

---

# CASE REPORTS

---

## SCINTIGRAPHY IN EVALUATION OF THE HYPOPLASTIC RIGHT HEPATIC LOBE: A RARE VARIANT

Sudhir K. Suneja, MD, and James S. Teal, MD  
Washington, DC

**A rare variant of right hepatic lobe hypoplasia associated with high gallbladder position in the right upper abdomen is described. Pain is frequent and may be due to cholelithiasis. It is important to recognize this variant because an associated hypertrophic left hepatic lobe can clinically masquerade as an abdominal mass. Radionuclide studies and abdominal computerized tomography are useful in defining the hypertrophied left hepatic lobe and ectopic gallbladder. The duodenum and hepatic flexure are positioned high due to space left by the hypoplastic right lobe.**

The range of normal hepatic configuration must be considered in scintigraphic evaluation of liver disease. Several normal variants exist and have been described in the literature.<sup>1,2</sup> The rare variant of right hepatic lobe hypoplasia associated with a high gallbladder in the right upper quadrant is described. This anomaly has been previously described in the surgical literature. McAfee et al<sup>2</sup> illustrate it diagrammatically in their large series.<sup>2</sup> Imaging studies of a patient with right lobe hypoplasia are discussed.

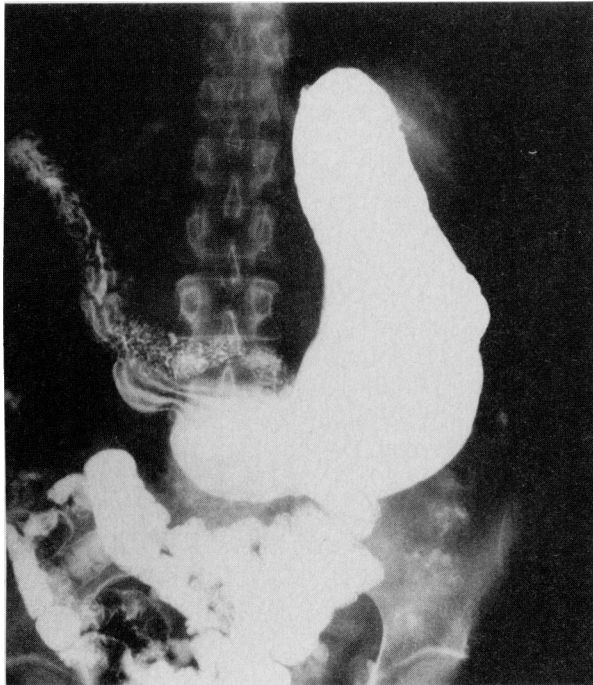
---

From Howard University Hospital, Department of Radiology, Washington, DC. Requests for reprints should be addressed to Dr. Sudhir K. Suneja, Howard University Hospital, Department of Radiology, 2041 Georgia Avenue, NW, Washington, DC 20060.

### CASE REPORT

A 56-year-old white female experienced right upper abdominal pain for several days, nausea without vomiting, and epigastric distress. Abdominal palpation revealed mild tenderness in the right upper quadrant and fullness in the epigastric region leading to a clinical suspicion of abdominal mass. There was no history of alcoholism or previous abdominal surgery. Gastroscopy revealed mild gastritis and an extrinsic impression on the lesser curvature aspect of the stomach. Plain radiography of abdomen suggested a soft tissue mass in the epigastrium associated with an air fluid level in the right upper quadrant. A barium upper gastrointestinal study (Figure 1) demonstrated the duodenum extending high into the right upper quadrant. Oral cholecystography, sonography, and endoscopic retrograde cholangiopancreatography were not helpful in elucidating the involved anatomy. Abdominal computerized tomography (CT) (Figure 2A, B) was performed, however, an intrahepatic segment of the inferior vena cava was not seen on any of the CT images. Due to the clinical suspicion and CT demonstration of biliary tract disease, hepatobiliary radionuclide imaging (Figure 3A, B) was performed. A round structure in the right upper quadrant was noted to fill and empty, probably representing a segment of duodenal loop en face; however, no evidence of gallbladder uptake was identified indicating cystic duct obstruction. The patient was evaluated on an ambulatory basis; she did not seek surgical consultation and was subsequently lost to follow-up. Radiocolloid imaging (Figure 4) revealed a "bizarre" somewhat kidney-shaped hepatic configuration.

continued on page 209



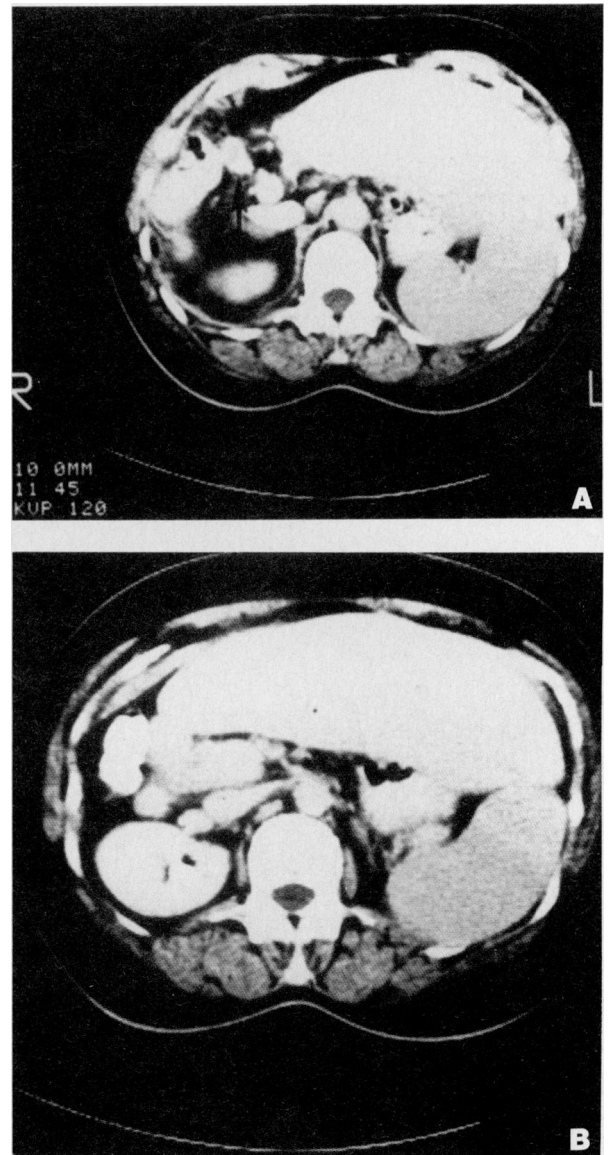
**Figure 1. Upper gastrointestinal contrast examination. The duodenal loop is unusually high and laterally positioned; the spleen is enlarged.**

continued from page 205

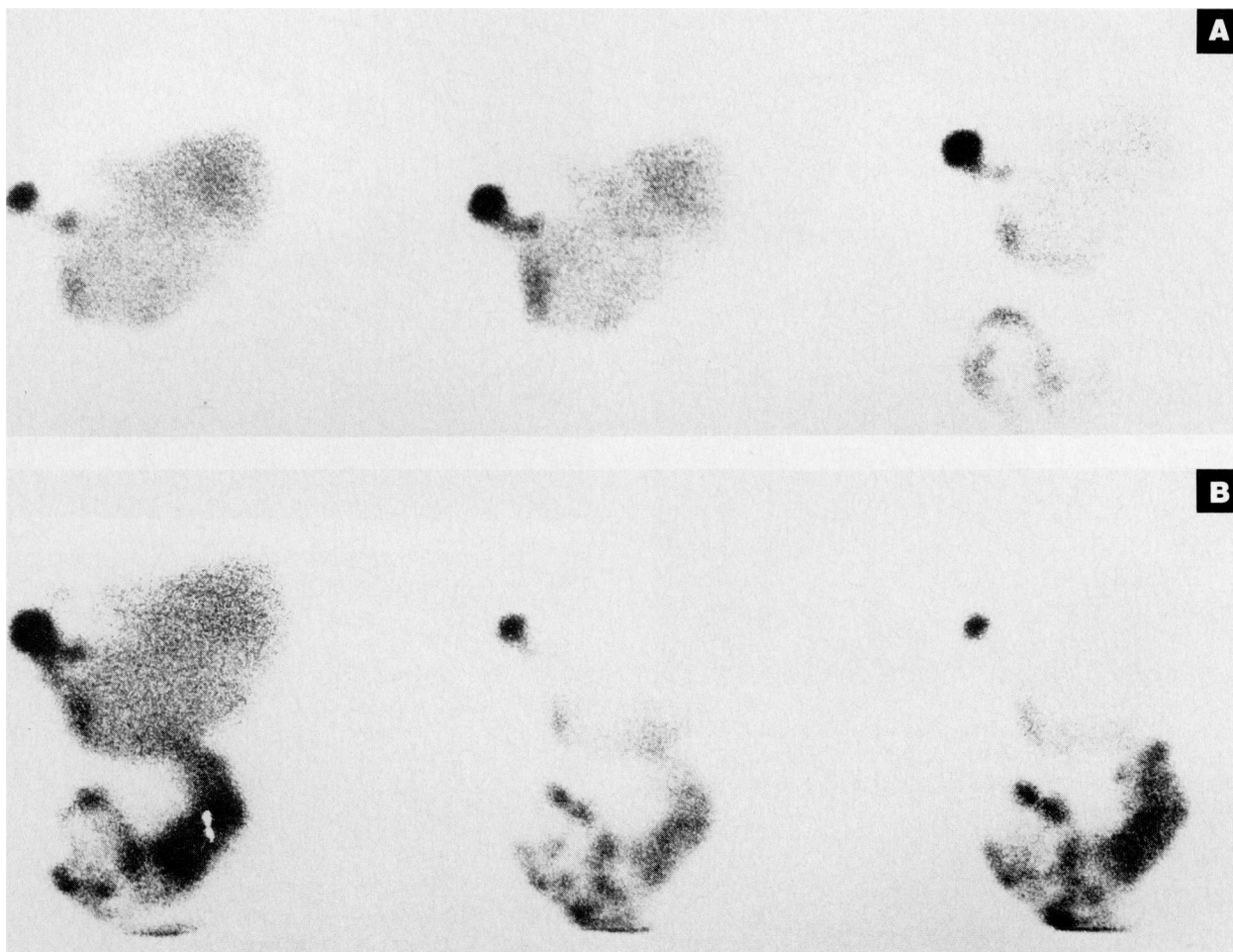
## DISCUSSION

Considerable variability in hepatic configuration is known to occur. McAfee et al<sup>2</sup> reported the scintigraphic appearances of the liver in a large group of patients of which 65% had the typical triangular configuration, 14% had the "policeman's hat" shape, 12% had a "square" shape due to a relatively large left lobe, 3% had globular hepatic configuration, 4% had Riedel's lobe, and others had additional rare configurations. One of the rare variants, including congenital interposition of colon between the liver and lateral abdominal wall is described here.

Hypoplasia of the right hepatic lobe is a rare variant and is associated with an abnormally positioned gallbladder.<sup>3-6</sup> During embryonic development, the liver appears as an entodermal outgrowth of the foregut into mesodermal surroundings. Continued cellular growth leads to the development of the cephalic division (pars hepatica) and the smaller caudal division (pars cystica).<sup>7</sup> The pars hepatica grows by tridimensional budding of the primary bile ductules around the portal branches. The final shape of the liver is determined to a certain extent by pressure from adjacent organs. Unequal



**Figure 2. Selected abdominal CT images. A. CT image at level of superior aspect of right kidney. The bulk of hepatic tissue on the slice is toward the left of midline, representing the hypertrophied left lobe; the spleen is enlarged. A small calcified stone (arrow) is visualized in the neck of a contracted gallbladder; the gallbladder and colon are high in the right upper quadrant with bowel interposed between the gallbladder and lateral abdominal wall. B. CT scan at mid-right kidney level. The liver is anteriorly located, extending predominantly to left of midline.**



**Figure 3. Hepatobiliary radionuclide imaging. A. Selected images at 15, 20, and 30 minutes. Note the unusual hepatic configuration. Right lobe is hypoplastic; left lobe appears kidney-shaped and enlarged. A laterally located round structure to the right of liver probably repre-**

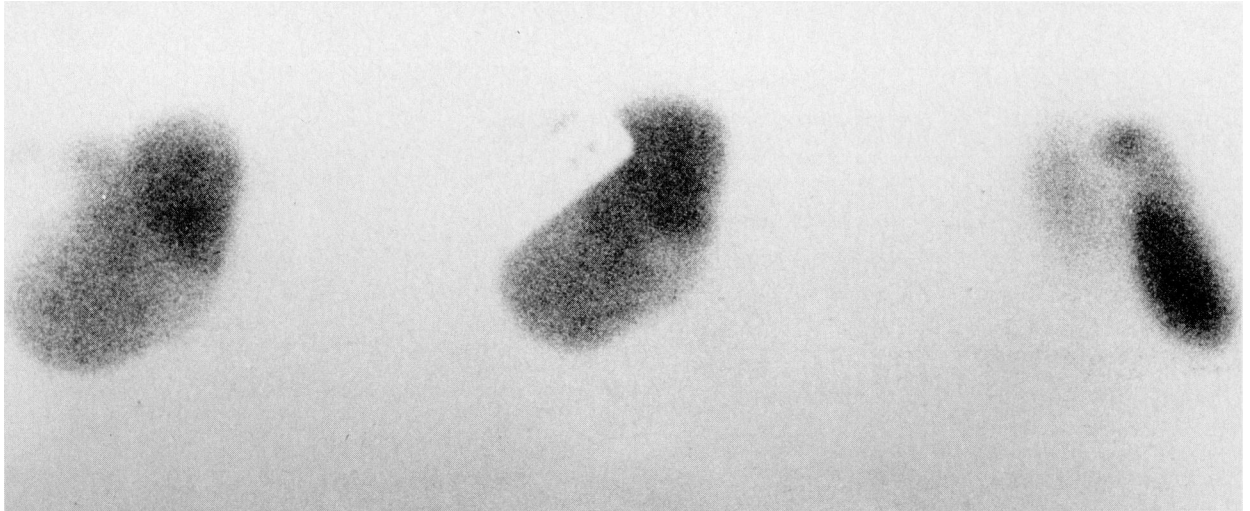
**sents a segment of duodenal loop seen en face. B. Anterior sequential images, 40 to 60 minutes. The duodenal loop is situated high in the right upper quadrant between liver and lateral abdominal wall.**

growth probably accounts for the typical lobar subdivisions. Disproportionate lobar growth must account for variability in size and shape of the lobes.<sup>5-9</sup> Left lobe hypoplasia occasionally occurs;<sup>10</sup> even rarer is right lobe hypoplasia, often associated with a hypertrophied left hepatic lobe and abnormal gallbladder position, which may be suprahepatic.<sup>11</sup> Right lobe aplasia is occasionally associated with agenesis of the gallbladder, intestinal malrotation, and diaphragmatic hernia.<sup>8</sup> Suprahepatic gallbladder is frequently associated with cholelithiasis, probably related to poor contractility and stasis.<sup>7</sup>

Malformations may be confused with inflammatory or neoplastic disease. Accessory lobes occur rarely and

are thought to be related to persistence of mesodermal septa, pressure from superfluous veins, or to direct growth from the hepatic diverticulum.<sup>8,9</sup> Makler et al<sup>10</sup> reported on left hepatic aplasia. Faintuch et al<sup>3</sup> described suprahepatic gallbladder with hypoplasia of the right hepatic lobe: they reported three patients who had right upper quadrant pain. The hypoplastic right lobe leaves space in the upper abdomen, which the hepatic flexure tends to occupy.

It is important to recognize the hypoplastic lobe so it is not confused with disease. Knowledge of the associated abnormal gallbladder location would alert the radiologist to include the high right upper abdomen in the coned views during cholecystography as well as the



**Figure 4. Radiocolloid scan. Anterior (without marker, with marker views) and right lateral view. Note the unusual or "bizarre" hepatic configuration, also seen on the hepatobiliary**

**scan. A small round area of uptake superiorly and toward the right probably represents part of the hypoplastic right lobe or an accessory lobe.**

entire right upper quadrant in the field of view for cholecintigraphy.<sup>11</sup> The prominent left lobe encountered in this condition may lead to the erroneous clinical impression of abdominal mass. Radionuclide images may be confused with metastatic disease replacing the right lobe.

Right upper abdominal pain is frequent in these patients, probably due to abnormal gallbladder contractility and stasis, and possibly cholelithiasis.<sup>3,5-7</sup> Lobar hypoplasia itself may not produce symptoms, but clinical symptomatology, when present, is often due to atypical cholecystitis, volvulus of the stomach, or portal hypertension.<sup>12</sup>

Without prior knowledge of this variant, sonographic evaluation can be misleading. Bowel gas in the right upper abdomen interferes with ultrasonic evaluation of the gallbladder and right hepatic lobe. Certainly, the clinical findings can initially suggest an epigastric mass or biliary tract disease. Scintigraphy and CT are useful in defining this rare anatomical variant.

Hepatobiliary radionuclide imaging demonstrating a predominantly left-sided, somewhat kidney-shaped liver should alert the physician to the possibility of right hepatic lobe hypoplasia or aplasia. Demonstration of a high duodenal loop positioned near the right lateral abdominal wall combined with the above finding strengthens the likelihood of the presence of right hepatic lobe hypoplasia with associated left hepatic hyperplasia.

#### Acknowledgment

We thank Christina Davis for her dedicated assistance in preparation of this manuscript.

#### Literature Cited

1. Johnson RJ: Anatomy of the liver, in Rothfeld B (ed): *Nuclear Medicine: Hepatolienal*. Philadelphia, JB Lippincott, 1980, pp 1-11.
2. McAfee JG, Ause RG, Wagner HN: Diagnostic value of scintillation scanning of the liver. *Arch Intern Med* 1965; 116:95-110.
3. Faintuch J, Machado MCC: Suprahepatic gallbladder with hypoplasia of the right lobe of the liver. *Arch Surg* 1980; 115:658-659.
4. Rappaport AM: Pathoanatomic considerations, in Schiff L, Schiff ER (eds): *Diseases of the Liver*. Toronto, JB Lippincott, 1985.
5. Morganstern L, Mazur M: Hypoplasia of the right hepatic lobe. *Am J Surg* 1958; 98:628.
6. Bohan EM: Aplasia of right lobe of liver with cholelithiasis. *Del Med J* 1956; 28:291-293.
7. Hamlin JA: Anomalies of the biliary tract, in Berk JE (ed): *Bockus Gastroenterology*. Philadelphia, WB Saunders, 1985, pp 3486-3498.
8. Clearfield HR: Embryology, malformations and malpositions of the liver, in Berk JE (ed): *Bockus Gastroenterology*. Philadelphia, WB Saunders, 1985; pp 2659-2665.
9. Katz HJ, Williams AJ: Accessory lobes of liver and their significance in roentgen diagnosis. *Ann Int Med* 1952; 36:880-883.
10. Makler TP, Lewis E: Nonvisualization of the left lobe due to atrophy or aplasia. *Clin Nucl Med* 1980; 5:63-65.
11. Youngwirth LD, Peters JC: The suprahepatic gallbladder. *Radiology* 1983; 149:57-58.
12. Weichert RF, Cerise EJ, Travieso CR: Atrophy of the right lobe of the liver. *Am Surg* 1970; 36:667-673.