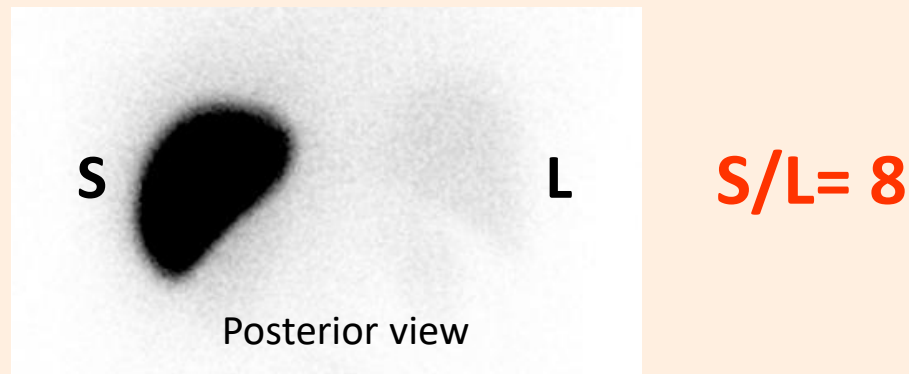


Role of ^{99m}Tc -labelled heat-denatured RBC - SPECT/CT in the investigation of suspected ectopic splenic tissue

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- Characterization of an abdominal masses as ectopic spleen tissue may be unsuccessful by contrast-enhanced CT or MRI
- ^{99m}Tc -labelled heat-denatured red blood cell (^{99m}Tc -HDRBC) scintigraphy, based on the ability of the spleen to rapidly sequester injured erythrocytes, is a highly accurate method in detecting functional splenic tissue

Normal ^{99m}Tc -HDRBC scan



Diffuse intense uptake in the spleen. Faint liver uptake. No marrow uptake

**The study is aiming to report on
the use of ^{99m}Tc -HDRBC-SPECT/CT
in the characterization of abdominal masses
suspected by contrast enhanced CT or MRI as
ectopic splenic tissue, in various clinical settings**

- Retrospective review of nine ^{99m}Tc -HDRBC-SPECT/CTs performed to our department between 9/2014 and 1/2021

^{99m}Tc -HDRBC protocol

- Pyrophosphate (Sn^{+2}) I.V injection to the patient
- Withdrawal of 6 ml of blood to a syringe containing 1 ml ACD 20 min later
- Addition of 2 mCi of $^{99m}\text{TcO}_4^-$ into the syringe
- Gentle syringe agitation for 10 min
- Incubation at 49-50 °C for 30 min
- Reinjection to the patient

Imaging

Planar and SPECT/CT images over the abdomen 2 hours p.i

Image analysis

- **Visual analysis**
 - presence or absence of lesion uptake
 - intensity of lesion uptake
- **Semiquantitative analysis**

three-grade scale, comparing
lesion to liver uptake

Grade	Intensity of lesion uptake
0	No lesion uptake
1	Less than liver uptake
2	Equal or greater than liver uptake

Additional, post ^{99m}Tc -HDRBC, imaging	No of cases
Somatostatin receptor (SSR) scintigraphy	3
^{18}F -FDG-PET/CT	1
Dynamic CT of the pancreas	2
CT	2
MRI	2

^{99m}Tc -HDRBC-SPECT/CT findings were correlated with additional imaging, surgical results or clinical follow-up

- **Nine** adult patients with a total of **11** abdominal lesions suspected of ectopic splenic tissue or splenosis by CT and/or MRI were included in the study



6 men - 3 women
aged 53.4 ± 14.6 yrs
3 splenectomized

2 for refractory immune thrombocytopenia (ITP)
1 along with left hemicolectomy for colon cancer

Patients and lesions characteristics

	Sex /Age (yrs)	Previous splenectomy	Prior Imaging	No of Known lesions	Lesion location	Lesion size dmax (cm)
1	F/54	No	MRI	1	Pancreas (tail)	1.5
2	M/44	Yes -20 yrs ago	CT	1	Left upper abdomen	3.2
3	M/50	No	MRI	1	Pancreas (tail)	1.0
4	M/32	No	MRI	1	Left upper abdomen	3.9
5	M/33	Yes -13 yrs ago	CT	2	Left upper abdomen Left upper abdomen	2.4 1.6
6	M/67	No	ECHO, CT, MRI	1	Pancreas	1.0
7	F/66	Yes -2 yrs ago	CT	1	Left upper abdomen	2.0
8	M/67	No	CT, MRI	2	Pancreas (tail) Left upper abdomen	2.0 1.5
9	F/68	No	ECHO, MRI	1	Left upper abdomen	8.5

^{99m}Tc -HDRBC-SPECT/CT identified 6/11 previously detected lesions as functioning splenic tissue

- 4 splenosis
- 2 accessory spleens - one intrapancreatic
- **One additional, previously undetected, small ectopic splenic mass was clearly detected by SPECT/CT in a patient with splenosis**

Intensity of 7 positive lesions

- 3 more intense than the liver
- 4 less intense than the liver

Median lesion diameter was 1.8 cm

**Location
of the total of 12 lesions**

- 8 in the left upper abdomen
- 4 intrapancreatic

Results of ^{99m}Tc -HDRBC scan



	Sex/ Age (yrs)	Lesion size dmax (cm)	Planar	SPECT/CT	Visual Grade of uptake	Lesion/Liver ratio (geometric mean from ANT and POST planar views)
1	F/54	1.5	Negative	Negative	0	-
2	M/44	3.2	Positive	Positive	2	1.42
3	M/50	1.0	Negative	Negative	0	-
4	M/32	3.9	Negative	Negative	0	-
5	M/33	2.4 1.6	Positive Positive	Positive Positive	1 1	0.33 0.22
6	M/67	1.0	Negative	Negative	0	-
7	F/66	2.0 0.5- previously UNDETECTED	Positive Positive??	Positive Positive	1 1	0.55 0.16
8	M/67	2.0 1.5	Positive Positive	Positive Positive	2 2	4.57 1.71
9	F/68	8.5	Negative	Negative	0	-

^{99m}Tc-HDRBC-SPECT/CT, Additional imaging & Final diagnosis

	Sex/ Age (yrs)	Lesion size dmax (cm)	^{99m} Tc-HDRBC SPECT/CT Diagnosis	Additional imaging - Diagnosis	Final Diagnosis	Clinical Outcome /Surgery
1	F/54	1.5	Not splenic tissue	SSRS - NET	NET	Surgery
2	M/44	3.2	Splenosis	-	Splenosis	Surgery
3	M/50	1.0	Not splenic tissue	SSRS negative MRI	Not established	Asymptomatic MRI stable
4	M/32	3.9	Not splenic tissue	-	GIST	Surgery
5	M/33	2.4 1.6	Splenosis Splenosis	-	Splenosis Splenosis	Asymptomatic Asymptomatic
6	M/67	1.0	Not splenic tissue	MRI, SSRS – NET	NET	Asymptomatic MRI stable
7	F/66	2.0 0.5	Splenosis Splenosis	CT CT	Splenosis Splenosis	Asymptomatic Asymptomatic
8	M/67	2.0 1.5	Ectopic spleen Accessory spleen	Dyn.pancreas CT Dyn.pancreas CT	Ectopic spleen Accessory spleen	Asymptomatic Asymptomatic
9	F/68	8.5	Not splenic tissue	¹⁸ F-FDG-PET/CT	NET	Surgery

4 patients with 7 ^{99m}Tc -HDRBC confirmed splenic lesions

- 3 avoided surgery and remained asymptomatic
- 1 with ITP was submitted to splenectomy

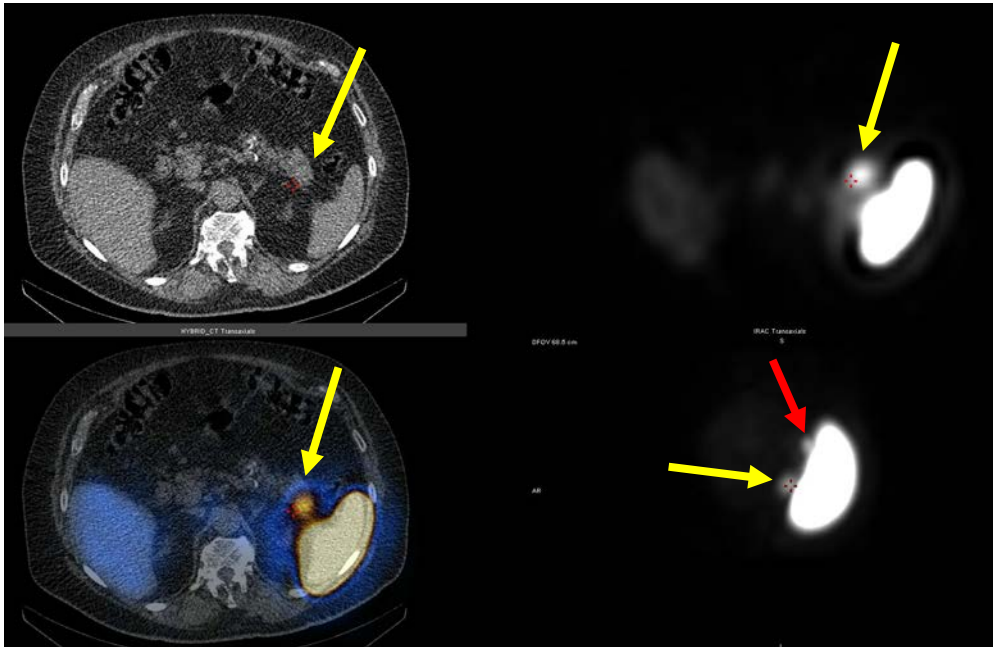
Final diagnosis of 5 patients with 5 ^{99m}Tc -HDRBC negative lesions

- NET in 3 (2 by surgery/histopathology, 1 by positive SSRS)
- GIST in 1 (by surgery/histopathology)
- Not established in 1 with an intrapancreatic mass
remaining asymptomatic with stable MRI findings over a year

Intrapancreatic spleen & Accessory spleen adjacent to upper pole of spleen

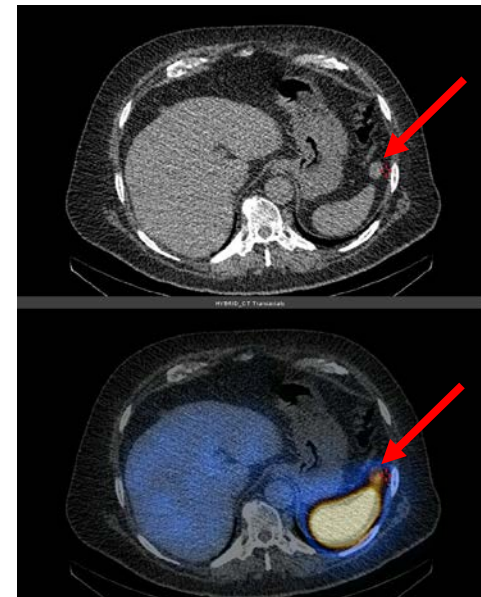
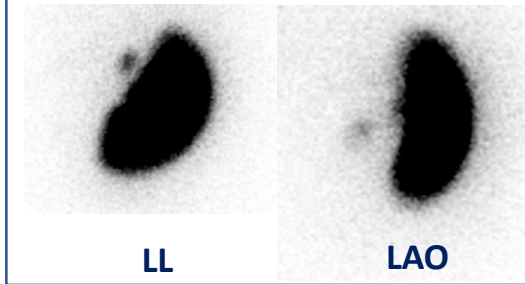
- M/67yrs
- Mass 2 cm in the tail of pancreas found on CT for postoperative testicular cancer staging

^{99m}Tc -HDRBC-SPECT/CT



Intrapancreatic lesion with increased tracer uptake compatible with ectopic splenic tissue

^{99m}Tc -HDRBC-planar

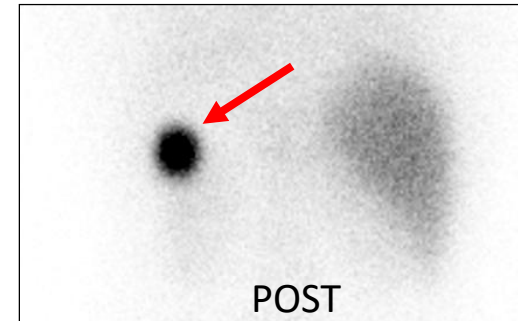


Lesion with increased uptake adjacent to the upper pole of the spleen compatible with accessory spleen, clearly seen on SPECT/CT

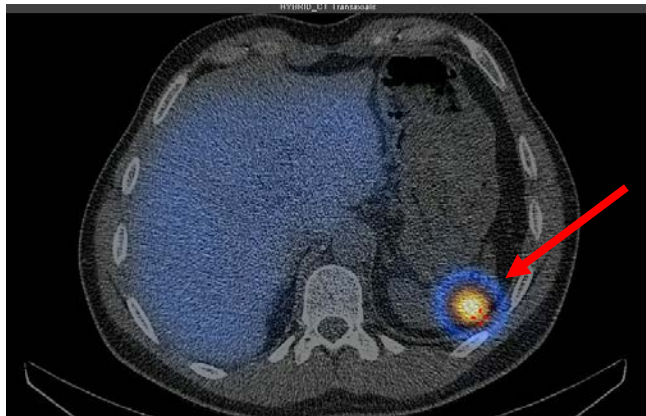
Splenosis

- M/44yrs
- Refractory ITP after splenectomy
- CT: mass 3.2cm in the left upper abdomen – splenosis?

^{99m}Tc -HDRBC-planar



^{99m}Tc -HDRBC-SPECT/CT



CT



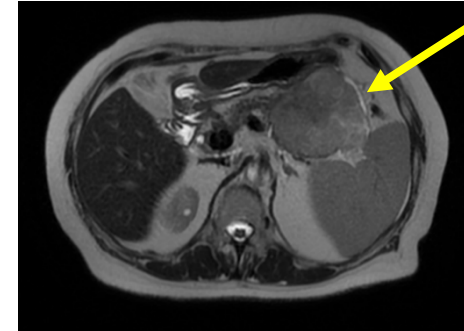
Increased focal tracer uptake in the 3.2 cm soft mass in the left upper abdomen, suggestive of splenosis

Diagnosis was confirmed by histopathology

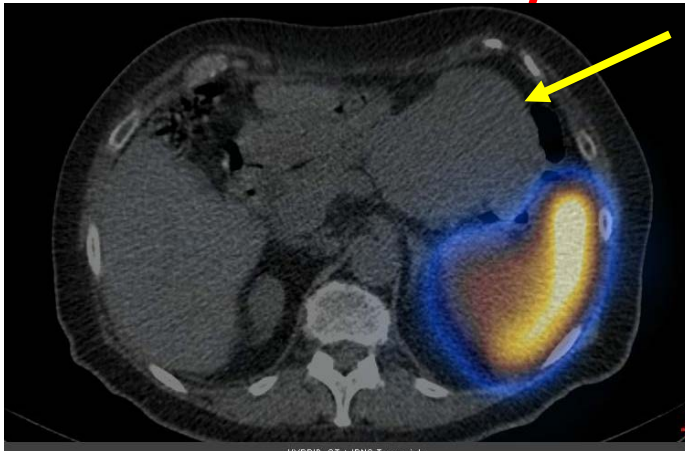
Negative ^{99m}Tc -HDRBC-SPECT/CT

- F/68yrs
- Mass 8.5 cm in the left upper abdomen
- MRI findings suggestive of ectopic splenic tissue

MRI - T2 W

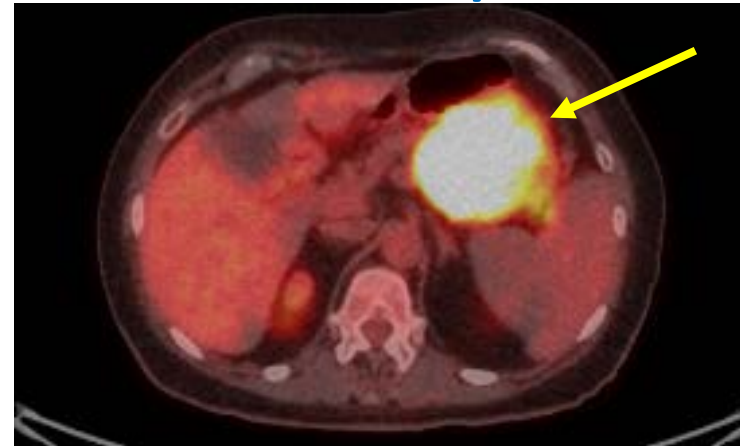


^{99m}Tc -HDRBC-SPECT/CT



Large mass in the left upper abdomen
without ^{99m}Tc -HDRBC uptake

^{18}F -FDG-PET/CT



Avid FDG uptake at the site of the mass
SUVmax=23.5

Diagnosis of NET was made by histopathology after resection of the mass

- ^{99m}Tc -HDRBC scintigraphy is a clinically valuable noninvasive imaging modality for correct characterization of abdominal masses suspected as ectopic splenic tissue by CT or MRI, thus optimizing further patients' management
- SPECT/CT increases the sensitivity of planar imaging for small lesions or those adjacent to native spleen and provides precise anatomic localization of the lesions