

# Role Of Ultrasonography And Computed Tomography In The Evaluation Of Focal Splenic Lesions

CM SHETTY, BN LAKHKAR, NM PEREIRA, SM KOSHY

## Abstract

**OBJECTIVE:** To study the role of ultrasonography and computed tomography in the evaluation of focal splenic lesions, to compare their diagnostic accuracies, to study the differential diagnosis of focal splenic lesions, to evaluate the imaging features of common lesions and to calculate the incidence of focal splenic involvement in lymphomas.

**MATERIALS AND METHODS:** A prospective study of 46 patients was undertaken in whom focal lesions in the spleen were detected on USG, CT or both. In all patients, USG was done and images were stored. Five mm thick contiguous sections were obtained from the spleen before and after injection of intravenous contrast material in the portovenous phase.

**RESULTS:** Of the focal splenic lesions 28 (60.8%) were benign and 18 (39.2%) were malignant. The spectrum of benign lesions included cysts (4), infarcts (10), abscesses (9) HIV+ve cases with focal hypodense splenic lesions (5) and a case of inflammatory pseudotumour. Malignant lesions included 6 cases each of Hodgkin's and non-Hodgkin's lymphoma and 6 cases of metastatic deposits in the spleen. Diagnostic accuracy of plain CT was 78.7%, of USG 87.2% and of CECT was 100%. Lesion detection was significantly improved by contrast enhancement. NHL, especially the high grade lymphomas presented with large nodular pattern of involvement of spleen whereas Hodgkin's lymphoma presented in majority of cases with small nodular pattern of involvement. Imaging features of infarcts corresponded to the classic wedge shaped peripheral pattern in a majority,(80%) and were extensive with hilar sparing in 20%.

**CONCLUSION:** We concluded that contrast enhanced CT is the ideal modality for detection of focal splenic lesions, with USG being used mainly for follow up. The spectrum of differentials of focal splenic lesions in our study corresponded with reports in literature.

Ind J Radiol Imag 2005 15:2:183-190

**Key words :** CT, USG, focal splenic lesions.

## INTRODUCTION

Throughout the history of clinical medicine, perhaps to the present day, the spleen has remained 'the organ full of mystery'. Probably because of the non-essential nature of the spleen to survival, medical scientists have refused to invest their time and energy on researching splenic pathology. This explains the extremely poor volume of literature on the spleen and the lack of large and authoritative studies on splenic lesions as compared to its counterpart in the right hypochondrium, the liver which has been extensively researched. However now that the spleen's essential role in body defence and immunity has been recognised, the scenario has changed and splenic

anatomy, physiology and pathology need to be elucidated. Advances in USG technology and the advent of modern cross sectional imaging techniques like CT and MRI and have greatly helped in and speeded up this process. It was against this background that we undertook this study on the role of CT and USG in the evaluation of focal splenic lesions.

## MATERIALS AND METHODS

A hospital based prospective study was conducted in Kasturba Hospital, Manipal, for a period of 29 months from January 2002- May 2004.

---

From the Department of Radio Diagnosis & Imaging, Kasturba Medical College & Hospital, Manipal-576 104

Request for Reprints: Dr. Chandrakant M. Shetty Associate Professor and Head of department of Radiodiagnosis & Imaging, Kasturba Medical College & Hospital, Manipal-576 104.

Received 8 November 2004; Accepted 10 February 2005

### Case selection

All patients referred with suspected splenic pathology or sonographically detected focal splenic lesions were further evaluated by plain and contrast enhanced CT. We also included in our study all patients in whom focal splenic lesions were first detected on CT scan with a normal USG. Patients with splenomegaly only, without evidence of focal lesions were not included in our study. Confirmation of diagnosis was by histopathology, clinical course and response to therapy or by preoperative confirmation of imaging findings wherever possible.

### Equipment

USG was done on LOGIQ 700 of GE Medical systems using multifrequency (3-8MHz) convex transducer probe. Computed tomography was done on helical CT scanner of GE Medical systems. The following parameters were used routinely:

120Kvp, 200mA.

Pitch 1:1.

Collimation 10mm in plain sections and 5mm in area of interest in post contrast scan. Both plain and contrast scans of abdomen after administration of 60 ml of Iopromide.

### Imaging parameters

The imaging parameters assessed on both USG and CT images were:

- Number and size of focal splenic lesions.
- Echopatterns and CT attenuation values with enhancement patterns.
- Presence of associated splenomegaly.
- Concomitant involvement of other intra-abdominal organs like liver, pancreas, adrenals & lymph nodes.

CT images were viewed in both abdominal and liver windows for interpretation.

### Follow up

Confirmation of our imaging diagnosis was done by histopathological and preoperative correlation wherever available. In the remaining cases, clinical course, response to therapy and follow up imaging studies helped in confirming our diagnosis.

### OBSERVATIONS

In our study we had 46 patients in whom a total of 47 lesions were encountered with one patient having both a traumatic intrasplenic pseudocyst and an infarct. (1a-c). Of these 37 were male and 9 were female patients. Age incidence ranged from 13 - 76 years with a mean age of

42 years. 43.5% (20 patients) presented with suspected splenic pathology in the form of a palpable spleen or left hypochondrial pain, 41.3% (19 patients) presented with splenic involvement as part of the disease spectrum and in 15.2% (7 patients) the splenic lesions were incidentally detected on imaging done for some other reason. Histopathological confirmation of the diagnosis was available in 67.3%, preoperative confirmation in 10.9% and in 21.8% imaging diagnosis was confirmed by correlation with laboratory parameters and clinical and imaging follow up.

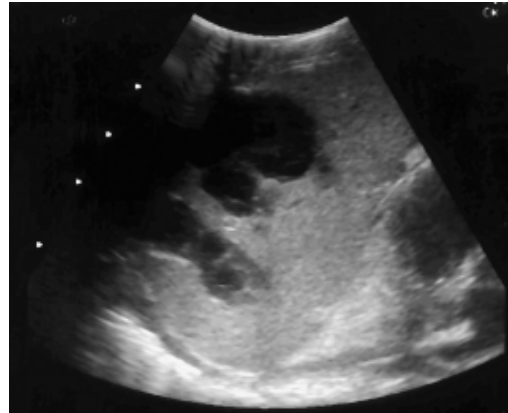


Fig 1 a. Traumatic intrasplenic pseudocyst with associated infarct. USG missed the infarct and showed only the cystic lesions.

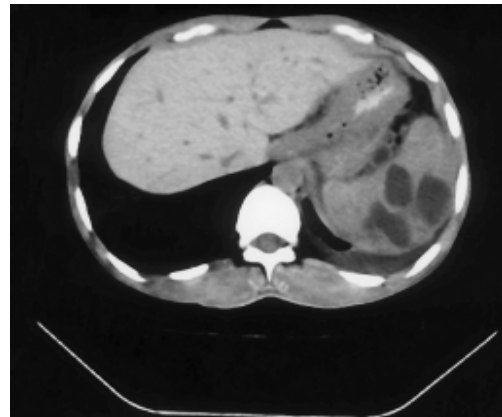


Fig 1 b. Traumatic intrasplenic pseudocyst with associated infarct. Plain CT.

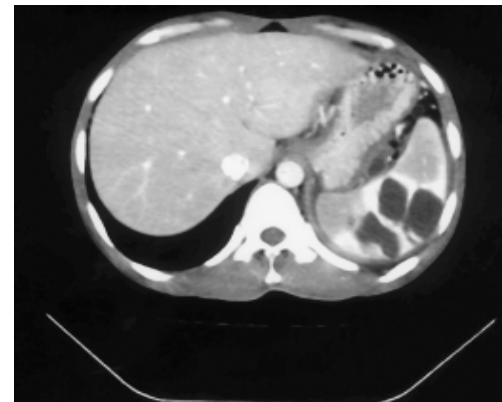


Fig 1 c. Traumatic intrasplenic pseudocyst with associated infarct. CECT.

Of the 47 lesions, 29 were benign and 18 were malignant lesions. Benign lesions included infarcts, abscesses, (2a-c) focal hypodense lesions in HIV+ve patients, (3a-c) cysts and a case of inflammatory pseudotumour (4a-c).(Table 1). Malignant lesions included 6 cases each of Hodgkin's disease, Non-Hodgkin's lymphoma and metastases (5a-d)(Table 2).

**Table 1. Differential diagnosis of benign lesions**

LESION	NUMBER	PERCENTAGE
INFARCTS	10	34.4
ABSCESSES	9	31.2
HIV WITH HYPODENSE LESIONS	5	17.2
CYSTS	4	13.8
INFLAMMATORY PSEUDOTUMOUR	1	3.4
TOTAL	29	100

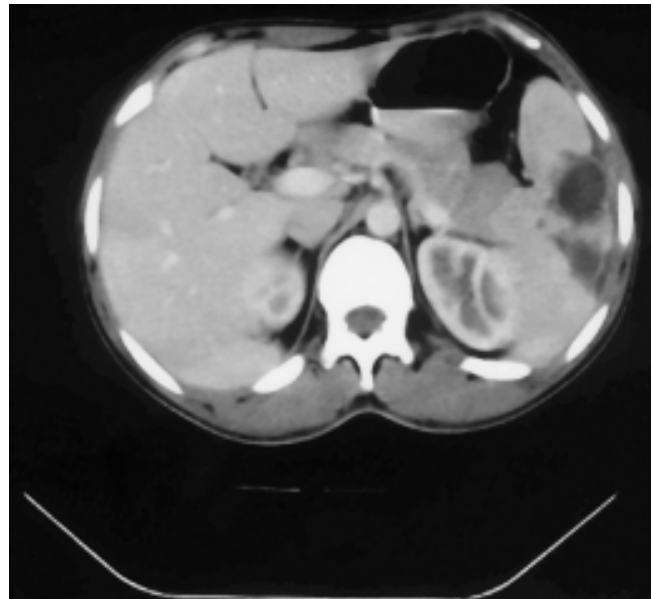


Fig 2 c. Splenic abscess in a patient with infective endocarditis. CECT



Fig 2 a. Splenic abscess in a patient with infective endocarditis. USG.

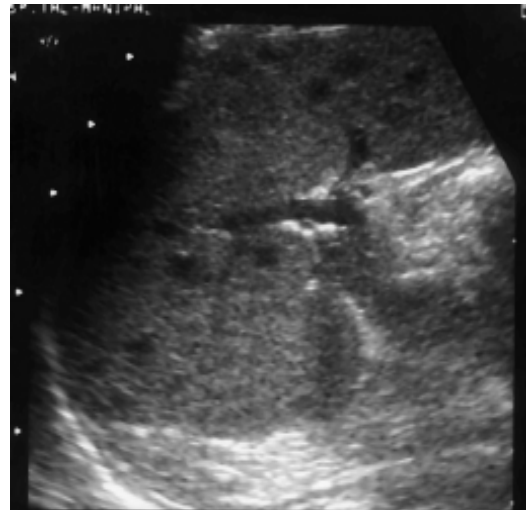


Fig 3 a. Multiple hypodense lesions in spleen in an HIV +ive patient (TB). USG.



Fig 2 b. Splenic abscess in a patient with infective endocarditis. Plain CT.

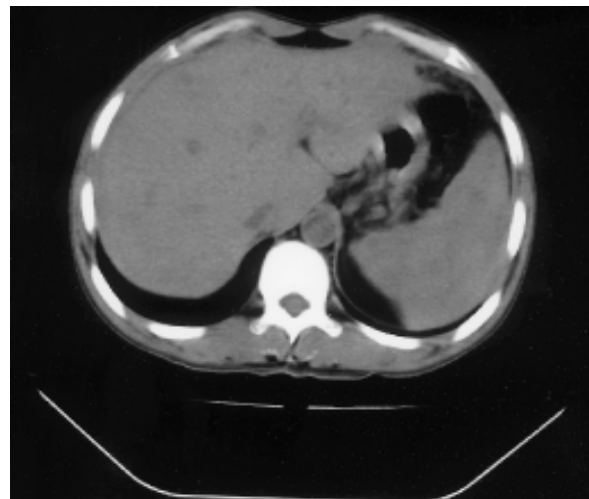


Fig 3 b. Multiple hypodense lesions in spleen in an HIV +ive patient (TB). Plain CT.

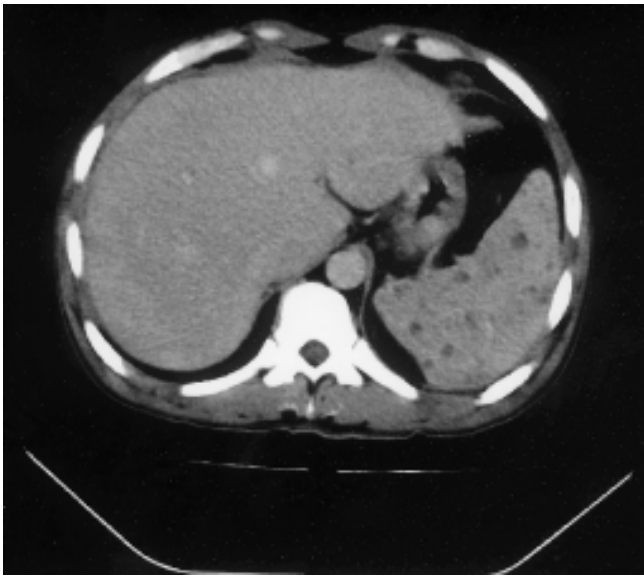


Fig 3 c. Multiple hypodense lesions in spleen in an HIV +ive patient.(TB). CECT.

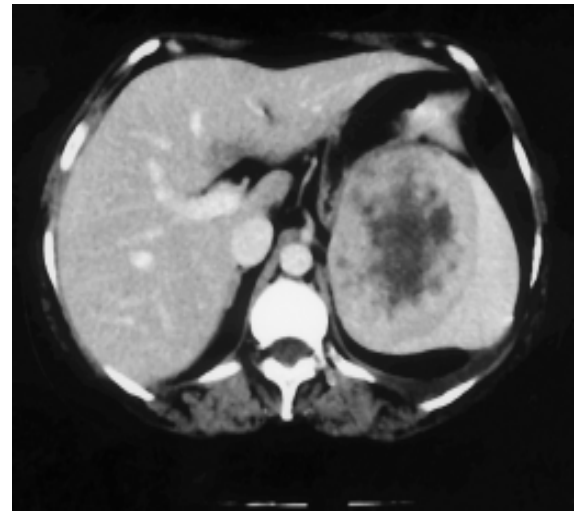


Fig 4 c. Splenic inflammatory pseudotumour. CECT.

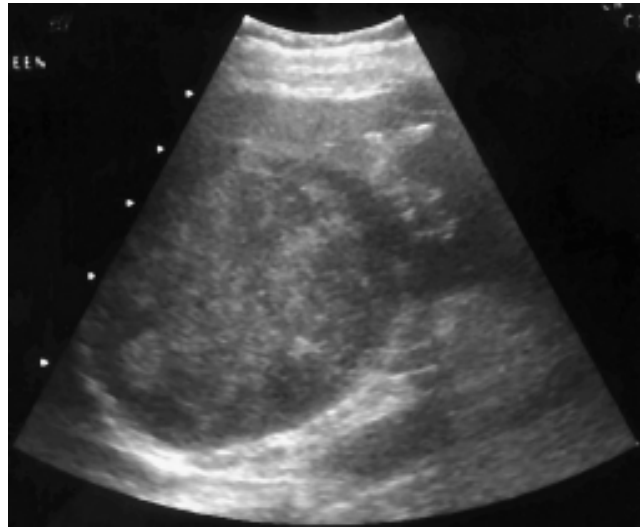


Fig 4 a. Splenic inflammatory pseudotumour. USG.

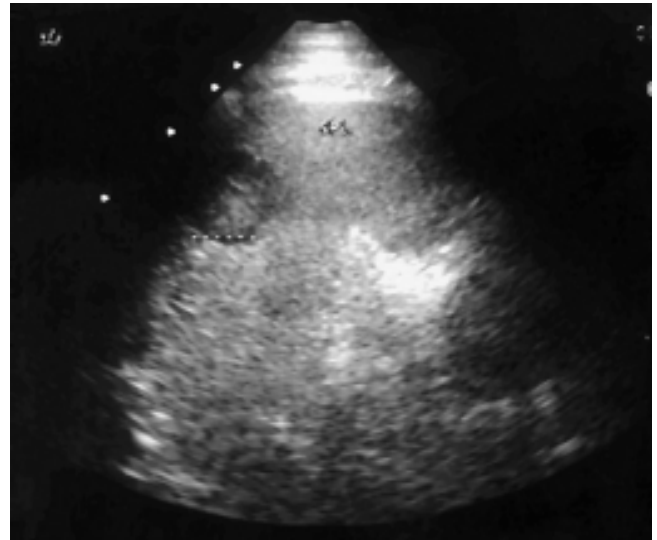


Fig 5 a. Splenic metastasis from bronchogenic carcinoma - USG.

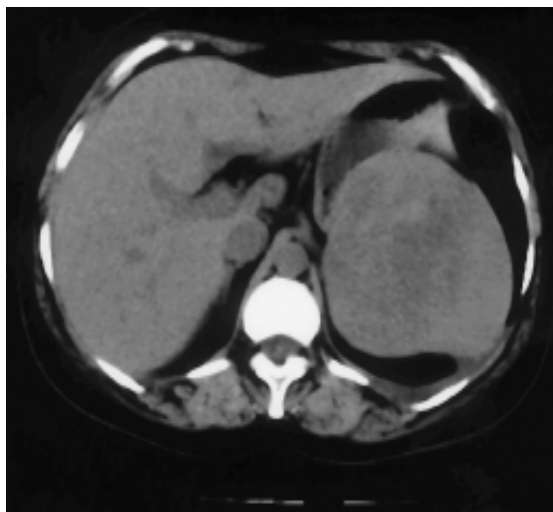


Fig 4 b. Splenic inflammatory pseudotumour. Plain CT.

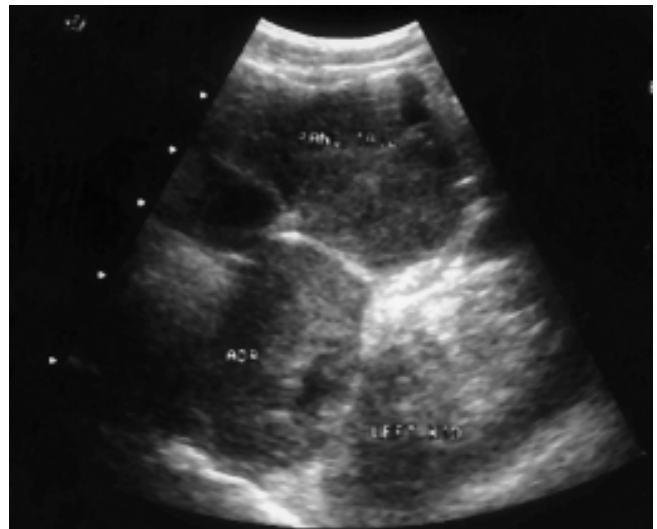


Fig 5 b. Same case showing concomitant involvement of adrenals and pancreas. USG.

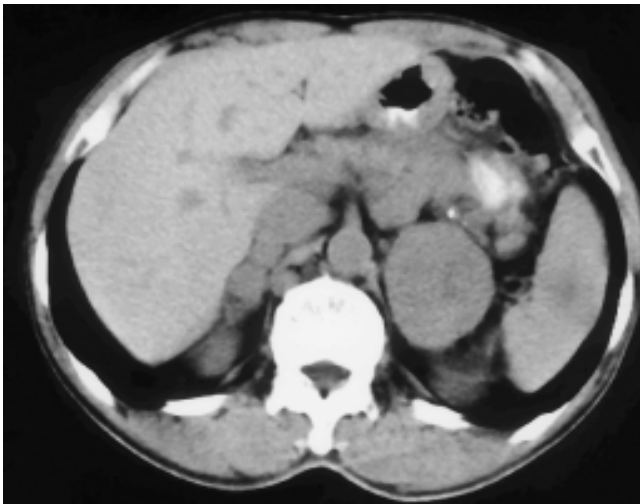


Fig 5 c. Splenic metastasis with concomitant involvement of adrenals and pancreas. Plain CT.

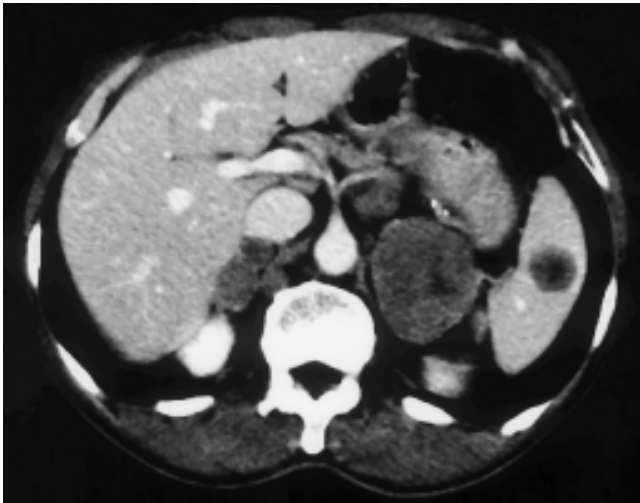


Fig 5 d. Splenic metastasis with concomitant involvement of adrenals and pancreas. CECT.

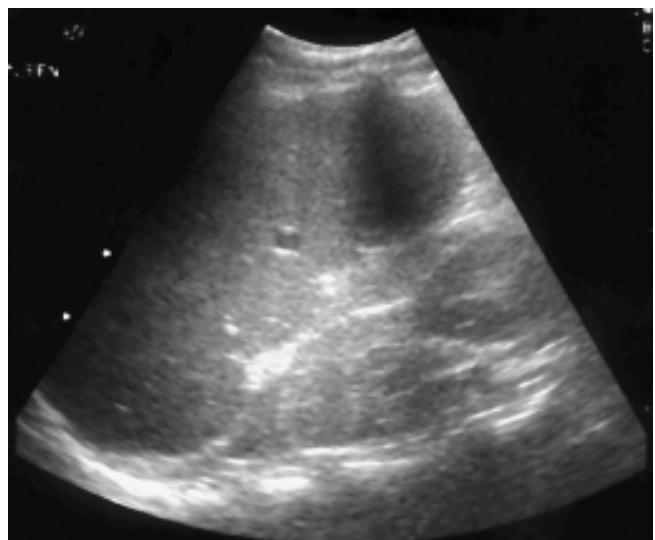


Fig 6 a Extensive atherosclerotic splenic infarct sparing only the hilum. USG was normal and did not show any focal lesion in the spleen.

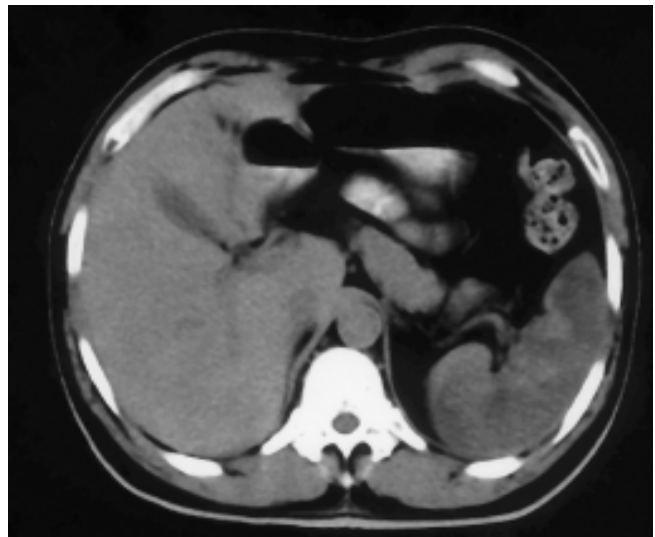


Fig 6 b. Extensive atherosclerotic splenic infarct sparing only the hilum. Plain CT.

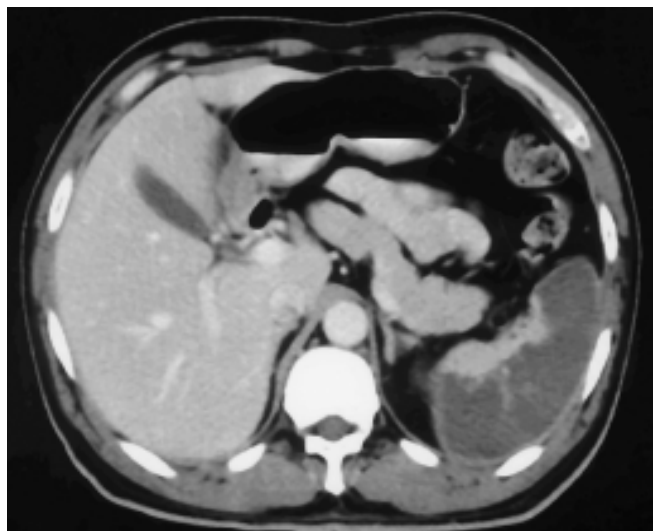


Fig 6 c. Extensive atherosclerotic splenic infarct sparing only the hilum. CECT.

**Table 2. Differential diagnosis of malignant lesions**

LESION	NUMBER	PERCENTAGE
HODGKINS LYMPHOMA	6	33.33
NON HODGKINS LYMPHOMA	6	33.33
METASTASES	6	33.33
TOTAL	18	100

USG picked up 41 lesions (87.2%), plain CT 37 lesions (78.7%) whereas contrast enhanced CT detected all of the 47 lesions. (Table 3). Lesions missed on USG included a case of extensive splenic infarct sparing only the hilum (6a-c) and an infarct associated with a traumatic intrasplenic pseudocyst (1a-c). Those missed on plain CT included splenic lymphomatous deposits, both large nodular (7a-c) and small nodular deposits (8a-c) which were isodense on plain scans.

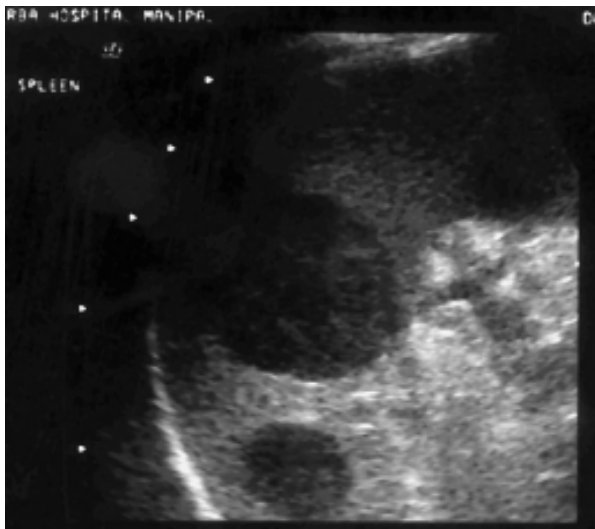


Fig 7 a. Non-Hodgkin's lymphoma with large nodular pattern (>3cm) of splenic involvement. USG.

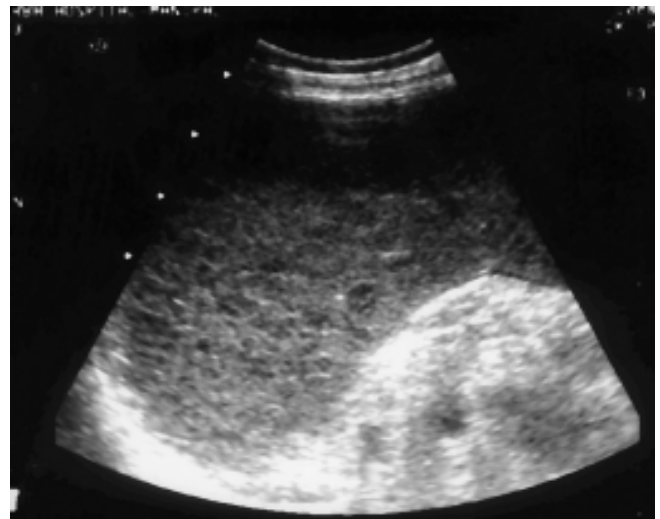


Fig 8 a. Hodgkin's lymphoma with small nodular pattern (<3cm) of splenic involvement. USG.

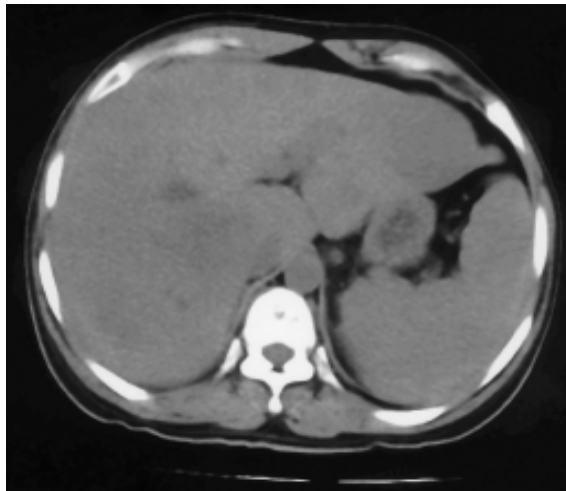


Fig 7 b. Non-Hodgkin's lymphoma with large nodular pattern (>3cm) of splenic involvement. Plain CT - shows only splenomegaly, focal lesions were missed.

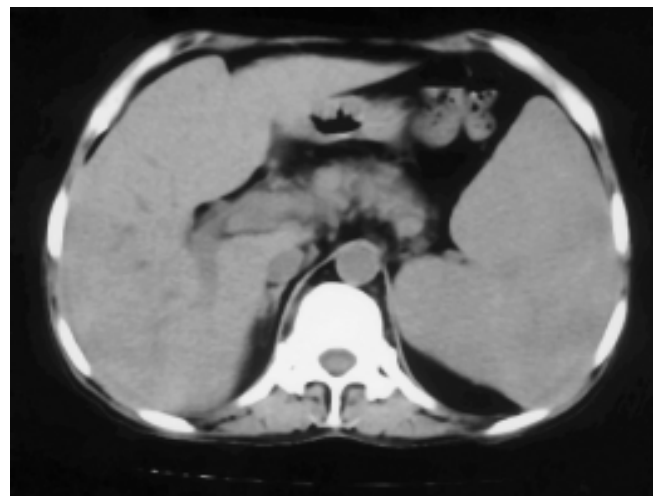


Fig 8 b. Hodgkin's lymphoma with small nodular pattern (<3cm) of splenic involvement. Plain CT - shows only splenomegaly, focal lesions were missed.



Fig 7 c. Non-Hodgkin's lymphoma with large nodular pattern (>3cm) of splenic involvement. CECT - shows the focal lesions in the spleen.

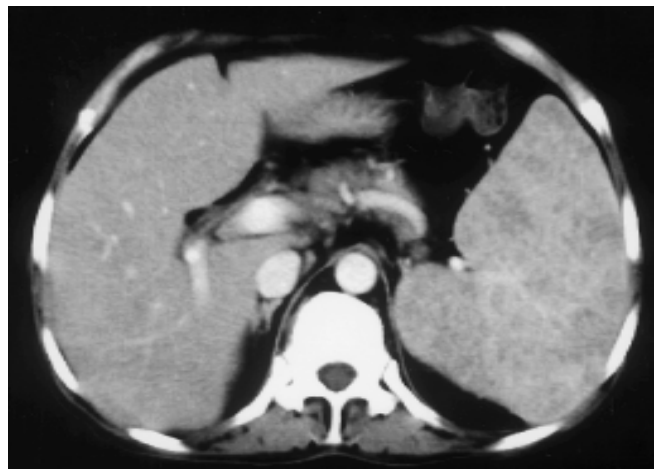


Fig 8 c. Hodgkin's lymphoma with small nodular pattern (<3cm) of splenic involvement. CECT - shows the focal lesions in the spleen.

**Table 3. Lesion detection with various modalities**

MODALITY	NUMBER OF LESIONS
USG	41 (87.2%)
PLAIN CT	37 (78.7%)
CECT	47 (100%)
TOTAL	47 (100%)

A review of our hospital records during the period of our study showed that a total of 119 cases of lymphoma were treated on an OP/IP basis who underwent imaging studies of whom 12 showed focal splenic lesions. Hence incidence of focal splenic involvement of lymphoma in our study was 10.1%.

NHL, especially the high grade lymphomas presented with large nodular pattern of involvement of spleen (7a-c) whereas Hodgkin's lymphoma presented in majority of cases with small nodular pattern of involvement (8a-c)(Table 4).

**Table 4. Imaging patterns of lymphomas**

PATTERN	HL	NHL
Diffuse	0	0
Small nodular	5	2
Large nodular	1	4
Bulky disease	0	0
Total	6	6

Imaging features of infarcts corresponded to the classic wedge shaped peripheral pattern in a majority, ( 9a-c) and were extensive with hilar sparing in the rest (6a-c)(Table 5).

**Table 5. Imaging features of infarcts**

Imaging features	Number	Percentage
Classic wedge shaped peripheral	8	80
Extensive lesion sparing only hilum	2	20
Total	10	100

## DISCUSSION

There was a definite male predominance in our patient population with 37 of the 46 patients being male and the mean age of the study group was 42; this correlated with previous studies in which the size of the study population were comparable [2,3].

The distribution of benign and malignant lesions which was 29:18 in our study. The differential diagnosis of benign and malignant lesions included infarcts, abscesses, focal hypodense lesions in HIV+ve patients, cysts, a case of inflammatory pseudotumour, lymphomatous deposits and metastases. Both these corresponded with the results of

previous studies [1,2,3].

The incidence of focal splenic lesions encountered in our study was 10.1% which corresponded to reports in literature [4,5].

NHL, especially the high grade lymphomas presented with large nodular pattern of involvement of spleen whereas Hodgkin's lymphoma presented in majority of cases with small nodular pattern of involvement. This corresponds to the findings of previous studies [4].

Imaging features of infarcts corresponded to the classic wedge shaped peripheral pattern in a majority, (80%) and were extensive with hilar sparing in 20%. This corresponds to reports in literature [6].

The diagnostic accuracy of combined NECT & CECT was 100% in our study whereas plain CT alone had a diagnostic accuracy of 78.7%. Diagnostic accuracy of USG was 87.2% in our study. This correlated with the findings reported by Y.L.Wan et al [3].

Multiplicity of lesions, extrasplenic involvement and associated splenomegaly were encountered both in benign and malignant lesions and did not help in their differentiation.

## CONCLUSIONS

USG and CT examinations of the spleen, together, helped in arriving at a definite and accurate diagnosis of the various splenic lesions encountered in our study and the differential diagnosis of splenic lesions in our study corresponded to reports in literature.

Diagnostic accuracy of combined NECT & CECT was 100% in our study whereas plain CT alone had a diagnostic accuracy of 78.7% with lesion conspicuity significantly more on post contrast images. Diagnostic accuracy of USG was 87.2% in our study. Hence we concluded that the ideal imaging modality for evaluation of focal splenic lesions was contrast enhanced CT scanning with USG being used as a screening modality and for follow up studies.

## REFERENCES

1. Jean Plakarski, M.D., Michael P. Federle, M.D., Albert A. Moss, M.D., and Stuart S. London, M.D. Computed tomography of the spleen. *Radiology* 135, June 1980:683-689.
2. Luigi Solbiati, M. Chiara Bossi, Elena Bellotti, Carlo Ravetto and Giuseppe Montali. Focal lesions in the spleen: Sonographic patterns and guided biopsy. *AJR* 140, January 1983:59-65.
3. Y.L. Wan, Y.C. Cheung, K.W. Lui, J.H. Tseng and T.Y. Lee. Ultrasonographic findings and differentiation of benign

- and malignant focal splenic lesions. Postgraduate Medical journal 2000;76:488-493.
4. C.Gorg,R.Weide and W.B.Scwerk.Malignant splenic lymphoma: Sonographic patterns, diagnosis and follow up.Clinical Radiology 1997;52:535-540.
  5. Karl Wernecke M.D.,Peter.E.Peters M.D. and Karl-Georg Kruger M.D. Ultrasonographic patterns of focal hepatic and splenic lesions in Hodgkins and Non Hodgkins lymphoma. The British journal of radiology 1987;60:655-660.
  6. Irene Balcar M.D.,Steven.E.Seltzer M.D.,Steven Davis B.S. and Stuart Geller M.D. CT patterns of splenic infarction: a clinical and experimental study. Radiology 1984;151:723-729.