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Utility of Imaging in the diagnosis of splenic diseases

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ABSTRACT

The spleen has a greater capacity for rapid change in size, than any other organ in the body. It is not likely to be palpable unless it is about three times the normal size. Imaging techniques like ultrasound and computed tomography at this stage have proved to be indispensible, as the pattern and other associated pathology can be identified and the physician can be aided in the early diagnosis and management of splenic disease. This is a prospective study of 30 patients with splenic pathology with, in most cases associated hepatic pathology as well. The study was done to know the possibility of diagnosing splenic disease through imaging and to find out the efficacy of imaging in diagnosing splenic abnormalities. The size of the spleen, the patterns of the disease in different imaging modalities and their correlation with age and sex and different clinical settings were studied. The patients were referred to our department from various other departments mainly from the departments of Medicine, pediatrics, surgery for various complaints. Plain films were taken for all patients for all patients in our study, out of which findings were positive for 3(10.00%). All the patients were subjected to ultrasonographic examination, and splenic disease was identified in all 30 cases. Computed Tomography was made use of, in 5 cases in which in all cases, splenic disease was identified (100%). The overall good sensitivity and accuracy of ultrasound diagnosis in splenic disease in our study has lent support once again to the proposition that ultrasound is the diagnostic technique of choice in the primary evaluation of splenic disease.

KEYWORDS Diagnosis, Spleen, Ultrasonography, Disease

INTRODUCTION

Aristotle once referred to the spleen as "an organ not of very stringent necessity". For nearly 2000 years, the spleen has been describes as an "organ full of mystery". It cannot be said that it has as yet discarded its cloak, though it appears, the spleen has a major role in the normal functioning of the body.

The spleen because of its anatomical location, high in the left upper quadrant, under the rib cage, has posed difficulties to the physician and to the radiologist. However the clinical observations over a period of time and the advent of cross-sectional imaging techniques, have thrown light on this mysterious organ thus enabling to identify a large gamut of diseases.

The spleen has a greater capacity for rapid change in size, than any other organ in the body. It is not likely to be palpable unless it is about three times the normal size. Imaging techniques like ultrasound and computed tomography at this stage have proved to be indispensible, as the pattern and other associated pathology can be identified and the physician can be aided in the early diagnosis and management of splenic disease.

MATERIALS AND METHODS

This is a prospective study of 30 patients with splenic pathology with, in most cases associated hepatic pathology as well. The study was done to know the possibility of diagnosing splenic disease through imaging and to find out the efficacy of imaging in diagnosing splenic abnormalities. The size of the spleen, the patterns of the disease in different imaging modalities and their correlation with age and sex and different clinical settings were studied. The patients were referred to our department from various other departments mainly from the departments of Medicine, pediatrics, surgery for various complaints.

Source of data:

The main source of data for this study was patients from the teaching hospitals attached to J.J.M. Medical College, namely Bapuji Hospital and Chigateri General Hospital.

This study was conducted at the department of Radio-Diagnosis J.J.M. Medical College, Davangere, during the period October 1997 to January 2000, involving 30 cases.

Selection of Patients:

The patients were referred from other departments like, Medicine, Surgery and Pediatrics. Most of the patients presented with signs and symptoms relating to the left upper quadrant of the abdomen or the left hypochondrium with unexplained fever, pain, vomiting and fullness of the abdomen etc.

In all the cases a detailed clinical history and thorough clinical examination was done and the findings, blood and laboratory investigations and the clinical diagnosis were recorded in the Performa.

The patients who were subjected for the study had clinical complaints like, unexplained fever, fullness of the abdomen, vomiting, weight loss etc. these patients were subjected to an ultrasonographic examination. If ultrasonography was inconclusive even in the presence of strong clinical suspicion, the patient was then subjected to a CT scan. In selected cases plain X-rays were taken. Patients with splenic trauma were excluded from the study.

The ultrasound equipments used were, Siemens sonoline S.L and Aloka flexus. Siemens ultrasound machine was fitted with one sector and one linear probe, with frequency of 3.5 MHz. The Aloka scanner equipment had one curvilinear and one linear probe of 3.5 MHz frequency.

The computed tomography scanner was a Seimens Somatom A.R.C., which is a modified third generation machine.

Preparation of patients:

In case of adult patients, the patients were kept nil orally 10

hours prior to the procedure with proper instructions being given for good bowel preparation, to minimize the problem of bowel interface. In the pediatric age group instructions regarding bowel preparation were not insisted upon.

Technique:
Ultrasound:
Ultrasound scan was performed by placing the patient in the right lateral decubitus position and having them in a state of suspended deep inspiration for best visualization. A single maximal longitudinal measurement was taken for the splenic length

Scans were obtained in both longitudinal and transverse planes.

Computed Tomography:
Preliminary topogram was done for all the cases. Either 10,5, or 2mm contiguous slices were imaged. The examination was performed by using oral and intravenous contrast material. Splenic length was obtained by summing the number of CT slices on necessary. Other associated findings were also noted.

Methods of collection of data:
Plain film radiographs were taken whenever necessary, where in X-ray abdomen, supine or erect were taken, whichever was found to be more suitable. Evidence of increase in size or abnormal calcification was noted.

In cases where ultrasound and CT was done, the following features were noted. Like splenic size, if calcifications were noted, then the size of the calcification was recorded, if focal lesions of the spleen were noted, whether they were hyper echoic/hyper dense or hypo echoic/hypo dense, whether the size of the lesion was large or small, whether, there were multiple lesions or single and whether there were internal echoes within a lesion or whether it was anechoic or totally hyper echoic/hypo echoic. The site of the lesion was noted.

In CT scan evidence of enhancement pattern of the lesion was noted. The type of enhancement i.e. peripheral or central was noted.

The associated findings in the rest of the abdomen were also noted.

Results:
Table-1: Incidence of splenic disease according to age and sex.

		No. of cases	Percentage
Age group in years	< 14	5	16.66%
	15-40	13	43.33%
	>40	12	40%
	Total	30	100
Sex			
	Male	21	70%
	Female	9	30%
	Total	30	100

In our study the 30 cases were divided into three groups in the following manner, < 14 years (pediatric age group), 15-40 years and > 40 years. Maximum number of patients was in the age group of 15-40 and > 40 years of age, with 13 and 12 cases each adding to 23.33%. Next was < 14 years – 5 cases which came up to 16.66% of the total. The distribution according to sex to male 21 (70%) and female 9 (30%)

Table 2: Splenic disease detected by various imaging modalities

Sl. No.	Imaging	No. of cases	Percentage
1	Plain film (30)	30	10.0%
2	Ultrasonography (30)	30	100%
3	Computed Tomography (5)	5	100%

Plain films were taken for all patients for all patients in our study, out of which findings were positive for 3 (10.00%). All the patients were subjected to ultrasonographic examination, and splenic disease was identified in all 30 cases. Computed Tomography was made use of, in 5 cases in which in all cases, splenic disease was identified (100%).

Table 3: Ultrasonographic evaluation of splenic size, lesions, appearance

		No. of cases	Percentage
Size	Normal	7	24.13%
	Mild increase	8	27.58%
	Moderate increase	10	34.48%
	Massive increase	4	13.79%
	Total	29	100%
Ultrasonographic appearance			
	Hypo echoic	8	26.66%
	Hyper echoic	1	3.33%
	Anechoic	4	13.33%
	Normal	17	56.66%
	Total	30	100
Ultrasonographic appearance			
	Normal Echo texture	29	96.66%
	Hypo echoic	1	3.33%
	Hyper echoic	0	0
	Total	30	100

Out of 29 cases, 7 (24.13%) were found to be normal, 8 (27.58%) were mildly enlarged, 10 (31.48%) were moderately enlarged and 4 (13.79%) were massively enlarged. Ultrasound was unsuccessful in measuring splenic size in 1 case. Out of 30 cases, 17 (56.66%) where no lesion was detected, 8 (26.66%) where there were hypo echoic areas, 4(13.33%) Where there were anechoic areas and only 1 (3.33%) where the lesion was hyper echoic. Out of total of 30,29 (96.66%) were of normal echo texture with 1 (3.33%) which appeared hypo echoic.

Table 4: Correlation between Ultrasonographic findings and C.T. in 5 cases

Sl. No	Conditions	Ultrasound	C.T.	Actual
1	Hepato Splenomegaly	2	2	2
2	Splenic metastases	1	1	1
3	Dissecting pseudo pancreatic cyst			
4	Splenomegaly with acute pancreatitis with cholelithiasis	1	1	1

From the above it is seen that Ultrasonographic findings were similar to the CT findings. In 4 cases CT study was performed after the Ultrasound examination. In one case Ultrasound examination was performed subsequently.

Table 5: Clinical versus Radiological diagnosis in splenic disease

Sl. No.	Clinical Diagnosis VS Radiological diagnosis		Percentage
1	Same	19	63.33%
2	Alternative	10	33.33%
3	Incidental	1	3.33%
4	Incidental	100	100

In 19 cases (63.33%) the imaging findings match up to the clinical suspicion. In 10 (33.33%) imaging gave alternative findings than what was felt clinically. In 1(3.33%) imaging finding was incidental without actual clinical suspicion.

Discussion
Splenic size can be estimated using a number of modalities, but ultrasonography has well recognized advantages. A number of methods have been suggested for estimating the splenic size using ultrasonography, to allow for the greater variability in splenic shape. Measurements are taken in more than one plane. Koga T, Marikawa et al (1975)[1] and Ishibashi

H, Okumura Y (1987)[2] proposed mathematical calculation for these measurements. These calculations are rather unwieldy for every day scanning purpose.

Therefore in our study we used a simple method of taking a single maximal longitudinal measurement.

The accepted upper limit of normal splenic length has been given as 12 cm from the studies concluded by the Frank K, Linhart et al (1986)[3] Dohnert W. et al (1993)[4] Senecail B, et al (1988)[5] in their study have documented that the maximum length of the spleen in healthy adults does not exceed 13 cms.

In our study we have arrived at 12 cm, as the upper most limit for a normal sized adult spleen. This is in accordance with accepted limits of normal spleen size.

However, when the division of degree of splenic enlargement was considered, we have differed from, the classification given by Carol. E. Mittelstaedt[6] of considering moderate spleen enlargement as between more than 11 and less than 20 and massive as more than 20 cm. we have related our classification of splenomegaly more in tune with the clinical appreciation and have organized Splenomegaly into 3 divisions. The increase in size was mild between 12-14 cm, moderate being 14-17 cm and massive being 17 cm and above.

This was done keeping in mind two things, one was to give the clinician a better appreciate of the degree of enlargement, the other was to have 3 divisions which gives a truer picture of the degree of splenic involvement.

Among the focal lesions of the spleen there were 4 cases of multiple granulomas in the spleen. 3 of these cases had moderate splenomegaly and in one case the spleen was normal in size. All the cases had multiple hypo echoic area noted in the spleen. The rest of the splenic echo texture appeared normal. In the case the clinical diagnosis was give as pyrexia of unknown origin and in one case as abdominal Koch's. There was one case in which the granulomatous lesion in the spleen were an incidental finding, in which, the clinical diagnosis was given as osteomyelitis upper end or left humerus.

John R, Peter L (1998)[7] observed that in active tuberculosis, echo-poor or cystic lesion representing tuberculous abscess may be seen. In all four cases of granulomas in the spleen, the radiological diagnosis was quite apparent in terms of the lesions being multiple and hypo echoic. This appearance probably points towards an etiology of tuberculosis.

Incidence of hydatid disease involving spleen in our study was 6.66% which is marginally higher than 2% in studies conducted by Franquet T. Montes M. et al (1989)[8].

We had one case of multiple abscesses in the spleen where in the patient presented with splenomegaly and pain abdomen.

The spleen was mildly enlarged with hypo echoic area noted in the spleen with evidence of few internal echoes within them. All the lesions had well defined walls.

Our findings are once again corresponding to the findings of Iko B. (1986)[9] who observed that sonographic features in 32 cases of splenic abscess there was splenomegaly, associated with hypo echoic lesions of different sizes and shapes, demonstrating little or no sonic through transmission.

There was one case of a pancreatic pseudo cyst in which the pseudo cyst was found dissecting through the splenic capsule. The patient presented with pain abdomen and there was no clinical diagnosis made.

Information regarding the incidence of pancreatic pseudo cyst involving the spleen is not known exactly but studies have been done in this regard by Kothari T, Mangla J.C. et al: 1979[10] and Farman J, Dallemand et al: 1977[11].

CT. was rather underutilized in our study. 5 patients were referred to CT. after they had been put through an ultrasound examination. Except in one case where, ultrasound failed to demonstrate the extent of extension of pseudo pancreatic cyst into the spleen, CT was referred in all other cases to discount the possibility of any other pathology which may be incidental. A probable diagnosis of hydrops gall bladder was confirmed in one case. Acute pancreatitis was diagnosed in another case in which ultrasound failed to pick up any pancreatic pathology. In the case of metastases, CT. confirmed the ultrasound findings.

Plain films had a very low identification percentage of 10. in our study. Both ultrasound and C.T. successfully identified splenic disease in all cases. Through the sensitivity of these imaging modalities were 100%, the specificity was only 46.66%

Conclusion

The overall good sensitivity and accuracy of ultrasound diagnosis in splenic disease in our study has lent support once again to the proposition that ultrasound is the diagnostic technique of choice in the primary evaluation of splenic disease.

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