



## Diaphragmatic Eventration: An Alarming Finding Diagnosed at an Orthopedic Consultation

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### Abstract

Diaphragmatic eventration is a partial or entire diaphragmatic muscular defect comprising of a thin structure that allows abdominal contents to be elevated into the chest cavity. Patients are often asymptomatic and diagnosed on chest radiographs incidentally. At times patients are symptomatic from other etiologies such as acquired (trauma) or congenital causes associated with numerous syndromes. We present a 73 year old woman who came for an orthopedic consultation status post traumatic fall on her left side with multiple orthopedic injuries including a chest wall injury. After concern for pulmonary trauma, a clinical examination and radiographic imaging were obtained that determined hospital observation for an incidental diaphragmatic eventration.

### Introduction

Diaphragmatic eventration occurs when there is a partial or entire elevation of the diaphragm due to thinned musculature of the diaphragm itself. The diagnosis is often confused with a diaphragmatic hernia which is a complete protrusion of intestine through an abnormal opening in the diaphragm. Both derive from a similar etiology being either acquired or congenital. Eventrations are often diagnosed incidentally during chest radiographs and typically are asymptomatic [1]. In adulthood patients with eventrations may become more symptomatic as lung structures change increasing the work of breathing or if an acute insult occurs such as a trauma that would decrease lung compliance [2,3]. During an orthopedic consultation the undiagnosed incidental finding presented itself in a peculiar fashion raising concern for a further pulmonary investigation.

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### Case Presentation

A 73 year old woman presented to our outpatient orthopedic office status post slip and fall injury one week prior. At that time she was evaluated at an outside hospital for her left upper extremity, shoulder girdle and chest pain. She was told she had a chest contusion, a left shoulder sprain and left distal radius fracture treated with splinting. The patient stated severe pain in her shoulder and radius including pleuritic chest pain worse on inspiration. On physical examination the patient was breathing normally, in no acute distress, just appeared uncomfortable due to her injuries. The left upper extremity examination was initially the priority, showing significant decreased range of



**Figure 1:** Office visit: Chest AP X-Ray showing raises left hemidiaphragm with numerous air bubbles signifying bowel loops.



**Figure 2:** CT obtained in ED showing significant elevation of diaphragm on the Left side directly behind the heart shown in (C). The diaphragm protrudes up against the left lobes of the lung and against the left main bronchus (A+B).

motion in the shoulder girdle demonstrating findings for a rotator cuff injury. All the orthopedic conditions were addressed appropriately. She had a large hematoma over her left breast and tenderness to palpation over her left chest wall stating this occurred due to her fall. The patient reported increased work of breathing and intermittent shortness of breath.

On chest auscultation she had normal vesicular sounds throughout the entire right lung. The left side had normal breathing sounds in the left upper lobe but absent in the lower lobe. Tactile fremitus and dullness to percussion were decreased in the same area. Following this examination, an AP Chest film was obtained for a differential diagnosis of pulmonary contusion, pneumothorax, pleural effusion diaphragmatic injury or rib fracture. The X-Ray revealed a left hemidiaphragm with asymmetric elevation of the gastric bubble within the chest cavity (Figure 1). Our primary concern was her orthopnea and dyspnea necessitating a further investigation; she was transported directly from our office to the emergency room. After a pulmonary consultation a CT was obtained showing a left sided diaphragmatic eventration (Figure 2). The patient was admitted for observation. On hospital day two, her orthopedic injuries were addressed operatively including a left distal radius volar plating and open left distal clavicle excision, acromioplasty and rotator cuff repair. Due to her elevated diaphragm, anesthesia was concerned so they did an interscalene block. Post operatively she recovered without any acute events and her pulmonary concerns resolved with bed rest. The self-resolving respiratory symptomatology suggested a congenital or acquired asymptomatic incidental diaphragmatic eventration. She was referred to a pulmonologist for further investigation if dyspneic episodes recur.

## Discussion

Eventrations as stated previously occur due to acquired or congenital etiologies. Diaphragmatic eventration are caused by a musculature defect replacing normal muscle structure with a membranous sheath that's occurs in two forms either partial or total elevation. Our patient had a total eventration meaning a complete elevation of the entire hemidiaphragm as seen in Figure 1 up to the left 6th thoracic rib. Typically, total eventrations occur in males on the left side and the incidence in adults is roughly 1 in 1000 [4]. In contrast, a partial eventration may only be a part of the diaphragm showing a small bulge or protrusion, typically in the right anteromedial aspect of the diaphragm [4,5]. At times these bulges, depending on location, may contain portions of organ such as the spleen, liver or kidney; this under radiography may be misrepresenting a tumor [4,5]. In a clinical review done by Kulkarni, the department of pediatrics identified numerous syndromes associated with diaphragmatic eventrations

such as, Kabuki makeup syndromes, Beckwith-Wiedemann syndrome, Poland syndrome, Jarcho Levin syndrome, Infections like rubella, cytomegalovirus, trisomies, chromosomal abnormalities and other congenital anomalies like pulmonary hypoplasia, congenital heart disease, tracheomalacia, cerebral agenesis, renal ectopia, malrotation, deformities of pinna, Meckel's diverticulum and Werdnig Hoffman disease [6]. A finding of a hemidiaphragm is alarming and should raise concern as diaphragmatic injuries have been involved in posttraumatic insults [7]. A radiograph showing a hemidiaphragm is typically the study presenting the incidental finding due to some thorax or respiratory concern. Our patient presented without a known history of an eventration and a CT provided additional information regarding the extent of the hemidiaphragm. Other modes of diagnosis may include MRI or fluoroscopy studies to evaluate the muscle function when patients have persistent symptomatology [1]. Patients with symptomatic eventrations showing chest discomfort, dyspnea, abnormal pulmonary function, pain or other pulmonology findings are typically consulted for surgical interventions.

## Conclusion

In summary, we present an unusual case of diaphragmatic eventration associated with orthopedic poly-trauma. Our patient presented with multiple orthopedic concerns but after a detailed physical examination with radiographs obtained an incidental finding was diagnosed. Although the patient respiratory status was unchanged the trauma overlapped with a coinciding diaphragmatic anomaly which brought awareness and concern for the patient's respiratory status.

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