Atypical Appearance of an Hepatic Hemangioma with Technetium-99m Red Blood Cell Scintigraphy

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Three-phase ^{99m}Tc red blood cell scintigraphy is an established technique for distinguishing hemangiomas from other focal liver lesions. The most widely recognized feature is the perfusion to blood-pool "mismatch" characterized by decreased or normal arterial perfusion, with lesion activity which progressively increases over 1–2 hr. Although increased arterial vascularity of hemangiomas has been described, such cases either involved small portions of the lesion only or occurred in lesions not conclusively proven to be hemangiomas. We report a case of an angiography proven hemangioma with increased arterial vascularity involving a significant portion of the lesion as well as intense early blood-pool activity similar to that seen on delayed imaging. This case emphasizes the diverse appearance of hepatic hemangiomas using ^{99m}Tc blood cell scintigraphy.

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Hepatic hemangiomas are the most common, benign neoplasm of the liver, being identified in up to 7% of postmortem studies (*1,2*). Technetium-99m red blood cell (^{99m}Tc RBC) scintigraphy has played an important role in distinguishing hemangiomas from primary or secondary hepatic neoplasms (*3–12*). Numerous groups (*3–5,7–14*) have emphasized the importance of "mismatching" between the arterial flow, early and delayed blood-pool images. Characteristically, a progressive increase in activity through the three phases has been considered diagnostic for hemangiomas (*3–5, 7–12*). Various authors, however, pointed out the variable appearance of hemangiomas using ^{99m}Tc RBC scintigraphy especially in the arterial flow and early blood-pool stages (*4,12,13*). Front et al. (*12*) and Brodsky et al. (*13*), described the uncommon phenomenon of increased arterial vascularity, usually to a small portion of the hemangioma only. We have encountered an hepatic hemangioma, confirmed by angiography and demonstrating increased arterial vascularity to most of the lesion as well as a similar increase in early and delayed blood-pool activity.

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CASE REPORT

A 42-yr-old Caucasian female was investigated for a 7-year history of epigastric and right upper quadrant abdominal pain. The pain was unrelated to meals and there was no associated nausea, vomiting, or alteration of bowel habit. The patient described no relevant past medical history and denied alcohol consumption. An examination revealed a moderately obese woman with no abnormal clinical findings. Liver function tests were normal. An abdominal ultrasound identified a solid, poorly defined hypoechoic mass measuring 4.5 × 3.0 cm, situated superolaterally within the right hepatic lobe. No other focal liver lesions were identified and the liver was normal in size. The spleen, kidneys, gallbladder, and biliary tree were unremarkable. Prior to consideration of percutaneous biopsy of this lesion a ^{99m}Tc RBC scan was performed using 400 MBq (10–11 mCi) of [^{99m}Tc]pertechnetate-labeled RBCs according to a modified in vivo technique (*15*). The patient was positioned under a large field-of-view gamma camera (Siemens Orbiter, Siemens Gammasonics Inc.) equipped with a low-energy, all purpose (LEAP) collimator and using a 15% window offset by 2.9% over the 140-keV photopeak of ^{99m}Tc. A posterior dynamic flow was acquired at 4 sec per frame for 32 sec. The use of a LEAP collimator in this setting enhances count acquisition; however, to enable improved lesion detection and characterization subsequently, a high resolution parallel hole collimator was then fitted. This normally takes <1 min to accomplish. Early blood-pool images were then obtained for 1 million counts (1000k) each in the anterior, posterior, right anterior oblique, and right lateral views. Delayed 1-hr images were also performed in these four projections for 1000k counts each. Tomography was then under-

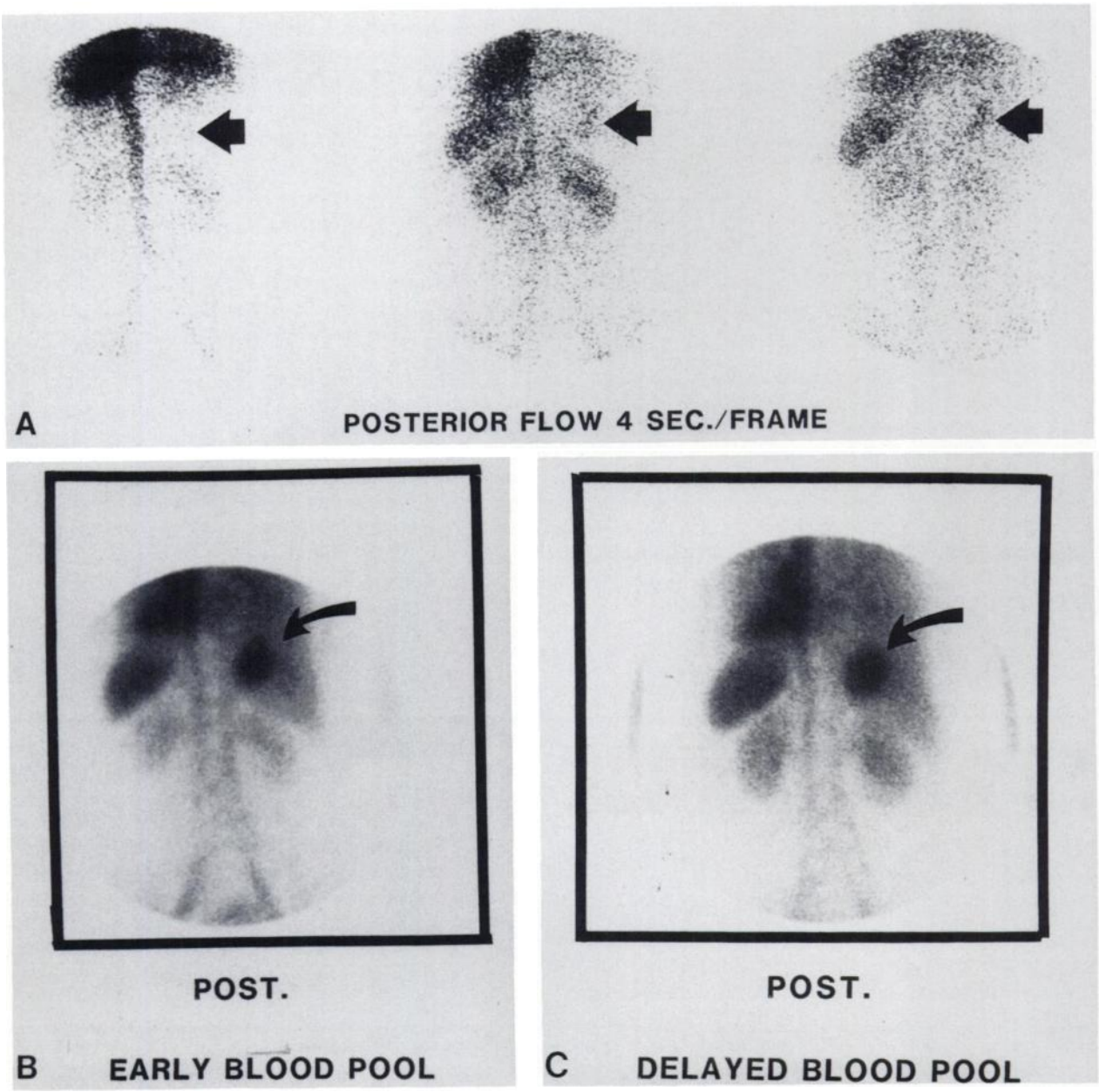

FIGURE 1
A: ^{99m}Tc RBC posterior dynamic flow demonstrating increased arterial vascularity to most of the lesion (arrow). B: ^{99m}Tc RBC early blood-pool image. Marked accumulation of activity seen within the hemangioma (arrow). C: ^{99m}Tc RBC delayed blood pool image. Persistance of activity within the hemangioma (arrow).

taken with a 360-degree acquisition of 64 projections at 40 sec per projection. Filtered backprojection with a Shepp-Logan-Hanning Filter and a 0.65 cutoff was used to reconstruct the final images. The red cell blood-pool scan demonstrated increased arterial vascularity of the lesion on dynamic imaging with marked red cell accumulation both in the early and delayed images. No other abnormality was identified (Fig. 1).

In view of the marked arterial vascularity and intense early blood-pool filling an hepatic angiogram was performed. This demonstrated a moderately large ring-like enhancing lesion within the right lobe corresponding to the area noted on ultrasound and scan. Enhancement was noted in the arterial phase and during the venous phase the central part of the lesion filled and adopted the same contrast density as the periphery (Fig. 2). These findings were considered characteristics of an hemangioma. A smaller hemangioma measuring ~0.5 cm was noted ~4 cm lateral to the main lesion.

DISCUSSION

A number of investigators have demonstrated that ^{99m}Tc RBC scintigraphy is a sensitive and specific technique for the diagnosis of hepatic hemangiomas (*3–13,16*). In these reports the importance of increased

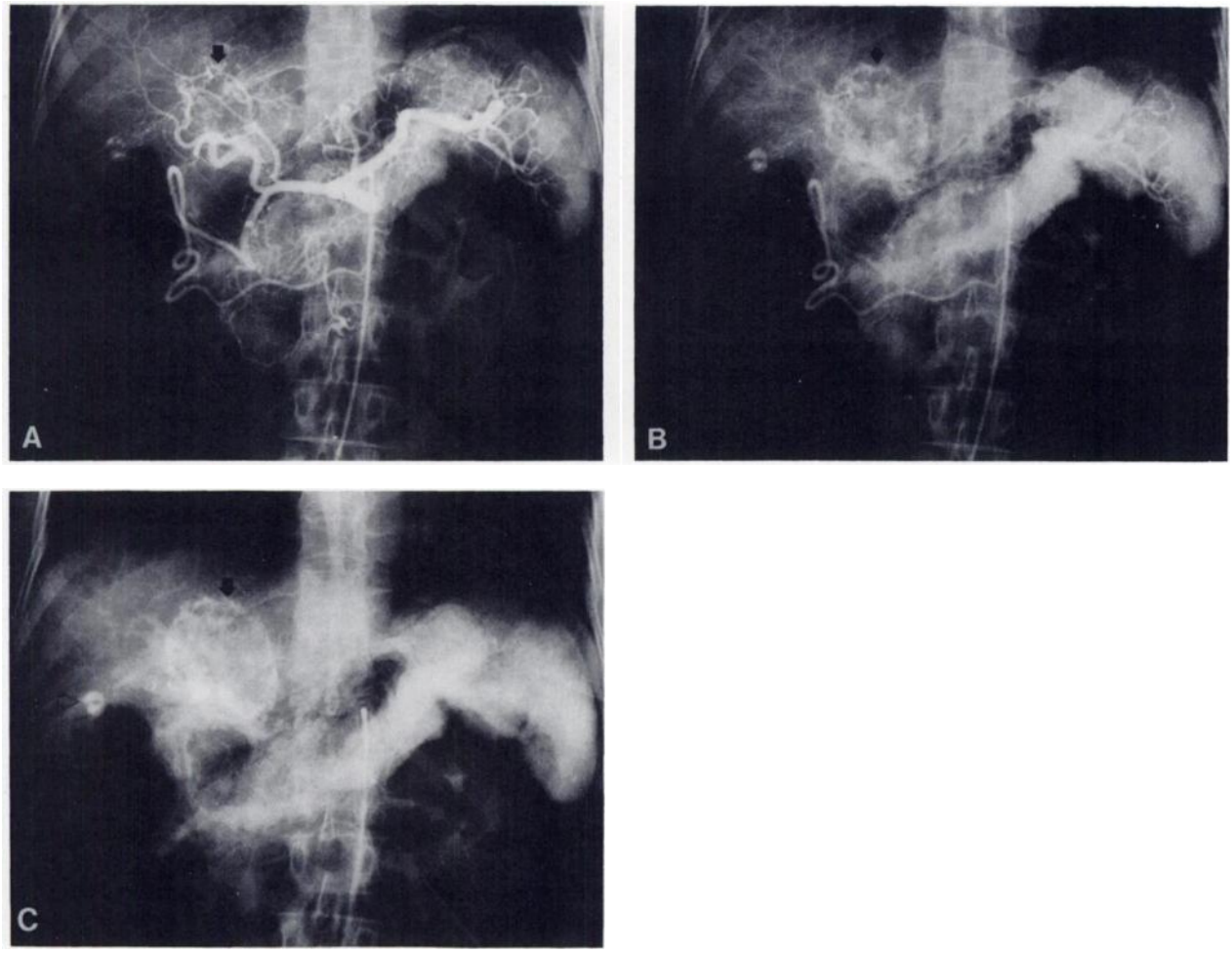

FIGURE 2
A: Coeliac axis angiogram—arterial phase demonstrating dense peripheral blushing within the larger hemangioma (closed arrow). Smaller hemangioma indicated (open arrow). B: Coeliac axis angiogram—capillary phase demonstrating intense peripheral enhancement within the hemangiomas. C: Coeliac axis angiogram—venous phase revealing persistence of enhancement.

delayed blood-pool activity was emphasized, as was the "mismatching" or discordance between the early and late phases of the study. Indeed, one author (*3*) claimed that hemangiomas and hepatomas could be differentiated on the basis of the flow pattern, as hepatomas were hypervascular with no mismatching whereas hemangiomas were usually hypovascular with a characteristic discrepancy between the flow and delayed blood-pool images. This case demonstrates, however, a proven hemangioma displaying increased arterial vascularity to a significant portion of the lesion with a similar degree of activity seen both on early and delayed blood-pool images. This hemangioma therefore lacked the typical scintigraphic features. The hypervascularity to a major extent of the lesion in particular, may have led to an erroneous diagnosis of an hepatoma if caution had not been exercised.

It is unclear why some hemangiomas demonstrate increased arterial flow and early blood-pool activity to a varying degree within the lesion although differences in dose administered, type of collimation used, hemangioma size and location, patient positioning and presence of partial thrombosis or fibrosis may be important. It is generally agreed that the characteristic pattern is that of a progressive increase in activity through the three phases of the study and this has been explained on the basis of sluggish flow through the large vascular spaces of the hemangioma (*17*). As the flow and early blood-pool appearances may be variable, however (*4*), careful attention should be paid to the presence of increased activity on delayed imaging. This would allow an hemangioma to be retained in the list of diagnostic possibilities despite a somewhat atypical scan pattern. Confirmation could then be sought using other imaging modalities such as angiography (*18,19*), rapid bolus contrast enhanced computed tomography (*20*), or magnetic resonance imaging (MRI) (*6,21–23*). Although angiography is widely regarded as the "gold standard," MRI in particular is a promising technique offering excellent sensitivity. There is some controversy regard-

ing its specificity, however, as initial reports describe difficulty in distinguishing vascular metastatic deposits from hemangiomas with secondary fibrotic changes (*21,23*).

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