

## Surgery of Eventration of the Diaphragm

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### Abstract:

**Background:** Eventration of the diaphragm is an abnormal elevation of the diaphragm. Publishing on eventration of diaphragm in Iraq is scarce.

**Objective:** This study was carried out to report on the Iraqi experience on eventration of diaphragm.

**Methods:** This study is a review of case records of 18 patients with eventration diaphragm treated in Ibn Al-Nafees Teaching Hospital during the period of March 2012 to December 2017.

**Results:** The age of patients ranged between 5 months to 70 years, with a male to female ratio of 2:1. Dyspnea was the dominating presenting symptoms followed by cough. The left hemidiaphragm was the most affected site (83.3%). The cause of eventration of the diaphragm was idiopathic in 72.2% of patients. Chest X ray showed the elevation of the affected hemidiaphragm while CT scan demonstrated the thinned-out raised hemidiaphragm. The most common complications were atelectasis, and recurrent chest infection. Hospital stay ranged between 4-14 days.

**Conclusion:** Eventration of the diaphragm is not uncommon in Iraq. Presentation, management, and complication are similar to those reported globally.

**Keywords:** Diaphragm. Eventration. Plication. Surgical repair. Phrenic nerve injury

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### Introduction:

Eventration of diaphragm (ED) is a rare condition in which all or parts of diaphragmatic muscle are replaced by fibroblastic tissue. The weakened hemidiaphragm is elevated and displaced into the thorax which can compromise breathing.<sup>1</sup>

Congenital eventration of the diaphragm is a spectrum of disorders that share the underlying cause of impaired fetal myotome migration. Mild cases may lack only the central tendon; whereas severe cases may lack the central tendon as well as the entire muscular diaphragm.<sup>2</sup> The phrenic nerve is normal. Acquired cases, also known as diaphragmatic paralysis or paresis, usually result from damage to the phrenic nerve, which in turn may be due to, thoracic surgery, tumors, inflammation, or central nervous system conditions, such as poliomyelitis.<sup>3, 4</sup>

Diaphragmatic elevation is poorly tolerated in neonates. The flaccid diaphragm compresses the lower lobe of the ipsilateral lung. Thus, there is

atelectasis of the ipsilateral lower lobe, compression of the left atrium and impediment to pulmonary venous blood flow, and contralateral lung compression with additional atelectasis. The result may be complete pulmonary failure which requires mechanical ventilation, to re-inflates the atelectatic lungs and balances the mobile mediastinum. The ipsilateral diaphragm is shifted into the abdomen.<sup>4</sup>

The diagnosis is typically made with a plain chest radiograph and to be confirmed with ultrasonography or fluoroscopy to notice paradoxical respiration on the affected area.<sup>4</sup> Surgical intervention is almost mandatory in symptomatic infants with eventration, and in adult population, the indications for surgery are less clear. Various techniques have been described in the literatures for plication of the diaphragm. Severe forms of congenital eventration of the diaphragm with only a pleuroperitoneal membrane will require patching.<sup>2</sup> The eventration can be repaired by thoracotomy, Video Assisted Thoracoscopic Surgery (VATS), total thoracoscopic technique, laparoscopy or hybrid technique.<sup>5-8</sup> This study was carried out to comment on Iraqi experience in dealing with eventration of diaphragm.

### Patients and Methods:

All case records of patients with ED treated surgically in Ibn-Al-Nafees teaching hospital were reviewed.

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The requested information was demographic data and presenting features (complaints, examination, and investigations). Plication of the diaphragm was done (started on the central tendon part of the diaphragm using 0 silk sutures and seven to nine lines of silk sutures were used). From the posteromedial to the anterolateral direction and by crossing the phrenic nerve fibers, and six to seven consecutive stitches at each line were performed. These sutures were hanged, and parallel plication was performed.

### Results:

A total of 18 case records were reviewed. The age range was 5 months to 70 years, giving male to female ratio of 2:1. Age distribution of this series is shown in Fig.1. It shows two peaks at  $\leq 1$  year and 50-59 years.

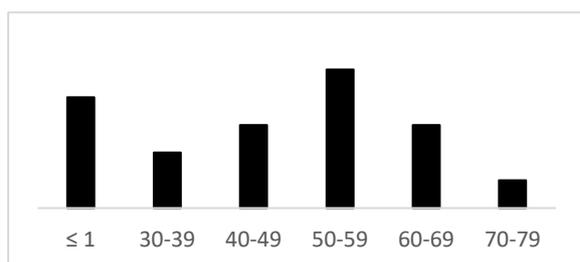


Fig. 1 Age distribution of cases with ED

Table 1 shows the presenting symptoms among the studied group. Dyspnea was manifested in 8 (44.4%) patients, cough was the complaint of 3 (16.6%) patients and tachypnea and recurrent chest infection were manifested in 2 (11.1%) for each. Chest pain, palpitation, and constipation were 1 (5.5%) for each. Trauma (road traffic accident), blunt chest trauma and surgery were obvious causes in 5 (27.8%). No obvious etiology was noticed in 13 (72.2%) patients (Table 2).

Table (1): Distribution of the common presenting symptoms.

Symptoms	Patients	
	No.	%
Dyspnea	8	44.4
Cough	3	16.6
Tachypnea	2	11.1
Recurrent chest infection	2	11.1
Chest pain	1	5.5
Palpitation	1	5.5
Constipation	1	5.5

Table (2): Distribution of etiology of ED in the studied group

Causes	patients	
	No.	%
Unknown	13	72.2
History of road traffic accident	2	11.1
History of blunt chest trauma	2	11.1
History of thoracic surgery	1	11.1

In all the studied cases, chest x ray showed elevation of affected hemidiaphragm as shown in figure (2).

CT scan of the chest showed raised affected hemidiaphragm.

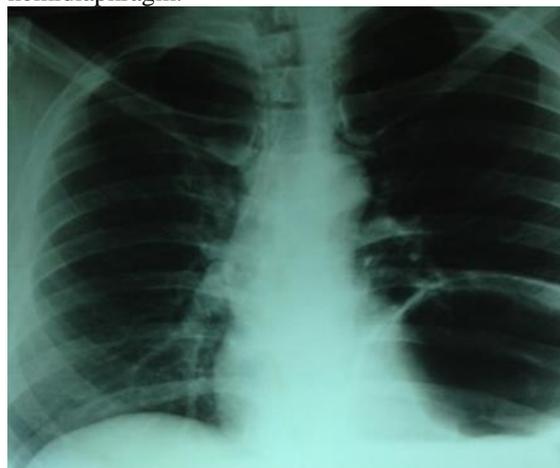


Figure (2): Chest –X-ray of a patient from our study, demonstrating eventration of the left hemidiaphragm. (Courtesy of Prof. Dr. Waleed M. Hussien)

All the patients were treated surgically. In 15 (83.3%) patients left posterolateral thoracotomy was done. Plication was the used surgical technique.

Seven patients (38.8%) patients developed complications. They were atelectasis in 2 (11.1%) patients, recurrent chest infection in 2 (11.1%), and pleural effusion and wound infection was seen in one (5.6%) for each patient. Recurrent eventration was noticed in one (5.6%) patient. No mortality was reported in this study. Hospitalization ranged from 4 – 14 days. The patients were followed at outpatient's clinic.

### Discussion:

This study showed a wide age range (5 months to 70 years), which was reported in previous study in Minia University Hospital Egypt.9 Other literature, 10-13 reported older age for ED. Male dominance was noticed in our series of ED, and it is also reported in the literatures.9-11 In the line with other studies, 10-12 dyspnea was the main presenting symptoms. Less common presenting symptoms in this study were (chest pain, palpitation, and constipation) and were also reported in other study.13 The left hemidiaphragm eventration was the dominant site in this study (83.3%). Is in consistence with that in literature.10-12 Idiopathic cause of ED was in 72.2%. It is consistent with that of other studies.13, 16 the finding is in contrast with that in reports considering that trauma was the major cause in their series.11, 12 the difference might be attributed to difference in the studied sample. A study 9 reported that the congenital cause was a prominent cause as the study was conducted in a pediatric center. Similar to that of other study, 11 the chests x ray finding was elevated hemidiaphragm. Literature 9, 10, 12 did not refer to chest X ray findings. This trend might be attributed to availability of highly sophisticated investigations.

The CT finding observed in this study was a thinned-out raised affected hemidiaphragm. It is in agreement with that reported in other study.11 others reported the use of tests like fluoroscopy and MRI.12, 13 such tests were not done in this study. The used surgical approach in managing patients was posterolateral thoracotomy left side (83.3%). It is consistent with that in other studies.11, 13 Thoracoscopic approach was reported.13 but it was not used in our study due to lack of expertise and the instrument. The most prominent complications were atelectasis and recurrent chest infection. Others reported similar findings.10, 13 The range of hospital stay in this study was (4-14 days) in consistence with that of other studies.9, 13 Recurrence of ED was observed in 5.5%. Similar findings were reported in another study.17 In the line of other studies10-12 no mortality was observed in this series. Follow up of patients of this series was poorly documented. It is a matter of lack of compliance of patients with regular visits.

#### Conclusion:

Eventration of diaphragm is not uncommon in Iraq. Presenting symptoms, management, and complications are similar to that reported in global centers.

#### Author's contributions:

**Waleed M. Hussien:** contributed to study conception, study design, data analysis and interpretation, drafting of the manuscript.

**Ahmed M. Mohammed and Akeel S. Yuser:** contributed to study conception, study design

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### جراحة الإندحاق الحجابي

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الخلاصة

الخلفية: الإندحاق الحجابي هو الإرتفاع غير الطبيعي للحجاب الحاجز.

الأهداف: أجريت الدراسة لتسجيل الخبرة العراقية في معالجة الإندحاق الحجابي.

المنهجية: أجريت الدراسة على ملفات ثمانية عشر مريضاً مصابين بإندحاق الحجاب الحاجز عولجوا في مستشفى بن النفيس التعليمي خلال الفترة من آذار 2012 إلى كانون الأول 2017.

النتائج: تراوحت أعمار المرضى بين خمسة أشهر إلى سبعين سنة وكانت نسبة الذكور إلى الإناث هو 1:2. ضيق النفس كان أهم عرض مرضي وبعده السعال. كان الحجاب الحاجز الأيسر متأثراً بنسبة 83.3% وكان سبب الإندحاق غير معروف بنسبة 72.2%. أشعة الصدر توضح الإرتفاع غير الطبيعي للحجاب الحاجز، بينما المفراس يظهر الحجاب رقيق ومرتفع. أهم المضاعفات كان الإنكماش الرئوي والتهاب القصبات الراجع. مدة المكوث في المستشفى تراوحت بين 4-14 يوماً حسب تحسن الحالة الصحية.

الاستنتاج: الإندحاق الحجابي ليس شائعاً في العراق وظهور اعراضه وعلاجه والمضاعفات مشابه لما مسجل عالمياً.

الكلمات المفتاحية: الحجاب الحاجز . الإندحاق . الطي . التصليح الجراحي . إصابة العصب الحجابي