

DIAGNOSIS OF POSTEROLATERAL CONGENITAL DIAPHRAGMATIC (BOCHDALEK) HERNIA BY LIVER SCINTIGRAM: CASE REPORT

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A characteristic liver scintigraphic finding was observed in a 2-month-old infant with hepatic herniation through a right-sided posterolateral congenital diaphragmatic defect (Bochdalek). The liver scintigrams showed an oblique band of decreased radioactivity dividing the liver into an inferior anteromedial portion and a superior posterolateral portion. In spite of the markedly abnormal liver scintigram, other diagnostic studies, including pneumoperitoneum abdominal radiography, remained negative. The liver scintigram can provide life-saving information in the diagnosis of congenital diaphragmatic hernia, as in the present case. The distinctive liver-scan findings among the various types of common diaphragmatic hernias are also briefly reviewed.

The liver scintigram can be of great value in the early diagnosis of congenital diaphragmatic hernia in infancy. The characteristic findings in a case of right-sided posterolateral (Bochdalek) diaphragmatic hernia will be presented.

The incidence of Bochdalek hernia is 0.8 per 10,000 live births, six times more frequent than the parasternal hernia of Morgagni. On reviewing 343

cases in the literature, we estimated that the left-sided hernia is about 6.5 times more common than that of the right side: namely, 86% left-sided, 13% right-sided, and 1% bilateral.

CASE REPORT

A 4-week-old male infant was first seen at an outlying general hospital with a 1-day history of cyanotic spells and whistling cough following a few episodes of vomiting. The possibility of a right diaphragmatic hernia was considered and diagnostic pneumothorax chest radiography was performed. However, no abnormality was detected in the right hemidiaphragm (Fig. 1). Subsequently, diagnostic pneumoperitoneum abdominal radiography was performed and the right hemidiaphragm again appeared intact.

A ^{99m}Tc -sulfur colloid scintigram of the liver was performed the same day using a Picker Nuclear Dyna-Camera. The dynamic study (radionuclide hepatic angiography) provided no evidence of subdiaphragmatic abscess. The right lower chest was not perfused during the pulmonary perfusion phase but

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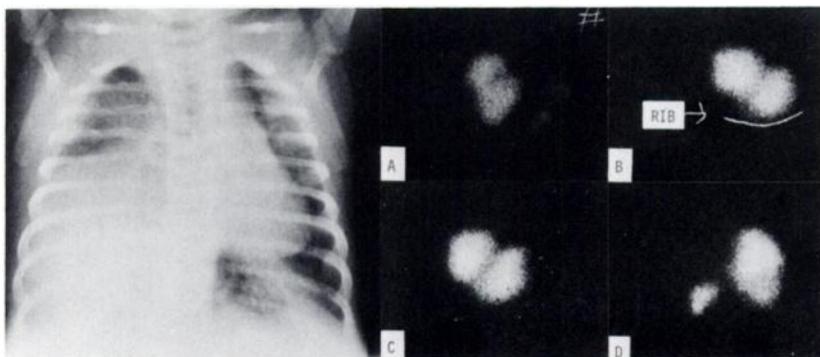


FIG. 1. Chest x-ray and liver scintigram of 4-week-old infant. Chest x-ray obtained after thoracocentesis. Note marked elevation of "right hemidiaphragm." Liver scintigram: (A) Anterior view: note indentation and "band" dividing liver into two portions. (B) Right lateral view: "band" divides liver into superoposterior and inferoanterior portions. "RIB" indicates lower costal margin. (C) Right anterior oblique view: note "hamburger" appearance of liver. (D) Posterior view: note that herniated portion is much higher than spleen and appears more distinct in contrast to weaker inferior portion, which is farther away from camera.

was perfused during the portal venous perfusion phase (24 sec after injection). The static scintigrams of the liver were most unusual (Fig. 1). In the anterior view, an oblique band of decreased activity was seen dividing the liver into a superior lateral portion and an inferior medial portion. In the lateral view, a similar oblique cold band is seen dividing the liver into a superior posterior portion and an inferior anterior portion. The right anterior oblique view reveals the band most clearly, giving the liver a "hamburger" appearance. The diagnostic impression from the study was probable posterolateral diaphragmatic hernia with part of the right lobe of the liver protruding above the diaphragm.

An ultrasound B-mode scan of the liver was performed, but the findings were inconclusive. The significance of the liver scintigrams was unfortunately not appreciated, since the usually definitive diagnostic radiographic studies were negative. Two weeks after the liver scintigram, the condition of the infant suddenly deteriorated. He went into acute respiratory distress and the chest x-ray showed a complete opacification of the right lung. Emergency fluoroscopy showed paradoxical movement of the right hemidiaphragm and a gastrointestinal series now showed small bowel in the right chest. Surgery was performed immediately.

At operation, there was a very large posterolateral hernia of the right diaphragm, with the entire liver displaced cephalad into the pleural cavity along with some loops of the small bowel. The infant had an unremarkable postoperative recovery and was discharged 10 days later.

DISCUSSION

The diaphragm is formed from four embryonic components: the septum transversum, the dorsal mesentery of the foregut, the pleuroperitoneal membrane, and a peripheral costal component. If the intestine returns into the abdominal coelomic cavity (which usually occurs at the tenth week) before firm closure of the pleuroperitoneal canal or the lumbocostal trigone has occurred, a hernia of the pleuroperitoneal canal or a hernia of the foramen of Bochdalek, respectively, is believed to result. Since the hernia that Bochdalek originally described is a defect in the lumbocostal trigone rather than of the pleuroperitoneal canal, some authors have discouraged the use of the term "hernia of the foramen of Bochdalek" to describe the more common hernia involving the pleuroperitoneal canal. The term "posterolateral congenital diaphragmatic hernia" appears to be more accurate, although the eponym Bochdalek is more commonly used.

This case shows the value of a liver scintigram in the diagnosis of right-sided posterolateral (Boch-

TYPE	ANTERIOR VIEW		RIGHT LATERAL VIEW	
	Right	Left	Post	Ant.
POSTEROLATERAL DEFECT (Bochdalek) A				
PARASTERNAL DEFECT (Morgagni) Comer, et al, 1973 Korobkin, et al, 1973 Soucek, 1975* Spencer, et al, 1971* B				
SEPTUM TRANSVERSUM DEFECT Tinglestad, et al, 1974 C				
TRAUMATIC HERNIATION Armstrong, et al, 1968 & 1970 Jallah, et al, 1970 D				

FIG. 2. Summary of common liver-imaging patterns in various types of diaphragmatic hernia reported in literature. Location and configuration of herniation can be characteristic. Dotted line in Fig. 2D denotes serration; asterisks denote literature cases not confirmed by operation.

dalek) hernia. The plugging of the defect in the right hemidiaphragm by the liver made the usually definitive diagnostic radiographic procedures negative. The liver scintigram was the only positive study before the defect yielded further and led to a sudden deterioration of the patient's condition. The high mortality of untreated congenital diaphragmatic hernia has been well documented. Immediate surgery is indicated if the infant is older than 24 hr. Clearly, the liver scintigram can give life-saving information in the early diagnosis of a posterolateral congenital diaphragmatic hernia.

The use of liver scans in the diagnosis of congenital and acquired diaphragmatic hernia has been described by various authors (1-8). These are summarized in Fig. 2. The liver images in these various situations vary characteristically with the location of the hernia. If the diaphragmatic defect is not too large, we feel that one can distinguish some of the various kinds of congenital diaphragmatic hernia by the liver scan with a certain degree of confidence. In this case of posterolateral congenital diaphragmatic hernia (Bochdalek), the "band sign" appears to be pathognomonic of a diaphragmatic hernia (provided that the costal margin is not mistaken for such a band) and the location of the hepatic herniation identifies the hernia as being posterolateral in type.

Finally, this case reports the rare intrathoracic ac-

cessory lobe of the liver with a small pedicle connecting to the liver below the diaphragm. It might not be possible to distinguish an accessory lobe from a genuine liver herniation by liver scan before operation.

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REFERENCES

1. ARMSTRONG RG, DOOLEY BN, HOOD RH: Liver scan in the diagnosis of ruptured right hemidiaphragm with herniation of the liver. *Ann Thorac Surg* 6: 480-483, 1968
2. ARMSTRONG RG, STANFORD W: Liver scan in the diagnosis of liver hernia. *Am Fam Physician* 1: 87, 1970
3. JALLAH EM, FRATER RWM, FREEMAN LM: Tension hepatothorax diagnosed by rapid scintiphography. *J Thorac Cardiovas Surg* 59: 283-286, 1970
4. SPENCER RP, SPACKMAN JJ, PEARSON HA: Diagnosis of right diaphragmatic eventration by means of liver scan. *Radiology* 99: 375-376, 1971
5. SOUCEK CD: Foramen of Morgagni hernia diagnosed by liver scan. *J Nucl Med* 16: 261-263, 1975
6. TINGLESTAD JB, HOWELL TR, SHARPE AR: Diagnosis of omphalocele and diaphragmatic hernia and hepatopericardium using ^{99m}Tc-sulfur colloid. *J Nucl Med* 15: 42-44, 1974
7. COMER TP, SCHMALHORST WR, ARBEGAST NR: Foramen of Morgagni hernia diagnosed by liver scan. *Chest* 63: 1036-1038, 1973
8. KOROBKIN MT, MILLER SW, DELORIMIER LS, et al: Hepatic herniation through the Morgagni foramen. *Am J Dis Child* 126: 217-219, 1973

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