

## Eventration of the diaphragm

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**Sriussadaporn S, Lerdlum S. Eventration of the diaphragm. Chula Med J 1998 Jan; 42 (1): 27-33**

*A case of eventration of the diaphragm is presented. The patient was a 52 year-old man presented with symptoms of frequent progressive dyspnea and pain at the left lower chest after meals during the prior 6 months. Physical examination revealed decreased breath sounds at the left lower lung field. A chest X-ray showed abnormally elevated left hemidiaphragm. Upper GI barium study revealed an abnormally high position of the fundus and body of the stomach. Operative repair of the eventrated diaphragm was performed with a left posterolateral thoracotomy through the 7th intercostal space. The paper-thin diaphragm was repaired by using the imbrication method. The postoperative course was uneventful with marked symptomatic improvement. He was discharged home on the 8th day with a normal chest X-ray. Symptomatic eventration of the diaphragm in adults is a relatively rare condition. Since the presenting symptoms may mimic the symptoms of hepatobiliary or cardiovascular diseases, preoperative evaluation should be carefully performed. Clinical improvement is usually obtained following appropriate surgical repair of the symptomatic eventration of the diaphragm.*

**Key words** : *Eventration, Diaphragm, Dyspnea.*

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Received for publication. November 10,1997.

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สุวิทย์ ศรีอัมภพร, สุกัลยา เลิศล้ำ. โรคกะบังลมหย่อนแต่กำเนิดในผู้ใหญ่. จุฬาลงกรณ์-  
เวชสาร 2541 ม.ค; 42 (1): 27-33

ได้รายงานผู้ป่วย 1 รายที่เป็นโรคกะบังลมหย่อนแต่กำเนิด เป็นผู้ป่วยชายอายุ 52 ปีมารับการ  
รักษาที่โรงพยาบาลจุฬาลงกรณ์ เมื่อเดือนกรกฎาคม พ.ศ.2540 ด้วยเรื่องรู้สึกหายใจขัดและเจ็บ  
บริเวณชายโครงซ้ายทุกครั้งหลังรับประทานอาหาร อาการเป็นมา ประมาณ 6 เดือนและเป็นมากขึ้น  
ในช่วง 3 เดือนหลัง ตรวจร่างกายพบว่าทั่ว ๆ ไปดูปกติดี ยกเว้นฟังเสียงหายใจได้เบาลงบริเวณ  
ตอนล่างของช่องอกด้านซ้าย เอ็กซเรย์ของปอดพบว่ากะบังลมข้างซ้ายยกสูงผิดปกติ แต่เคลื่อนไหว  
ได้ดีเมื่อหายใจเข้าออก จากการทำ upper GI barium study พบว่าตัวกระเพาะอาหารยกสูงเข้าไป  
ในช่องอกด้านซ้าย ผลการตรวจ ultrasound ของถุงน้ำดีและระบบทางเดินน้ำดีอยู่ในเกณฑ์ปกติ  
การตรวจคลื่นหัวใจและทำ exercise stress test อยู่ในเกณฑ์ปกติด้วยเช่นกัน ผู้ป่วยได้รับการผ่าตัด  
ซ่อมแซมกะบังลมหย่อน ด้วยวิธีimbrication โดยผ่าตัดเข้าทางแผลleft posterolateral thoracotomy  
ผ่านทางช่องซี่โครงที่ 7 หลังผ่าตัดผู้ป่วยฟื้นตัวดี อาการหายใจขัดเจ็บแน่นที่ชายโครงซ้ายหลังรับ  
ประทานอาหารหายไป เอ็กซเรย์ปอด พบว่ากะบังลมข้างซ้ายกลับคืนสูงตำแหน่งปกติ โรคกะบังลม  
หย่อนแต่กำเนิดในผู้ใหญ่ที่มีอาการมากจนต้องผ่าตัดรักษาพบได้ไม่บ่อย การผ่าตัดมักช่วยให้ผู้ป่วย  
ดีขึ้นจากอาการของระบบทางเดินหายใจและระบบทางเดินอาหาร ก่อนผ่าตัดควรตรวจดูความ  
ผิดปกติของถุงน้ำดี ระบบทางเดินน้ำดีและระบบหัวใจและปอด ซึ่งอาจทำให้เกิดอาการคล้ายกันด้วย

Eventration of the diaphragm is defined as an abnormal elevation of all or a portion of one diaphragmatic leaf.<sup>(1,2)</sup> It is an uncommon condition and has been previously reported as being found on routine chest X-rays from once in every 1,400 to once in every 13,000 examination.<sup>(3-5)</sup> Small localized eventrations are frequently asymptomatic and do not warrant surgical intervention. For symptomatic eventration, patients usually complain of respiratory and/or gastrointestinal disturbances. However, other diseases of the pulmonary, cardiac, hepatobiliary, or gastrointestinal systems may also have similar symptoms and the attending surgeon should be aware of such similarities to avoid an unnecessary operation on the diaphragm. Morrison, in 1923, accomplished the first successful surgical repair in a 10 year-old girl.<sup>(6)</sup> Chin and Lynn<sup>(3)</sup> found that surgical repair was necessary in only 5 of the 32 patients of their reported series.

We report here a case of eventration of the diaphragm requiring surgical repair which resulted in immediate relief of symptoms.

### Case presentation

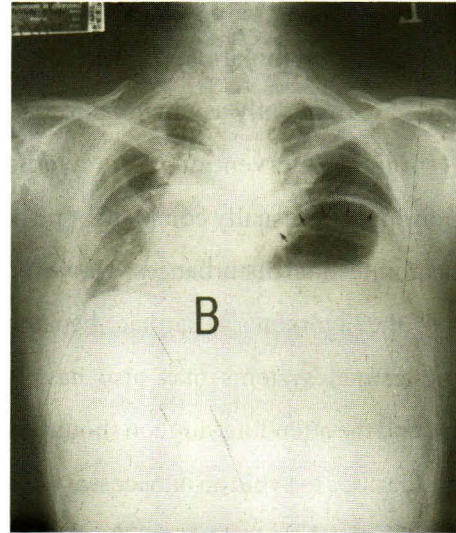
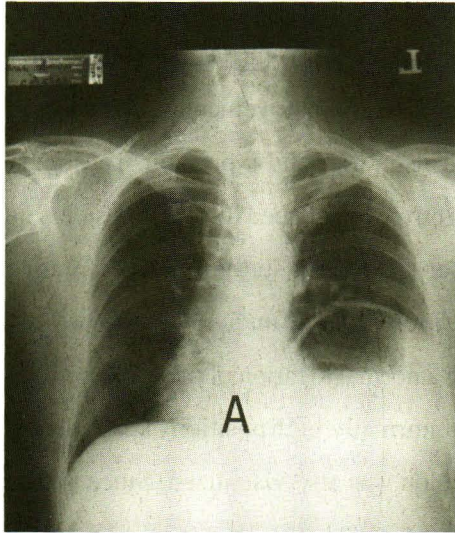
A 52 year old man was admitted on July 21, 1997, because of frequent dyspnea and pain at the left lower chest after meals during the prior 6 months. The symptoms persisted until the stomach was naturally emptied. His symptoms were progressive, especially during the last 3 months. He was previously healthy with no history of significant accidents or trauma. Physical examination revealed a slightly over weight patient (66 kg in weight, 164 cm in height). The blood pressure was 130/90 mHg, pulse

84/minute, respiration 14/minue. Decreased breath sounds at the left lower lung field was observed. Other physical findings of the chest, heart and abdomen were unremarkable. Roengenograms of the chest showed a marked elevation of the left hemidiaphragm with partial atelectasis of the left lower lobe. Normal movement of the diaphragm was noted on inspiration and expiration. The mediastinum was slightly displaced to the right side (Figure 1). An upper GI barium study revealed an abnormally high position of the fundus and body of the stomach but with a normal location of the EG junction (Figure 2). An abnormally high position of the splenic flexure of the colon was also visualized. Since symptomatic gall stones and ischemic heart disease may also cause post-pandrial epigastric discomfort similar to symptom of the presented case, therefore, ultrasonography of the hepatobilliary system and and electrocardiography with an exercise stress test were performed, all of which turned out normal. The operation was subsequently scheduled to correct the symptomatic eventration of the diaphragm.

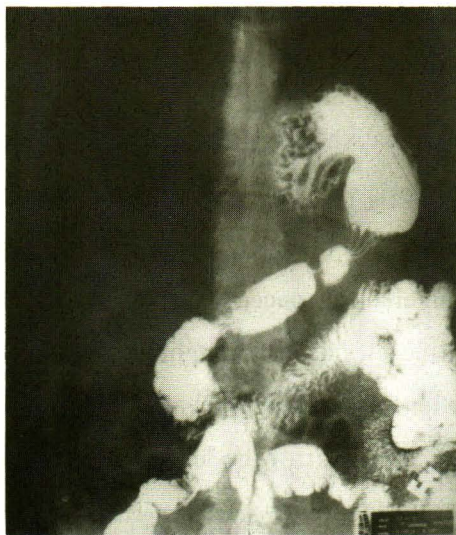
Operative repair was performed under general anesthesia via a left posterolateral thoracotomy incision. The left pleural cavity was entered through the 7th intercostal space. No adhesion between the lung and the left side of the diaphragm was found. The left portion of diaphragm was markedly elevated with a greater part of the leaf thinned and almost translucent (Figures 3 and 4). The lung and the phrenic nerve appeared normal. The diaphragm was restored to its normal position by the imbrication method as described by Shields<sup>(7)</sup> (Figures 5 and 6). The redundant part of the diaphragm was removed

and sent for pathological examination. Few layers of fascicles of skeletal muscle were observed from the pathological sections. The postoperative course was

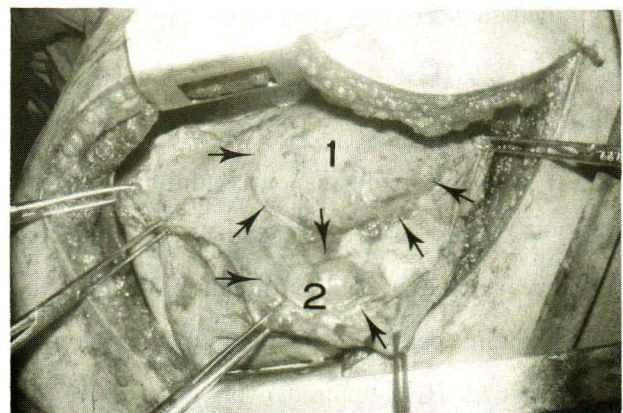
uneventful. The patient's symptoms were immediately relieved. He was discharged home on the 8th day with a normal chest X-ray (Figure 7).



**Figure 1.** Chest roentgenograms reveal marked elevation of the left hemidiaphragm (arrows) with normal movement on inspiration (A) and expiration (B). The mediastinum is slightly displaced to the right side.

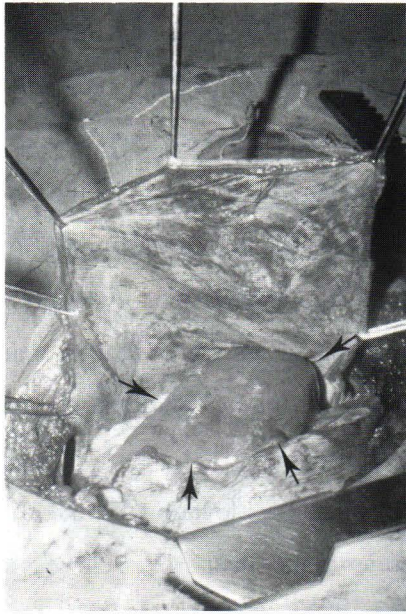


**Figure 2.** Upper GI study shows abnormal high position of the fundus and body of the stomach with normal location of the EG junction.

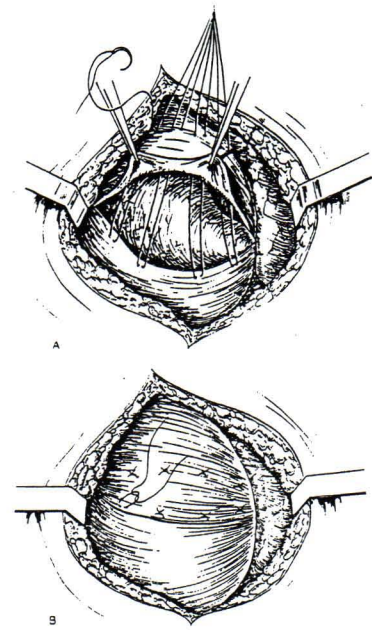


**Figure 3.** Showing the paper-thin left diaphragmatic leaf during operative repair. The spleen (1) and splenic flexure of the colon (2) can be visualized through the translucent diaphragm (arrows).





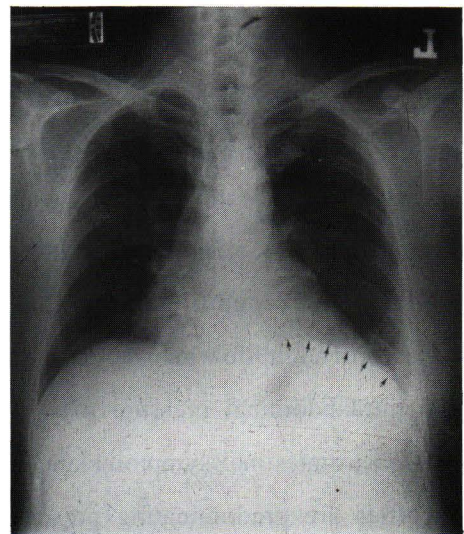
**Figure 4.** The thin diaphragm was open showing the spleen underneath (arrows).



**Figure 5.** Showing technique of repair eventration of the diaphragm with imbrication method (A and B).



**Figure 6.** Showing the diaphragm after imbrication. Suture lines are seen (arrows). The diaphragm is no longer transparent and the spleen cannot be seen through the imbricated diaphragm.



**Figure 7.** Chest X-ray 1 week after operation reveals normal position of the left diaphragm.

### Discussion

Eventration of the diaphragm is a congenital abnormality due to failure of muscularization of the diaphragm. It may be a partial or complete eventration.

In complete eventration, the whole dome may be involved and the diaphragm is represented by a thin, diaphanous membrane attached peripherally to normal muscle.<sup>(3)</sup> Eventration of the diaphragm is a

different clinical entity from diaphragmatic paralysis. Apart from the membranous appearance of the abnormal area in diaphragmatic eventration, a marked left-sided predominance is also found. A partial form of eventration of the diaphragm is usually asymptomatic while in the complete form, symptoms may be present during infancy. On the other hand, unilateral paralysis of the diaphragm is an acquired condition with no side predominance and is often symptomatic. During thoracotomy, it is not difficult to distinguish eventration with its membranous appearance from diaphragmatic paralysis, in which the diaphragm, even if somewhat atrophic, is fully muscular.<sup>(8)</sup> In our case report, the presentations, investigations, operative findings, and pathological examination of the diaphragm were all compatible with the diagnosis of eventration of the diaphragm.

Eventration may be detected at any age. In one study involving 32 patients, the ages ranged from 13-72 years.<sup>(3)</sup> There is no definite clinical picture by which the diagnosis can be made. In newborn, it may cause death from cardiorespiratory failure. Once beyond infancy the condition tends to remain symptomless until adult life when increasing weight and raised intraabdominal pressure may produce symptoms. Gastrointestinal symptoms and respiratory difficulties are predominating presentations. However, severe respiratory disturbance or even cardiac distress may occur.<sup>(9)</sup> The pulmonary symptoms accompanying eventration result from restriction of ventilation due to loss of diaphragmatic function and position, as well as paradoxical motion

of the involved leaf. Respiratory symptoms are most prominent in the very young and in those over 40 or 50 years old, when ventilatory reserve is decreased.<sup>(6)</sup> The gastrointestinal symptoms include epigastric pain, flatulence, belching, or gastrointestinal bleeding.<sup>(3)</sup> Rare complications of eventration of the diaphragm such as gastric volvulus, cardia and pyloric obstruction, and diaphragmatic rupture have also been reported.<sup>(10,11)</sup>

Conspicuous elevation of the diaphragm which presents a smooth unbroken curve is said to be one of the cardinal diagnostic features of complete eventration. Barium meal and enema are frequently diagnostic as they may demonstrate the stomach rolling upside down along side the splenic flexure of the colon beneath the intact dome of the diaphragm.

In the majority of cases of eventration of the diaphragm, surgical treatment is unnecessary. However, when definite symptoms occur, surgery should be undertaken. Surgical repair should be performed by posterolateral thoracotomy incision through the 6th, 7th, or 8th intercostal space. Correction of the eventrated diaphragmatic leaf may be performed by: 1) resection of the redundant membrane and suturing of the muscular component,<sup>(3,12)</sup> 2) plication of the diaphragm,<sup>(6,7,13)</sup> or 3) imbrication of the diaphragm<sup>(7)</sup> which was the procedure performed in our study. Recently, repair of diaphragmatic eventration has been successfully performed by video-assisted thoracoscopy which offers patients the advantages of a minimally invasive operation.<sup>(14)</sup>

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