
Scintigraphic and Ultrasound Features of Giant Hemangiomas of the Liver

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Giant hemangiomas of the liver are clinically distinct from smaller and more innocent hemangiomas as they are more prone to complications. On imaging with ultrasound, they can also be readily confused with hepatoma, metastatic disease, or focal nodular hyperplasia. Nine giant hemangiomas (maximal diameter > 8 cm) were studied by scintigraphy and ultrasound. In all instances, the fill-in of the lesion on [^{99m}Tc]RBC scintigraphy indicated the diagnosis of hemangioma, adding specificity to the screening sonographic study. The pattern of fill-in on scintigraphy also appeared to be size dependent with lesions < 11 cm in diameter equilibrating uniformly, while larger abnormalities intensified in centripetal fashion.

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Hemangiomas of the liver are the most common benign tumors to involve that organ and second only to metastatic disease as a cause of hepatic space-occupying lesions. They are amenable to diagnosis through a variety of noninvasive modalities which include scintigraphy (1-7), ultrasound (8-12), computed tomography (CT) scanning (13-15), and magnetic resonance imaging (16-18). The contribution of scintigraphy to the diagnostic process is particularly valuable, as giant hemangiomas may have a puzzling appearance when first detected on ultrasound screening examinations.

Patients and Methods

Eight patients, two males and six females ranging in age from 46 to 63 yr, with cavernous hemangiomas of the liver were investigated by scintigraphy and ultrasound. In each instance, the nuclear medicine examination had been prompted by the detection of a solid hepatic mass lesion on sonography. There were nine hemangiomas, each of at least 8 cm in diameter. The diagnosis had been established by laparotomy (one patient), biopsy (one patient), confirmatory CT findings (two patients), and the presence of stable vascular hepatic lesions which did not change over an interval of 1 to 2 yr (four patients).

The scintigraphic studies consisted of a liver and spleen scan obtained in the standard projections, with a large field-of-view camera equipped with a general purpose, low energy

collimator. One million counts were accumulated for each image after the intravenous injection of 5 mCi of technetium-99m sulfur colloid ([^{99m}Tc]SC). Forty-eight hours later, the subjects were studied following the intravenous injection of autologous red blood cells (RBCs) labeled with 25 mCi of ^{99m}TcO₄ according to conventional modified in vitro techniques. Rapid sequential 3-sec images were first registered, over 45 sec, after rapid injection of the blood, in the position that showed the lesion to best advantage on the colloid study. At 1 min, a static postsequential image was done and, thereafter, equilibrium images of the liver blood pool were obtained at 15-min intervals for a period of 1 hr. Each static image registered 1 million counts.

Lesion size was measured to the nearest centimeter on sonography which was performed on standard gray-scale equipment with both realtime and static techniques.

RESULTS

Table 1 summarizes our observations.

There were nine giant hemangiomas which ranged in size between 8 and 17 cm in diameter (mean = 11.5 cm). On dynamic scintigraphy, five of the lesions were seen to be hypoperfused, two revealed focal peripheral hyperemia with a hypoperfused center, while the last lesion showed normal perfusion. Five of the hemangiomas filled in centripetally, while four showed uniform fill-in. In all patients, the fill-in process was complete by 1 hr. Except for one subject with a well-defined hyperechogenic focus on sonography, the ultrasound manifestation for the hemangiomas was one of a large complex mass of mixed hyper and hypoechogenicity.

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TABLE 1

Patient age/sex	Maximal diameter of lesion	Liver/spleen scan	Flow	Delayed blood-pool images	Ultrasound
F/61	8 cm	Solitary defect posterior Aspect right lobe	Decreased perfusion	Uniform fill-in	Slightly irregular Hyperechogenic focus
F/54	9 cm	Solitary defect inferior Aspect left lobe	Decreased perfusion	Uniform fill-in	Mass of heterogeneous echogenicity
M/53	10 cm	Solitary defect anterior Inferior aspect right lobe	Normal perfusion	Uniform fill-in	Well-defined mass with heterogeneous echogenicity
F/60	11 cm	Solitary defect left lobe Compressing the right lobe	Decreased perfusion	Uniform fill-in	Regular mass with heterogeneous echogenicity
F/61	12 cm	Solitary defect posterior Aspect right lobe	Increased perfusion at periphery, central hypoperfusion	Centripetal fill-in	Mass of heterogeneous echogenicity
M/63	12 cm	Solitary defect posterior Aspect right lobe	Increased perfusion at periphery, central hypoperfusion	Centripetal fill-in	Well-circumscribed mass of heterogeneous echogenicity
F/52	14 cm	Defect right lobe	Decreased perfusion	Centripetal fill-in	Irregular masses of heterogeneous echogenicity
	11 cm	Defect left lobe	Decreased perfusion	Centripetal fill-in	
F/46	17 cm	Solitary defect posterior Aspect right lobe	Decreased perfusion	Centripetal fill-in	Slightly lobulated mass of heterogeneous echogenicity

Figures 1–3 illustrate some of the scintigraphic and ultrasound features of giant hemangiomas.

DISCUSSION

Cavernous hemangiomas are the most common benign tumors of the liver and are found in 0.4–7.3% of autopsy cases (19). They have been labeled as giant hemangiomas by surgeons when they exceed 4 cm in size (20). Imaging specialists have reserved the term only for those with a diameter surpassing 8 cm in at least one dimension (14). While smaller lesions are innocuous and carry little clinical significance, massive hemangiomas are not as innocent and are most apt to result in symptoms. Patients with the larger vascular abnormalities may present, for instance, with an abdominal mass or hepatomegaly. They may also complain of discomfort or pain from pressure or impingement on adjacent organs. More urgently, the hemangiomas may rupture spontaneously and bleed either intrahepatically or intraperitoneally. The incidence of this particular complication is reported to be between 4.5% and 19.7% and the mortality as high as 75% (19,20). Because of these issues and also since giant hemangiomas may be confused with primary or secondary hepatic neoplasms (21), an accurate diagnosis is essential for the appropriate management of the patient. Preferably, this diagnosis should be obtained with noninvasive techniques, since despite the reports

about the safety of percutaneous needle biopsy (22,23), we are aware of instances of rapid exsanguination from fine needle biopsy of hemangiomas. Unfortunately, however, not only are giant hemangiomas clinically distinct from smaller asymptomatic ones, but they are also more difficult to identify as they may display unusual features with some imaging modalities.

On CT scanning, small and giant hemangiomas may differ in their portrayal such that the tomographic study may not be specific for the bigger lesions. It is known that large hemangiomas examined by CT after the slow drip infusion of i.v. contrast material may be mistaken for metastatic disease or hepatoma (14). This particular difficulty arises because the early peripheral enhancement and serial centripetal fill-in expected for a hemangioma are not best revealed by this scanning approach. Further, even when the technique is optimized and bolus infusion CT is done, giant lesions may still not fulfill one of the three stringent pathognomonic criteria for a typical hemangioma by failing to become completely isodense on delayed imaging as do the smaller vascular lesions (14). In fact, only 55% of all hemangiomas satisfy the strictest CT prerequisites of a hypodense mass on precontrast study with peripheral enhancement after bolus i.v. contrast injection and complete isodense fill-in on delayed scans (13).

Our observations indicate that giant cavernous hemangiomas may also have a nonspecific appearance on liver sonography such that they may be mistaken for primary or secondary neoplasms. The more typical sonographic feature of hemangiomas in a nonfatty liver

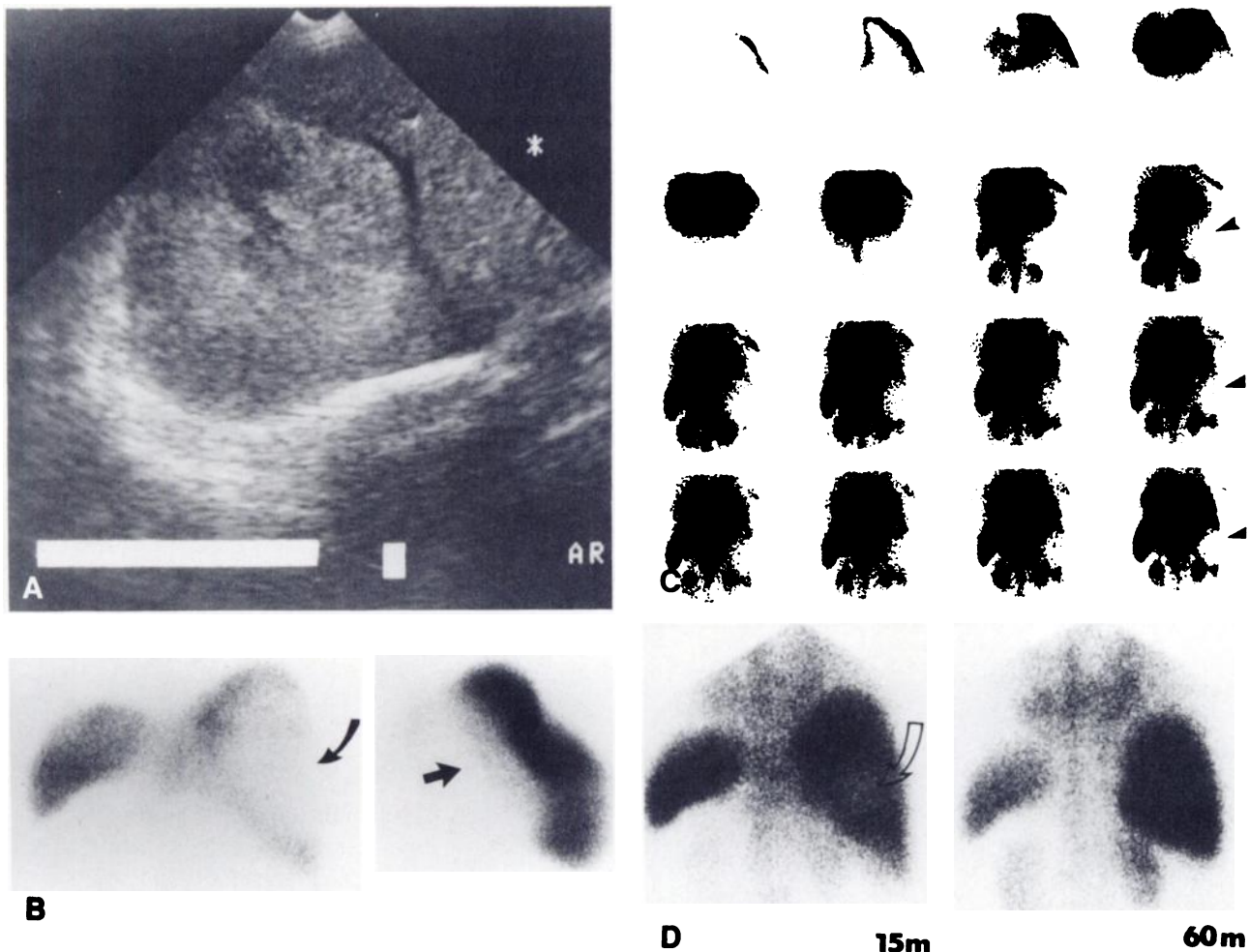


FIGURE 1

Sonogram (A) reveals the presence of a 17-cm-diameter heterogeneously hyperechogenic mass indistinguishable from neoplasm or focal nodular hyperplasia. A defect (curved arrow posterior view, straight arrow right lateral view) is also noted on the [^{99m}Tc]SC scan (B). There is hypoperfusion (arrowheads) on the flow study obtained in posterior view (C). The blood-pool images (D) of this very large hemangioma demonstrate centripetal fill-in with a persisting cool center at 15 min (left, arrow) and complete fill-in by 60 min (right).

is that of a sharply margined hyperechoic mass of uniform density (15). Occasionally, acoustic enhancement and a hypoechoic center may be documented. Only one of the giant hemangiomas studied by us fulfilled these suggestive traits for a more confident diagnosis. The remaining eight presented as large complex masses of mixed echogenicity which were indistinguishable from malignant tumors, liver cell adenoma, or focal nodular hyperplasia.

In contrast to this sonographic experience, the giant hemangiomas behaved more predictably on blood-pool scintigraphy showing characteristic ^{99m}Tc red blood cell (RBC) intensification of the colloid defect and by 1 hr increased activity in relation to normal liver on the blood-pool images. In some instances, the fill-in process spread centrally from the periphery of the lesions. In other cases, the intensification process appeared to have

occurred uniformly, at least in the 15-min time frame from which the lesions were first monitored. Uniform fill-in was apparent in the lesions up to 11 cm in diameter. Above that, the fill-in pattern was centripetal indicating that the phenomenon was size dependent with a greater time period required for equilibrium to occur in the central and more stagnant zones of the largest hemangiomas. The fill-in process was also noted to be complete for all of the hemangiomas with no cold center to suggest fibrosis, bleeding, or thrombosis. The pathognomonic scintigraphic feature of hepatic cavernous hemangiomas being one of perfusion to blood-pool mismatch was also evident in six of the nine hemangiomas studied. It was of interest to document, however, that two of the vascular abnormalities could exhibit an accentuated arterial blush to the periphery on dynamic imaging, while one of the hemangiomas was associated

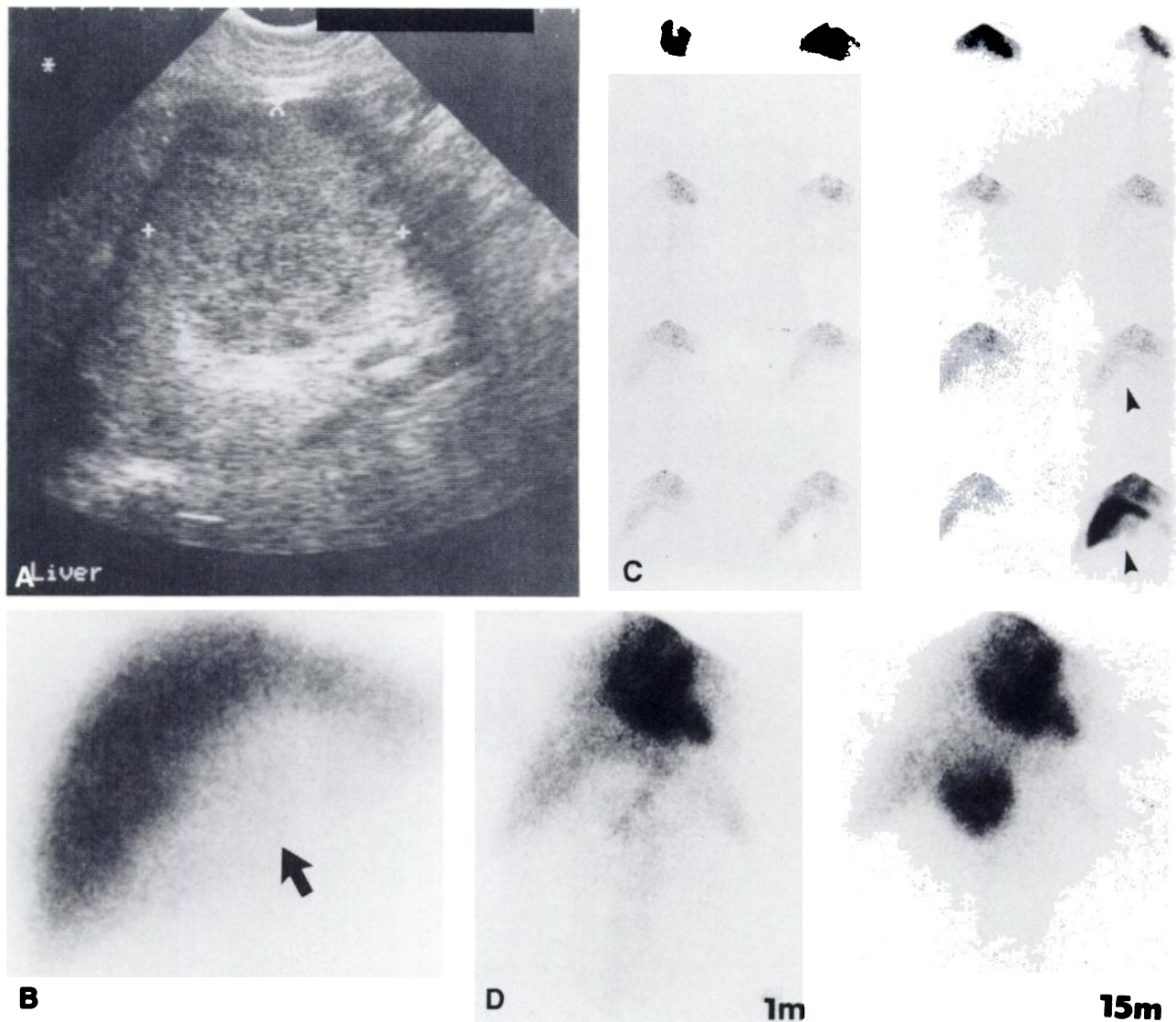


FIGURE 2

A 9-cm-diameter mass with mixed hyper and hypoechogenic features of nonspecific etiology is detected on the screening ultrasound study (A). A defect (arrow anterior view) is also seen along the inferior margin of the liver on the [^{99m}Tc]SC scan (B) with hypovascularity at that site (arrowheads) on the flow study (C). This hemangioma fills in uniformly on the [^{99m}Tc]RBC images (D) between the 1-min film (left) and the 15-min frame (right).

with normal perfusion. In all three instances, however, fill-in was documented which was typical for hemangiomas and did not lead to confusion with more serious pathologies.

The proper identification of giant hemangiomas of the liver is necessary primarily because the tumor represents a benign process which can be mistaken for more alarming or malignant conditions, and also because of the possible complications that might arise from the vascular lesion. Despite these potential hazards nevertheless, the usual management of the asymptomatic patient with giant hemangioma is conservative. It is best to regularly monitor the pathology by noninvasive imaging due to the difficulty in resecting such

extensive vascular intrahepatic masses (21). Other large space-occupying lesions which may be confused with hemangioma on ultrasound will, however, frequently require more active or aggressive interventions.

Ultrasound is frequently the screening test for hepatic mass lesions because of its noninvasiveness, lack of radiation, and suitable amount of specificity. Giant hemangioma of the liver should be included in the differential diagnosis of a mass > 8 cm in diameter and displaying a heterogeneous echogenic texture. In these circumstances, the ultrasound study can then be appropriately complemented by scintigraphy to reach a precise diagnosis of giant hemangioma and exclude more threatening conditions.

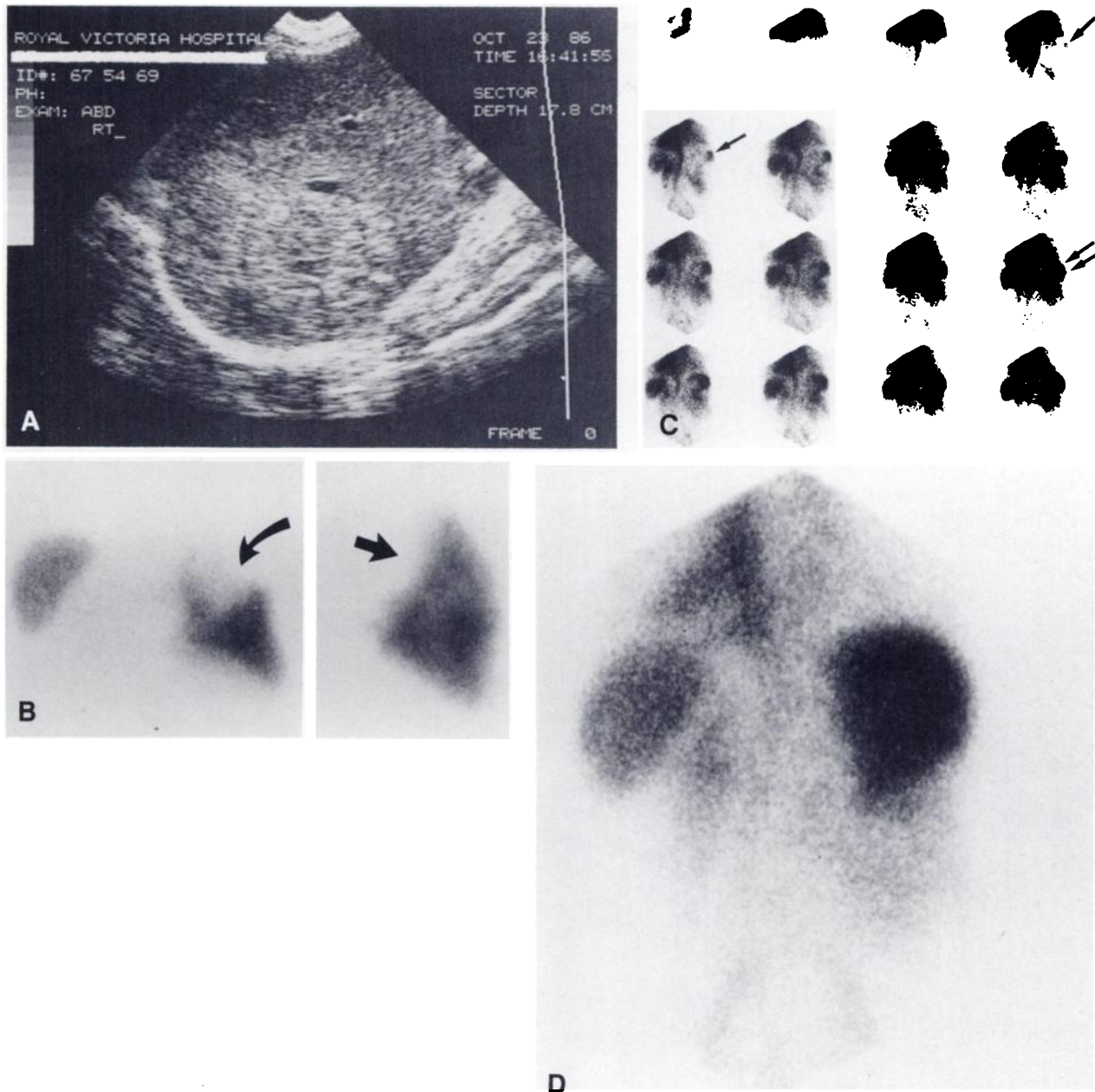


FIGURE 3

The ultrasound study shows a 12-cm-diameter complex echogenic mass (A) corresponding to the defect (curved arrow posterior, straight arrow right lateral view) seen on the colloid scan (B). On dynamic scintigraphy (C), obtained in posterior view, a prompt arterial blush is present (single arrows) with a gradual extension around the periphery of the lesion on the later frames (double arrows). Despite this arterial blush, the lesion shows more intense accumulation of [^{99m}Tc]RBCs by 1 hr than the rest of the liver (D) indicating the presence of a giant hemangioma.

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