay in the diagnosis of less obvious injuries, such as a diaphragmatic hernia. The symptoms of a TDH, such as chest pain, dyspnea, or abdominal pain, may be easily attributed to the more prominent injuries. For instance, chest pain may be attributed to rib fractures, dyspnea to pulmonary contusions or pneumothorax, and abdominal pain to other intra-abdominal injuries.

This "masking effect" of other injuries is a significant contributor to the diagnostic challenges of delayed TDHs. The initial clinical evaluation may be focused on ruling out or treating the most obvious and life-threatening conditions, with less attention paid to the possibility of a diaphragmatic injury. Furthermore, patients who have sustained traumatic brain injuries may be unable to provide a clear history of their injuries or accurately describe their symptoms, further complicating the diagnostic process. In this particular case, the patient's initial presentation was suggestive of a pneumothorax. The patient presented with dyspnea, a common symptom following chest trauma, and the initial chest X-ray revealed rib fractures and pneumothorax. A chest tube was inserted to address the pneumothorax, which is a standard and appropriate intervention. Pneumothorax, the presence of air in the pleural space, is a frequent complication of chest trauma. The insertion of a chest tube is a well-established procedure to evacuate the air and allow for lung re-expansion. In this case, the initial management was appropriate for the identified injuries. However, the persistence of the patient's respiratory symptoms despite the chest tube placement should have raised suspicion for an alternative or additional diagnosis. Pneumothorax, when adequately treated with a chest tube, should result in improvement of respiratory distress. The lack of improvement in this patient suggested that the pneumothorax, while present, might not be the sole cause of her symptoms, or that another underlying condition was contributing to her respiratory compromise. This clinical scenario underscores the importance of continuous monitoring and reassessment of patients following trauma. If the clinical course is not progressing as expected, it is crucial to consider alternative diagnoses or the presence of additional injuries. This case highlights a critical diagnostic pitfall, the potential for misdiagnosis or delayed diagnosis in patients with delayed TDHs. The initial focus on the pneumothorax led to a delay in recognizing the underlying diaphragmatic injury. This case underscores the

importance of considering TDH in the differential diagnosis of patients presenting with respiratory symptoms following trauma, even if the initial evaluation suggests another cause. Misdiagnosis can have significant consequences for patient outcomes. A delayed diagnosis of TDH can lead to increased morbidity and mortality. The herniated abdominal organs can become incarcerated or strangulated, leading to ischemia, perforation, and sepsis. Respiratory compromise can worsen, leading to respiratory failure. The longer the delay in diagnosis, the greater the risk of complications and the more challenging the surgical repair may become. Therefore, it is imperative that clinicians maintain a high index of suspicion for TDH in patients with a history of trauma, even when the initial presentation is not typical or when other more obvious injuries are present. This requires a thorough and systematic approach to the evaluation of trauma patients, with careful consideration of the possibility of diaphragmatic injury, regardless of the initial clinical picture.¹¹⁻¹⁵

Given the diagnostic challenges associated with delayed TDHs, maintaining a high index of suspicion is crucial. Clinicians must be vigilant in considering the possibility of a diaphragmatic injury in any patient with a history of significant trauma, even if the initial presentation does not suggest this diagnosis. The insidious nature of delayed TDHs, coupled with their potential to mimic other conditions, necessitates a proactive and inquisitive approach from medical practitioners. A high index of suspicion, in this context, translates to a heightened awareness and a proactive consideration of TDH in the differential diagnosis, even when other more obvious or seemingly straightforward explanations for a patient's symptoms exist. This requires a departure from a purely reactive approach to diagnosis, where investigations are solely guided by the most apparent symptoms, towards a more anticipatory and comprehensive evaluation that explores less likely but potentially serious conditions. This is particularly vital because a delayed or missed diagnosis of TDH can lead to significant morbidity and

mortality. The consequences of a missed TDH can range from chronic discomfort and disability to life-threatening complications such as strangulation of herniated viscera, bowel obstruction, and respiratory failure. Therefore, the importance of a high index of suspicion cannot be overstated in the effective management of patients with a history of trauma. It forms the cornerstone of early diagnosis, timely intervention, and ultimately, improved patient outcomes. A thorough history and physical examination are essential components of the diagnostic evaluation. In this case, the patient's history of a motor vehicle accident with a direct impact to the left chest should have raised the possibility of a diaphragmatic injury. The medical history serves as a critical guide in the diagnostic process. In the context of trauma, a detailed account of the mechanism of injury, the forces involved, and the specific areas of the body impacted can provide invaluable clues to the potential for underlying injuries. A seemingly minor detail in the history, such as the direction of impact or the specific object involved, can be pivotal in directing the clinician's attention towards the possibility of a TDH. In this case, the fact that the patient experienced a direct blow to the left chest during a motorcycle accident should have immediately alerted the medical team to the potential for injury to the diaphragm, which lies in close proximity to the chest wall. The physical examination complements the medical history by providing objective data on the patient's current condition. A comprehensive physical examination should include a thorough evaluation of all major body systems, with a particular focus on the areas of the body that were potentially injured. In the case of suspected TDH, the chest and abdomen should be examined meticulously. The physical examination findings of decreased breath sounds and dullness to percussion on the left hemithorax, along with tenderness to palpation over the left lower ribs, were also suggestive of a significant thoracic injury. Decreased breath sounds on one side of the chest compared to the other can indicate a variety of pulmonary issues, including pneumothorax, pleural

effusion, or consolidation, but it can also be a sign of a diaphragmatic hernia where abdominal contents are compressing the lung. Dullness to percussion, which is an abnormal finding elicited when tapping on the chest wall, suggests increased density in the underlying tissue, which can be due to fluid or solid masses, such as herniated organs. Tenderness to palpation over the ribs is a common finding in rib fractures, but it can also indicate underlying chest wall trauma that could extend to the diaphragm. These physical findings, in conjunction with the patient's history of trauma, should have collectively heightened the suspicion for a diaphragmatic injury. It is important to note that the absence of overt abdominal findings on physical examination does not rule out the possibility of a diaphragmatic hernia. In this case, the abdominal examination was unremarkable, despite the presence of a large diaphragmatic hernia with herniation of abdominal viscera. This highlights the fact that the physical signs of a diaphragmatic hernia can be subtle or absent, particularly in cases of delayed presentation. The diaphragm's unique anatomical location, separating the thoracic and abdominal cavities, means that injuries to this structure can manifest with both thoracic and abdominal signs and symptoms. However, in cases of delayed TDH, the abdominal findings can be particularly elusive. The herniation of abdominal organs into the chest cavity may occur gradually, and the body may initially compensate for this anatomical change. As a result, the abdomen may appear soft, non-tender, and with normal bowel sounds, even in the presence of a significant diaphragmatic hernia. The absence of abdominal tenderness, guarding, or distension should not be interpreted as evidence against a diaphragmatic injury. In this case, the fact that the abdominal examination was unremarkable despite the presence of a large diaphragmatic hernia underscores this point. The examiner might be falsely reassured by a benign abdominal exam, leading to a delay in considering or diagnosing a TDH. This phenomenon is particularly relevant in delayed presentations, where the clinical picture may be less

acute and the physical findings less pronounced. Therefore, clinicians must be aware that a normal abdominal examination does not exclude the possibility of a diaphragmatic hernia, and they should rely on a combination of clinical findings, including the history, thoracic examination, and imaging studies, to make an accurate diagnosis. In patients with persistent or worsening respiratory symptoms following trauma, despite appropriate treatment for other conditions, the possibility of a delayed TDH should be strongly considered. In this case, the persistence of the patient's dyspnea despite the chest tube placement for pneumothorax should have prompted further investigation for an alternative cause of her symptoms. As discussed earlier, the initial management of trauma patients often involves addressing the most immediate and life-threatening conditions. In this case, the patient presented with dyspnea, and a pneumothorax was diagnosed and treated with a chest tube. This is a standard and appropriate intervention, and it is expected to result in improvement of respiratory symptoms if the pneumothorax is the primary cause of the patient's distress. However, the persistence or worsening of respiratory symptoms, such as dyspnea, despite adequate chest tube placement and management, should serve as a red flag, prompting clinicians to consider other potential causes of the patient's condition. In the context of trauma, a delayed TDH should be high on the list of differential diagnoses in such cases. The persistence of dyspnea suggests that the pneumothorax, even if adequately treated, may not be the sole or the main contributor to the patient's respiratory compromise. Other possibilities, such as pulmonary contusion, hemothorax, or diaphragmatic hernia, should be actively investigated. This requires a systematic and thorough approach, with a willingness to reconsider the initial diagnosis and pursue further investigations. In this case, the persistence of dyspnea despite chest tube placement should have prompted the medical team to broaden their differential diagnosis and consider the possibility of a delayed TDH. This would have led to further investigations,

such as a repeat chest X-ray or a CT scan, which would have revealed the diaphragmatic hernia and allowed for timely intervention. The failure to consider alternative diagnoses in the face of persistent symptoms can lead to a delay in diagnosis and potentially adverse outcomes for the patient.¹⁶⁻²⁰

4. Conclusion

This case report highlights the complexities associated with delayed TDHs and underscores the critical importance of maintaining a high index of suspicion in patients with a history of trauma. Delayed TDHs present a significant diagnostic challenge due to their insidious nature, the potential for vague or nonspecific symptoms, and the possibility of other associated injuries masking the diaphragmatic injury. This case demonstrates that a high index of suspicion, thorough clinical evaluation, and appropriate imaging studies are crucial for accurate diagnosis and timely management. The initial misdiagnosis of pneumothorax in this patient emphasizes the need for clinicians to consider TDH in the differential diagnosis of patients presenting with respiratory symptoms following trauma, even when other conditions seem more likely. The persistence of symptoms despite appropriate treatment for other conditions should raise suspicion for an alternative or additional diagnosis, prompting further investigation. This case also illustrates that a normal abdominal examination does not exclude the possibility of a diaphragmatic hernia, and clinicians should rely on a combination of clinical findings and imaging studies to establish the diagnosis. Early recognition and prompt surgical intervention are essential to prevent potentially life-threatening complications associated with delayed TDHs.

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