this patient either clinically or radiologically, although he did not have a repeat esophagoscopy postoperatively. In Wilkins and Bartlett's series, one case which was closed circumferentially also did not result in reflux. It appears from all the reported cases that reflux is not a problem no matter what method is used to correct the pathology unless radical resection with esophagogastrectomy is performed.

This case also brings to focus the basic problem of the etiology of a lower esophageal ring, a subject not yet fully investigated. At the least it raises the possibility that a developmental anomaly is involved which, for as yet unknown reasons, does not manifest itself until late adult life.

References

Reprint requests: Dr. Hadidian, 203 Greene Street, Cumberland, Maryland 21502

Pneumoperitoneum for Diagnosis of Localized Eventration of the Diaphragm with Liver Hernia*

Cecil C. Vaughn, M.D.

The diagnosis of the right sided diaphragmatic eventration with liver hernia can be made in most cases by the use of diagnostic pneumoperitoneum. Patients with this abnormality are usually asymptomatic. A right cardiophrenic mass may be seen in the chest x-ray films. Operative treatment is rarely indicated. Two elderly patients are presented in which diagnosis was easily established by diagnostic pneumoperitoneum. Surgical repair was not performed.

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A n asymptomatic radioopaque mass at the right cardiophrenic angle is a diagnostic challenge to the clinician. Many different types of lesions are possible. Cardiophrenic masses which appear continuous with the hepatic opacity may be liver extending into a localized diaphragmatic eventration. One relatively simple diagnostic study, pneumoperitoneum followed by erect chest x-ray examination, will define this entity. Subsequent studies will usually be unnecessary and surgical treatment is rarely indicated. The following two case reports illustrate the use of pneumoperitoneum to make the diagnosis of segmental eventration of the right hemidiaphragm. Many studies, including diagnostic thoracotomy, and prolonged hospitalization were avoided by diagnostic pneumoperitoneum.

Case Reports

Case 1:

A 78-year-old man was referred to the University of Utah Medical Center because of an abnormal appearance on his chest x-ray film (Fig 1). He denied dyspnea, hemoptysis, cough, chest pain, chest trauma, orthopnea, or weight loss. Physical examination and laboratory studies were within normal limits. Radioactive liver scan was normal. Electrocardiogram showed an old posterior myocardial infarction. Pneumoperitoneum was performed by injecting 500 ml of air into the right lower abdominal quadrant under local anesthesia. Erect lateral chest x-ray film following pneumoperitoneum is shown in Figure 2.

The diagnosis of right diaphragmatic eventration with liver hernia was made by pneumoperitoneum. The patient was discharged.

Case 2:

A 73-year-old man* was admitted to the Latter Day Saints Hospital.

*Presented courtesy Preston R. Cutler, M.D., Salt Lake City, Utah.

Figure 1. Erect posterior-anterior film shows a large, well circumscribed, antero-basal radiopaque mass at the right cardiophrenic angle.
Erect lateral film following pneumoperitoneum showing the eventrated diaphragmatic segment contrasted by intraperitoneal air. The outline of the eventrated segment corresponds to the mass seen in Figure 1.

Saints Hospital, Salt Lake City because of abnormal findings on chest x-ray examination. He denied any cardiopulmonary symptoms except mild dyspnea on exertion. He had fallen from a height of approximately six feet and struck his right hemithorax several years before admission. He did not sustain rib fractures and had no known sequelae from this minor injury. At physical examination, he had moderate hypertension. Laboratory studies were within normal limits.

Lateral chest x-ray appearance is shown in Figure 3 revealing a right anterobasal opaque mass. Diagnostic pneumoperitoneum was performed and chest x-ray films were exposed in the erect posterior-anterior (Fig 4) and lateral positions. Following pneumoperitoneum, the patient had some respiratory distress which was promptly relieved by aspiration of the air from the abdominal cavity. He was discharged with a diagnosis of diaphragmatic eventration and liver hernia.

**DISCUSSION**

Diaphragmatic eventration was first described by Pettit in the 18th century. Beclard gave the term eventration, which means out of (e) the belly (venter). It may be defined as an abnormal elevation of a phrenic leaf as a result of aplasia, paralysis, or atrophy.¹²

The etiology may be congenital or acquired. Congenital eventration usually occurs on the left side and may be infrequently associated with extralobar sequestration of the lung. Ravitch and Handlesman³ described right sided diaphragmatic eventration with liver hernia in infants. Acquired diaphragmatic eventration may result from some impairment of phrenic nerve function. This may be caused by a variety of conditions including tumor, lung abscess, subphrenic abscess, aneurysm, Echinococcus infections, pericarditis, influenza, syphilis, and alcohol or lead poisoning.¹ More often, the etiology is obscure.
Eventrations are usually asymptomatic. Pressure on contiguous lung, heart, and great vessels and strangulation of the liver are rare. Abnormal appearances of chest x-ray films are the usual cause for medical consultation. Eventration may cause severe respiratory embarrassment in the infant, as reported by Ravitch and Handlesman.

The differential diagnosis of a right cardiophrenic radiopaque mass includes primary lung lesions, diaphragmatic tumor or cyst, pericardial lipoma, cyst, or diverticulum, neurogenic tumors, hernia of the foramen of Morgagni, and diaphragmatic eventration with herniation of the subjacent liver. One should begin the diagnostic evaluation by establishing, as far as possible, the origin of the lesion, i.e. lung, pleura, pericardium or diaphragm. Posterior-anterior and lateral x-ray films of the chest may show an opacity continuous with the liver. Chest laminography will occasionally delineate a diaphragmatic lesion separate from the lung parenchyma. Diagnostic pneumoperitoneum may demonstrate diaphragmatic eventration and eliminate the need for further diagnostic studies. Liver scan may be helpful in establishing the presence of liver below the eventrated segment of the diaphragm.

Surgical treatment of asymptomatic diaphragmatic eventration with liver hernia is unnecessary. In the rare event of strangulation or excessive pressure on contiguous viscera, operative reduction of the hernia and appropriate reconstruction of the eventrated diaphragmatic segment may be required. Wolfson and Goldman report strangulating hernia of the liver through an eventrated diaphragmatic segment successfully operated on in an infant. Vaughn reported repair of a localized diaphragmatic eventration with liver hernia. This latter case represented a small eventration with a nodule of liver presenting through it. Constriction at the base of the herniating liver nodule indicated how strangulation of the liver might occur in this entity.

REFERENCES


Reprint requests: Dr. Vaughn, 1532 Arlington Drive, Salt Lake City 84103

Vectorcardiogram Simulating Myocardial Infarction in Idiopathic Hypertrophic Subaortic Stenosis*

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Vectorcardiograms and electrocardiograms that simulated patterns of myocardial infarction were recorded in two patients with idiopathic hypertrophic subaortic stenosis. Both patients had normal coronary arteries as shown by selective coronary arteriography. The angiographic evidence of normal coronary arteries in these patients supports the clinical impression that both the vectorcardiogram and the electrocardiogram can simulate myocardial infarction in patients with idiopathic hypertrophic subaortic stenosis. The vectorcardiogram may not distinguish between the electrocardiographic pattern of myocardial infarction and the electrocardiographic pattern that mimics myocardial infarction in such patients.

Vectorcardiograms compatible with myocardial infarction occasionally have been reported in patients with idiopathic hypertrophic subaortic stenosis. Clinical evidence indicates that the vectorcardiograms of these patients merely simulate myocardial infarction and in fact are due to other mechanisms. Few studies of the coronary arteries of such patients are available to determine whether or not the coronary arteries were patent. This report describes two patients with idiopathic hypertrophic subaortic stenosis who had vectorcardiograms and electrocardiograms compatible with myocardial infarction and who had normal selective coronary arteriograms. The angiographic evidence of normal coronary arteries in these patients supports the clinical impression that both the vectorcardiogram and the electrocardiogram of patients with idiopathic hypertrophic subaortic stenosis can simulate a pattern of transmural myocardial infarction. Vectorcardiograms may not distinguish between the electrocardiographic pattern of myocardial infarction and the electrocardiographic pattern that mimics myocardial infarction in patients with subaortic stenosis. A correct diagnosis may be facilitated by awareness of this hazard in vectorcardiographic as well as electrocardiographic interpretation.

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