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Case Report

Successful Management of Diaphragmatic Eventration Using the Imbrication Technique

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Abstract

The term "diaphragmatic eventration" commonly refers to a relaxed state of the diaphragmatic dome. This can be congenital, arising from developmental anomalies of the diaphragm, or acquired later in life, termed "acquired diaphragmatic paralysis" or "acquired diaphragmatic elevation". We discuss a 50-year-old male who reported a 6-month period of progressive exertional dyspnea and was diagnosed with a notably elevated left diaphragmatic copula. A diaphragmatic imbrication technique was utilized for repair.

Keywords: *Diaphragmatic Eventration; Adult; Repair*

Case Presentation

A 50-year-old male with no significant past medical history, no prior trauma or surgeries, or smoking. presented to the emergency department. He described a 6-month progression of exertional dyspnea and shortness of breath, accompanied by worsening abdominal distension and constipation necessitating laxatives. Physical examination revealed reduced breath sounds over the left lung base but was otherwise unremarkable. Laboratory investigations were within normal parameters. A chest radiograph indicated an elevated left hemidiaphragm, reduced left lung volume, and rightward mediastinal shift (Figure 1A). A contrast-enhanced CT of the chest revealed marked eventration of the left diaphragmatic copula without any visible defect, rightward shift of the heart and mediastinum, and minimal atelectasis in the dependent parts of the left lower lobe (Figure 1B).

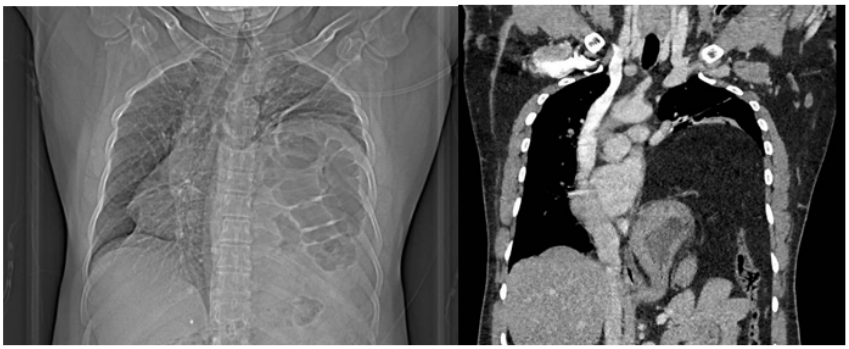

Figure 1A and 1B: *1A (Left side) CT scout Imaging showing elevation and eventration of the left hemidiaphragm, 1B (Right side) CT scan showing significant elevation of the left hemidiaphragm with mediastinal shifting.*

The patient was diagnosed with diaphragmatic eventration and was admitted to the thoracic surgery department for surgical correction. Given the significant elevation of the left diaphragm, an open thoracic approach was chosen. Anticipating a redundant diaphragm and restricted operative field, a muscle-sparing left anterolateral thoracotomy was performed in the 5th intercostal space, providing access to the anterior portion of the diaphragmatic leaflet. The diaphragm, though appearing morphologically normal, was relaxed. After incising the diaphragm anteriorly and peripherally, avoiding the major phrenic nerve branches, the transverse colon and spleen were relocated inferiorly. Due to significant diaphragmatic redundancy, a 10 x 6 cm elliptical muscle segment was excised. The diaphragm was subsequently reconstructed using a double breasted techniques. Postoperatively, the patient's recovery was uneventful. One month later, he reported significant symptom relief, and a chest radiograph confirmed near-complete left lung expansion (Figure 2).

Figure 2: *Post operative chest x-ray before discharge showing near full expansion of the left lung.*

Discussion

Genuine diaphragmatic "eventration" originates from a congenital underdevelopment of a section or the entirety of the diaphragm, leading to its thin, membranous appearance with reduced muscle fibers [1,2]. Conversely, "acquired paralysis" or "acquired elevation" pertains to diaphragmatic relaxation observed in older children and adults, believed to stem from partial or complete diaphragmatic paralysis, not congenital defects. Injuries, diseases such as polio, shingles, diphtheria, or flu, cancers, or autoimmune conditions can cause this relaxation. The "idiopathic" form, more common in adults, is attributed to a latent viral infection, typically presenting unilaterally [3]. Surgical correction is recommended for significant respiratory distress, especially if symptoms persist beyond 3 - 6 months. It's imperative to rule out other dyspnea causes before surgery.

Respiratory function tests before and after diaphragmatic correction demonstrated significant improvements in lung volumes, DLCO, and resting pO_2 over a 5-to-12-year follow-up [4,5]. The primary distinction between true eventration and its acquired counterpart is the potential for spontaneous resolution in the latter. The congenital form usually presents symptoms early in life due to the affected lung's developmental impairment.

In this case, the repair technique, termed imbrication, is frequently employed for a redundant diaphragm, contrasting with the historically used diaphragmatic plication methods like "Flag" or "Accordion" [6,7]. Imbrication involves opening the diaphragmatic dome and overlapping the muscle edges. When the diaphragm is substantially elevated, a section is resected before employing the double-breasted suture reconstruction technique.

Conclusion

Diaphragmatic eventration, whether congenital or acquired, poses significant clinical challenges given its impact on respiratory mechanics and overall pulmonary function. The presented case underscores the critical importance of early detection, comprehensive assessment, and timely surgical intervention in managing patients with this condition. The use of the imbrication technique, as highlighted, offers an effective surgical solution, ensuring both the restoration of the diaphragm's anatomical integrity and the improvement of the patient's respiratory function. This approach, combined with a thorough preoperative evaluation and postoperative care, can lead to favorable outcomes, as evidenced by the patient's rapid symptomatic relief and radiographic improvement.

Furthermore, it's worth emphasizing that while the symptoms of diaphragmatic eventration, such as exertional dyspnea, can be non-specific, a high index of clinical suspicion, especially in patients with progressive respiratory complaints, is paramount. Modern imaging modalities, including contrast-enhanced CT, play a pivotal role in confirming the diagnosis, assessing the degree of diaphragmatic elevation, and planning the surgical approach. The choice between various surgical techniques should be tailored to the individual patient's anatomical and clinical specifics.

Disclosure

Nothing to disclose.

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