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Hybrid Imaging with SPECT-CT and SPECT-MR in Hepatic Splenosis.

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Splenosis, commonly occurs **incidentally** and locates to bowel surfaces, parietal peritoneum, mesentery, and diaphragm, but can potentially occur anywhere in the peritoneal cavity. Patients frequently have a history of splenectomy or trauma. On the other hand, **hepatic** splenosis is a rare entity and may present itself **clinically**. Indeterminate liver lesions can pose a clinical dilemma and may lead to additional investigations, anxiety, follow-up imaging and even to invasive procedures. MRI usually performs extremely well. In difficult cases, scintigraphy can be of great value –especially with novel SPECT-CT and SPECT-MR techniques-. We describe a case of a 29-year-old lady with hepatic splenosis and the impact of hybrid imaging.

Our patient presented with epigastric/right upper quadrant abdominal pain. She had a splenectomy 10 years prior for hereditary spherocytosis as well as a cholecystectomy. A year earlier she underwent an abdominal CT scan for workup of nephrolithiasis, which demonstrated an incidental not characterized hepatic hypodensity (**Figure 1A**). After symptomatic management the patient was discharged but returned twice in the subsequent weeks for continued abdominal pain with mildly elevated liver function tests. Consequently, the patient underwent an abdominal ultrasound demonstrating a small, hyperechoic lesion within the right lobe of the liver (**Figure 1B**). Findings were confirmed with an MRI, which demonstrated an indeterminate exophytic mass within segment VI of the liver (**Figure 2**). After developing fevers, malaise with continued pain, the patient was admitted and her blood work showed atypical lymphocytes, elevated lactate dehydrogenase (LDH) and uric acid, and Epstein-Barr virus (EBV) serologies consistent with acute mononucleosis. She underwent a biopsy the liver lesion that yielded islands of mature red blood cells and hematopoietic tissue, but no hepatic tissue**.** Pathology could not yield a definitive diagnosis. An ^{18}F-FDG PET/CT scan was then performed to evaluate for a possible malignancy. This revealed extensive metabolically active lymphadenopathy throughout the body. A pertinent finding is that the hepatic mass was **not** metabolically active as seen in **Figure 3.** However, this was still not totally helpful as some cancers may not be FDG avid. Left axillary lymph node biopsy was performed, which found EBV positive reactive lymphoid hyperplasia. Infectious mononucleosis was established, however the nature of the hepatic lesion **remained unclear even after a biopsy**. Further investigations were sought and considering the hematopoietic tissue yielded from the hepatic lesion biopsy, a ^{99m}Tc radiolabeled damaged red blood cell SPECT-CT scan was performed to evaluate for hepatic splenosis. This exam demonstrated focal uptake correlating to the mass seen on the MRI (confirming hepatic splenosis) and a smaller focus of uptake in the left upper quadrant of the abdomen (splenule) shown in **Figure 4**. She was advised that her abdominal pain was likely related to inflammation of the ectopic splenic tissue and would improve with the resolution of her infectious mononucleosis. The patient has done well.

Even with a relevant clinical history (splenectomy, trauma), hepatic splenosis diagnosis can be challenging and can be confused with focal nodular hyperplasia, adenoma, HCC or metastases (1,2-4). MRI is the modality of choice to evaluate liver lesions. In clinical practice findings may not always be straightforward. A review of the literature showed that about 75% of hepatic splenosis reported cases were for men and 95% had a history of splenectomy. Only about 37% had no risk factors and about 60% had either HCC risk factors or a preexisting malignancy. Blood supply of splenules is derived from local arteries at implantation sites (1). Even though

^{99m}Tc-sulfur colloid or tagged damaged RBCs efficiently target ectopic splenic tissue (5,6) and clinch the diagnosis; invasive diagnostic measures are still performed in more than 50% of cases. One should note that about 79% of reported cases had either a biopsy, FNA or surgery to fully diagnose the hepatic lesion. It is surprising that only 21% of cases had a scintigram. Novel hybrid SPECT-CT or fusion SPECT-MR ^{99m}Tc damaged RBC co-registered datasets are the best tests to evaluate for splenosis or accessory spleens. Sulfur colloid due to its normal liver biodistribution would be a second choice. Nowadays the sensitivity, specificity and accuracy of these studies has improved. Prior reported concerns relating to the detectability of small lesions, or proximity to major vascular structures and remaining spleen are no longer applicable. One should also note that as in our case several tests were performed when scintigraphy would have completed work-up early. These techniques should be used more frequently to decrease complications, financial burden and anxiety that is related to costly follow-up imaging as well as invasive procedures.

References

1. Lee JB, Ryu KW, Song TJ, et al. Hepatic splenosis diagnosed as hepatocellular carcinoma: report of a case. Surg Today 2002;32(2): 180-2.
2. Choi GH, Ju MK, Kim JY, et al. Hepatic splenosis preoperatively diagnosed as hepatocellular carcinoma in a patient with chronic hepatitis B: a case report. J Korean Med Sci 2008;23(2): 336-41.
3. Yoshimitsu K, Aibe H, Nobe T, Ezaki T, Tomoda H, Hayashi I, Koga M. Intrahepatic splenosis mimicking a liver tumor. Abdom Imaging. 1993;18:156–158.
4. Gruen DR, Gollub MJ. Intrahepatic splenosis mimicking hepatic adenoma. AJR Am J Roentgenol. 1997;168:725–726.
5. Foroudi F, Ahern V, Peduto A. Splenosis mimicking metastases from breast carcinoma. Clin Oncol (R Coll Radiol) 1999;11(3): 190-2.
6. Lu HC, Su CW, Lu CL, Chang CP, Lin HC. Hepatic splenosis diagnosed by spleen scintigraphy. Am J Gastroenterol 2008;103(7): 1842-4.

Figure 1. A) Single phase **CT** from an outside hospital that does not demonstrate the typical arterial enhancement B) **US** showing hyper-echoic mass. Typically hypoechoic.

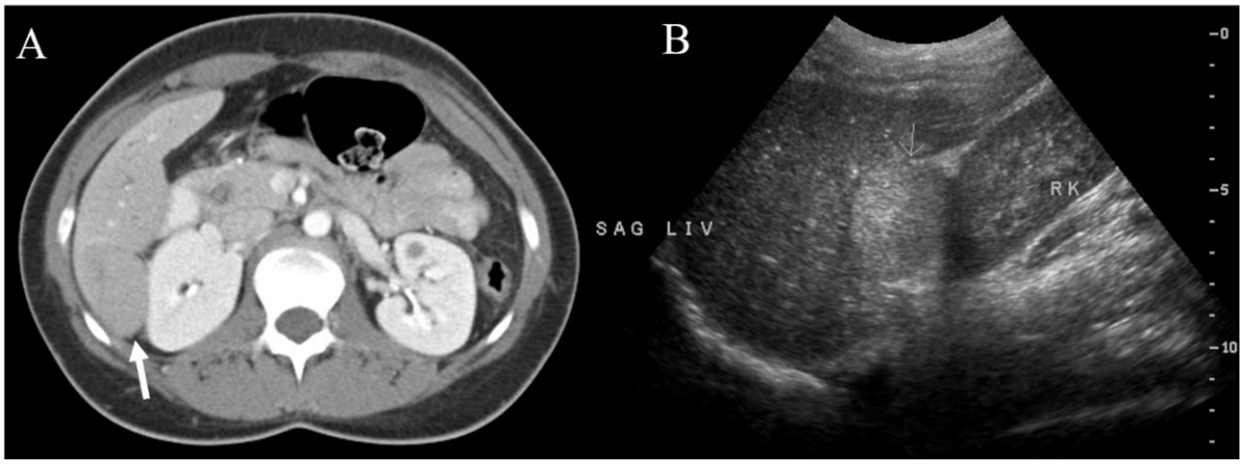

Figure 2. <u>MRI sequences</u> A) Axial T1 fS VIBE pre: Typical hypointensity. B) Arterial-phase Axial T1 VIBE: no Eovist uptake A') Axial T2: typical hyperintensity. B') Portal venous-phase Axial T1 VIBE: no Eovist uptake

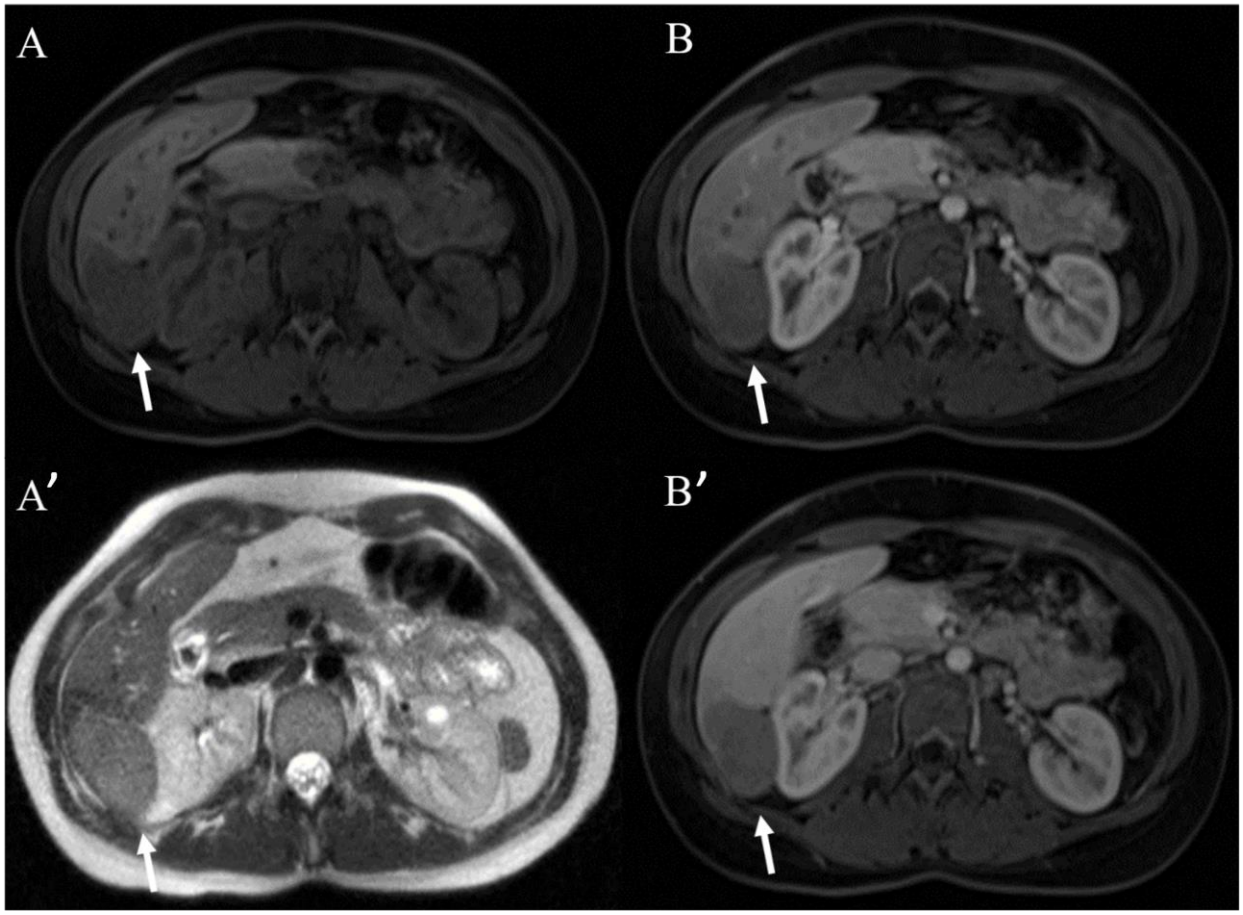

Figure 3. A) **^{18}F-FDG PET-CT scan** shows the liver lesion exhibiting similar glucose metabolic activity to surrounding normal parenchyma. B) **^{18}F-FDG PET-CT scan** shows widespread FDG avid lymphadenopathy

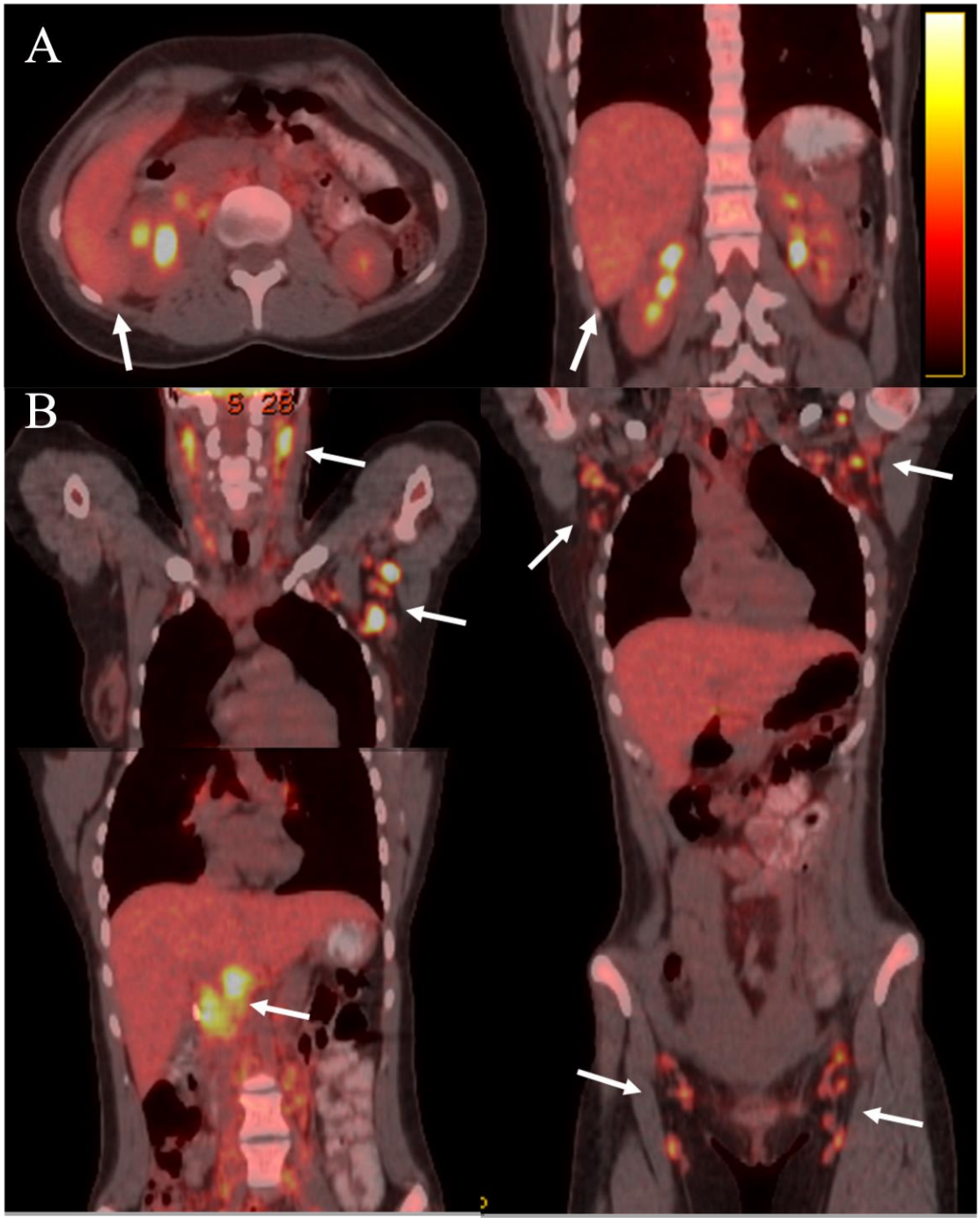

Figure 4. A) **^{99m}Tc damaged red blood cell scan** shows increased uptake in hepatic and B) left flank splenule A') Coronal T1-weighted **MRI** B') **SPECT-MR** images of intrahepatic splenosis in an unusual location