

## Original Research Article

# Role of ultrasonography in evaluation of right iliac fossa mass compared to CT-scan

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### ABSTRACT

**Background:** With the demonstration of origin and nature of RIF mass by high-resolution ultrasound and multidetector CT scan, the patients presenting with clinically palpable mass in RIF need not to undergo time consuming, uncomfortable and unpalatable barium study. The objective is to evaluate the diagnostic precision of CT and ultrasonography in the diagnosis of right iliac fossa masses and to assess the effectiveness of USG in diagnosing various right iliac fossa masses in comparison with CT scan in terms of sensitivity, specificity, and predictive accuracy.

**Methods:** The study was conducted on 35 patients presenting with right iliac fossa mass who were stable enough to undergo USG followed by CT scan. The time gap between these studies had kept to minimum to make the studies comparable. USG and CT scan was performed by 2 expert radiologists, who had been blinded of each other findings.

**Results:** More than 50% cases were related to appendicular pathology. Ultrasound abdomen had a sensitivity and specificity of 88.9% and 94.11% in diagnosis of appendicular mass, 71.42% and 96.42% in diagnosis of appendicular abscess, 66.7% and 96.6% in diagnosis of ileo-caecal tuberculosis, 50% and 100% in diagnosis of carcinoma caecum respectively as compared to CT scan.

**Conclusions:** USG is the most easily available bed side investigation and excellent screening test for RIF mass. However, CECT whole abdomen remains the gold standard investigation for etiological diagnosis of RIF mass.

**Keywords:** Right iliac fossa mass, Ultrasonography, CT scan

### INTRODUCTION

Right iliac fossa mass, a clinical diagnosis, has multiple differential diagnosis based on its origin as it may arise from parietal wall, intraperitoneum or retroperitoneum; may be a right iliac regional structure or an extension from nearby structure. Differential diagnosis of RIF mass are as follows: Parietal wall origin: Lipoma, desmoid tumour, pyogenic abscess, haemorrhage, and iliac or appendicular abscess that has penetrated the abdominal wall. Intraperitoneal origin: Appendicular masses or

abscesses, ileo-caecal tuberculosis, carcinoma caecum, mesenteric adenitis, iliac nodes, typhlitis, Crohn's disease, actinomycosis, distended gallbladder, ovarian cysts, fibroid uterus, tubo-ovarian mass, occasionally intussusception, amoeboma, and diverticular disease. Retroperitoneal masses: Sarcoma, aneurysm, psoas abscess, undescended testis, unascended kidney, and tumour from ilium and cartilage.

Appendicular pathology is commonest cause for right iliac fossa mass (either appendicular mass or abscess).<sup>1-4</sup>

Other common causes are ileo-caecal tuberculosis and carcinoma caecum. An inflammatory appendix that is adherent to a dilated ileum, greater omentum, and caecum forms an appendicular mass.<sup>5</sup> Suppuration in an acute appendicitis or suppuration in an already formed appendicular mass causes an appendicular abscess.<sup>5</sup> The disease abdominal tuberculosis is widespread in poor nations like India. The sixth most common extra pulmonary tuberculosis kind is it. In people with HIV, it occurs frequently.<sup>6</sup> Due to the presence of Peyer's patches and the favouring effect of the ileo-caecal valve on the stasis of luminal contents, ileo-caecal tuberculosis is the most prevalent kind of abdominal tuberculosis. Adenocarcinoma is the most common kind of carcinoma in the caecum. The third typical location for large bowel carcinoma it is (12%). Risk is increased by diets heavy in fat and lacking in fibre. Antioxidant vitamins A, C, and E, zinc, and a high-fibre diet minimise the risk. In our country, the commonest causes of right iliac fossa mass are appendicular mass or abscess, ileo-caecal tuberculosis and carcinoma caecum. The entire clinical examination, radiographic, biochemical, microbiological, and pathological studies play a major role in the right iliac fossa mass diagnosis. In order to diagnose patients arriving with right lower quadrant pain with a mass, ultrasonography is the imaging modality of first choice.<sup>7</sup> It is a good method for confirming the mass, classifying it, tracing the origin, determining its likely etiopathology, knowing the vascular state, tissue viability of the lesion and assessing neoangiogenesis.<sup>8-10</sup> However, due to obscuration by intestinal gas, skilled operator dependency, and limited resolution in obese people in ultrasonography; contrast-enhanced multiphase CT has become a very handy tool in the arsenal of diagnostic radiology to recognise and classify the lesion.<sup>11</sup> Combining ultrasonography and a CT scan is very beneficial since it allows for the identification of an area of interest.

Use of intravenous contrast and positive oral contrast in bowel studies aids in determining whether a lesion is intraluminal, intramural, or extramural and defines the local and distant spread of any pathology. However, because of radiation exposure to patients, CT should not be done on child unless absolutely necessary and is not advised for pregnant woman. The objective of this study was to evaluate the diagnostic precision of CT and ultrasonography in the diagnosis of diverse right iliac fossa masses and to assess the effectiveness of USG in diagnosing various right iliac fossa masses in comparison to CT scan in terms of sensitivity, specificity, and predictive accuracy.

## **METHODS**

A total of 35 cases with mass in the right iliac fossa (RIF) were included in this observational cross-sectional study done in the department of radiodiagnosis of Bankura Sammilani Medical College & Hospital, West Bengal, during the time period of June 2021 to November 2022.

### ***Inclusion criteria***

Inclusion criteria were; All the patients who presented with mass in right iliac fossa with or without pain and Cases included both male and female patients.

### ***Exclusion criteria***

Exclusion criteria were; Bony swellings of the region, patient with a previous known history of complication due to dye administration, Patients on whom USG & CT could not be performed due to pregnancy, non-cooperation, requirement of immediate surgical intervention.

### ***Data collection***

All the 35 cases selected on a simple random sampling basis were subjected to: Clinical examination of abdominal pain, Interview using predesigned pretested semi structured, interviewer administered questionnaire, Scrutiny of relevant medical reports, Imaging investigations: Ultrasonography followed by CT scan.

Ultrasonography was performed via GE LOGIQ P9 ultrasonography machine with 3.5 MHz curvilinear and 7-12 MHz linear transducer. The patient was nil per oral 12 hours prior to examination. Graded compression technique was utilized to reduce the focal distance of high frequency transducer, displace artifacts producing gas in bowel and precisely locate the region of pathology by maximal tenderness if present. All USGs was performed by the same senior radiologists. The radiologist had been blinded of the clinical and CT scan findings of the patient prior to ultrasonography. Reporting was done immediately. Images had been obtained for each viscus and had been saved for reference. CT scan was performed using standard 16 slice CT scan machine from Siemens.

Water soluble contrast material for CT scan was used in case of suspected cases of bowel perforation. For CECT a bolus of intravenous contrast material, typically 100-150 ml; 350 mg of iodine per millilitre, total iodine load of 35-52.5 had been injected at a rate of 3-5 ml/sec through an 18- or 20-gauge cannula located in a large peripheral vein. Multiphasic imaging had been done; portal venous phase 75-80 sec after contrast administration, delayed phase- 5-10 minutes after contrast administration, arterial phase 25-30 sec after contrast administration was used if required.

### ***Parameters of the mass to be studied on USG & CT***

Parameters were; Location, Size, Margin on USG (well/ill-defined) and on CT (defined/poorly defined/lobulated/spiculated), Nature (solid/septated cystic/non-septated cystic), Echogenicity (anechoic/ isoechoic/hyperechoic/hypoechoic/heteroechoic) in USG & density

on CT, Vascularity (non-vascular/minimally vascular/profoundly vascular/peripherally vascular).

**RESULTS**

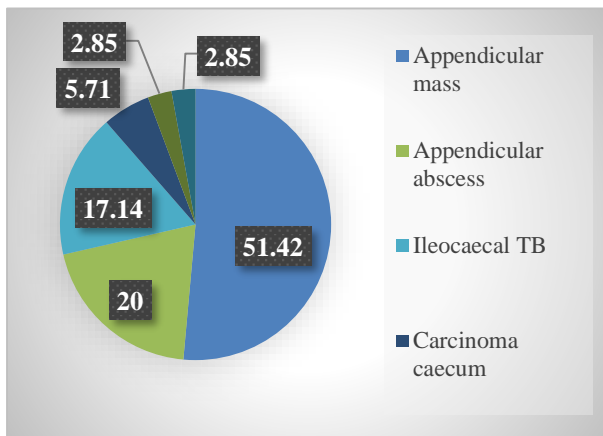
This study of 35 cases presented with right iliac fossa mass was as shown below.

**Table 1: Different types of mass in the right iliac fossa on USG.**

Diagnosis	N	%
Appendicular mass	17	48.57
Appendicular abscess	6	17.14
Ileocaecal TB	5	14.28
Carcinoma Caecum	1	2.85
Psoas abscess	1	2.85
Iliac lymphadenopathy	1	2.85
Inconclusive	4	11.42
Total	35	100

The (Table 1, Figure 1) denote distribution of various pathologies of RIF masses diagnosed in USG and CT scan respectively.

It can be seen that appendicular pathology, on USG constituted (65.71%) including appendicular mass (48.57%) and appendicular abscess (17.14%) and on CT constituted (71.42%) including appendicular mass (51.42%) and appendicular abscess (20%). Ileo-caecal tuberculosis was next maximum diagnosed in USG (14.28%) and in CT scan (17.14%).

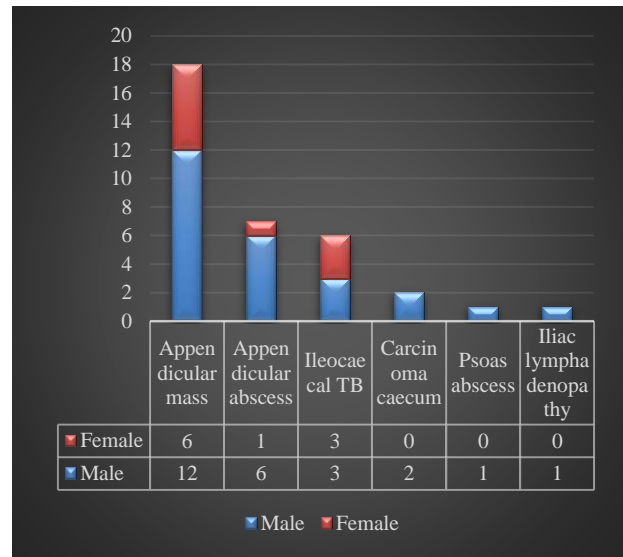


**Figure 1: Distribution of different pathologies of RIF masses diagnosed in CT.**

The (Table 2) denotes age distribution of patients presented with RIF masses. Here study subjects were divided into seven age groups: 11-20 years, 21-30 years, 31-40 years, 41-50years, 51-60 years, 61-70 years, 70+ years. In this study, youngest patient was of age 12 years, who presented with appendicular mass and the oldest was 73 years of age presented with carcinoma caecum. Age of the patients ranged from 12 years to 73 years with median age of 40.8 years.

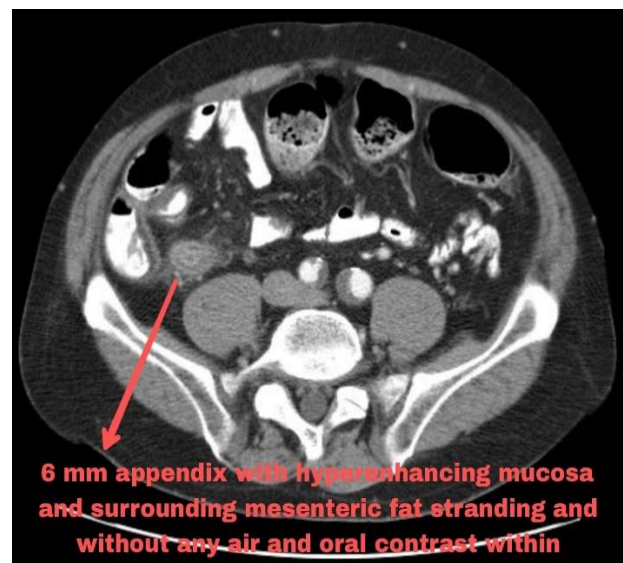
The (Figure 2) shows, male: female ratio was 25:10 (2.5:1). In present study, appendicular mass (66.66%) and appendicular abscess (85.71%) were common in males.

According to (Table 3), most of the sonographically diagnosed RIF masses, i.e. 17 (54.83%) out of 31 masses were hypoechoic and 20 (64.5%) out of 31 masses were peripherally vascular. In present study, patients of appendicular mass had 10 masses (58.8%) with heterogenous echogenicity, 7 hypoechoic masses (41.2%), 12 peripherally vascular masses (70.58%) and 5 non vascular masses (29.41%) on USG.



**Figure 2: Incidence of sex distribution.**

As per (Table 4), most of the masses were of mixed density on CT, i.e.,18 masses (51.4%). On CECT scan, all the cases diagnosed as carcinoma caecum (2 cases) had heterogenous enhancement and rest all had homogenous enhancement.



**Figure 3: CT scan in a case of acute appendicitis.**

**Table 2: Incidence of age distribution.**

Diagnosis	N	Age (years)						
		11-20	21-30	31-40	41-50	51-60	61-70	70+
Appendicular mass	18	2	5	5	2	2	1	1
Appendicular abscess	7	1	1	1	2	2	-	-
Ileocaecal TB	6	-	-	1	1	2	2	-
Carcinoma Caecum	2	-	-	-	-	-	1	1
Psoas abscess	1	1	-	-	-	-	-	-
Iliac lymphadenopathy	1	1	-	-	-	-	-	-
<b>Total</b>	<b>35</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>5</b>	<b>6</b>	<b>4</b>	<b>2</b>

**Table 3: Different parameters of USG in diagnosis of RIF mass.**

Diagnosis	Echogenicity on USG			Vascularity on USG		
	Isoechoic	Hypoechoic	Heterogenous	Non vascular	Profound vascular	Peripherally vascular
Appendicular mass	0	7	10	5	0	12
Appendicular abscess	0	5	1	1	0	5
Ileocaecal TB	2	3	0	4	0	1
Carcinoma Caecum	0	1	0	0	1	0
Psoas abscess	0	0	1	0	0	1
Iliac lymphadenopathy	0	1	0	0	0	1
<b>Total</b>	<b>2</b>	<b>17</b>	<b>12</b>	<b>10</b>	<b>1</b>	<b>20</b>

**Table 4: Different parameters of CT in diagnosis of RIF mass.**

Diagnosis	Density of mass on CT			Enhancement on USG	
	Isodense	Hypodense	Mixed density	Homogenous	Heterogenous
Appendicular mass	0	3	15	18	0
Appendicular abscess	0	5	2	7	0
Ileocaecal TB	1	5	0	6	0
Carcinoma Caecum	0	2	0	0	2
Psoas abscess	0	0	1	1	0
Iliac lymphadenopathy	0	1	0	1	0
<b>Total</b>	<b>1</b>	<b>16</b>	<b>18</b>	<b>33</b>	<b>2</b>

**Table 5: Comparison of USG to CT scan in diagnosis of RIF mass.**

Diagnosis	Sensitivity	Specificity	PPV	NPV	Predictive accuracy	Positive likelihood ratio	Negative likelihood ratio	Kappa value	P value
Appendicular mass	88.9	94.11	94.11	88.9	91.42	15	0.12	0.828	<0.00001
Appendicular abscess	71.42	96.42	83.33	93.1	91.42	20	0.3	0.71	0.0002
Ileocaecal TB	66.7	96.6	80	93.3	91.42	19	0.35	0.67	0.000056
Carcinoma Caecum	50	100	100	97.05	97.14	∞	0.5	0.653	0.012
Psoas abscess	100	100	100	100	100	∞	0.0	1	0.003
Iliac lymphadenopathy	100	100	100	100	100	∞	0.0	1	0.003

**DISCUSSION**

The most common condition presented as right iliac fossa mass in present study was appendicular mass followed by

appendicular abscess, ileocaecal tuberculosis, carcinoma caecum, psoas abscess and iliac lymphadenopathy. Similar results had been reported in studies conducted by Juniorsundresh et al, Raju et al, Behera et al, Millard et al



said USG abdomen correctly diagnosed 97% of RIF masses, so the investigation of choice in RIF mass is USG abdomen, which was comparable.<sup>7,12-14</sup> Martinez-Ares et al said that USG abdomen is 79% sensitive and 92% specific for the diagnosis of colonic carcinoma, which was comparable.<sup>15</sup>

#### ***Appendicular mass-comparison with other studies***

Raju B et al in their study of 50 cases of right iliac fossa mass concluded that appendicular masses accounted for 46% of cases.<sup>13</sup> Shetty et al and Raju et al reported the maximum age incidence in the 3rd and 4th decade.<sup>4,13</sup> In present study, Appendicular mass was seen more commonly in 2nd and 3rd decade. According to Shetty et al, Raju et al and present study, appendicular masses were more common in males than in females.<sup>4,13</sup> The percentage of USG sensitivity with respect to CT scan for appendicular mass in our study is 88.89 as compared to 96 in the study of Madhushankar et al.<sup>2</sup>

#### ***Appendicular abscess-comparison with other studies***

According to Anuradha et al appendicular abscess was common in the 3rd decade.<sup>16</sup> But in present study, most of the cases were in both 4th and 5th decade covering about 57.14% cases which was rather matching the mean age of 40.7±2.7 in Bradley et al study.<sup>17</sup> In present study, appendicular abscess was more common in males (85.7%) which was matching Shetty et al study (70%).<sup>4</sup> The percentage of USG sensitivity with respect to CT scan for appendicular abscess in our study is 71.42 as compared to 98.33 in the study of Madhushankar et al.<sup>2</sup>

#### ***Ileocecal tuberculosis-comparison with other studies***

According to Prakash et al, Shetty et al and Shashikala et al the maximum age of incidence of ileocaecal tuberculosis were age group of 20 to 40 years, 3rd and 4th decade (83%) and 4th decade respectively.<sup>4,18,19</sup> But the present study found the maximum age incidence in the 5th and 6th decade covering about 66.6% cases. This study is matching the equal sex incidence of male and female with Bharat Kumar Behera et al study.<sup>14</sup> The percentage of USG sensitivity with respect to CT scan for ileocecal tuberculosis in our study is 66.7 as compared to 89.28 in the study of Madhushankar et al.<sup>2</sup>

#### ***Carcinoma caecum-comparison with other studies***

Shetty et al and Raju et al reported that 87% and 100% cases were more than 40 years old respectively.<sup>4,13</sup> But in the present study, carcinoma caecum was common in the 6th and 7th decades. The present study revealed that carcinoma caecum was more common in males (100%) which was matching Raju et al, McDermott et al, but contradicting Shetty et al.<sup>4,13,20</sup> Richardson et al said that sensitivity, specificity and accuracy of abdominal ultrasonography in colonic tumours considered to be consistent with colonic carcinoma was 96%, 67% and

91%, respectively.<sup>21</sup> In present study, USG in detecting carcinoma caecum had sensitivity of 50%, specificity of 100% and predictive accuracy of 97.14%. The percentage of USG sensitivity with respect to CT scan for carcinoma caecum in our study is 50 as compared to 75 in the study of Madhushankar et al.<sup>2</sup>

#### ***Psoas abscess-comparison with other studies***

According to Shetty et al 75% cases presented in the 4th decade. In the present study, all cases presented in the 1st decade.<sup>4</sup> The percentage of USG sensitivity with respect to CT scan for psoas abscess in both of our study and the study of Madhushankar et al.<sup>2</sup>

#### ***Iliac lymphadenopathy-comparison with other studies***

Vikramjit S Kanwar studied that Lymphoid mass steadily increases after birth until age 8-12 years.<sup>22</sup> In present study, all cases presented in 1st decade. Munker et al in showed in his study that iliac lymph nodes were recognized with greater sensitivity by computed tomography than by ultrasound (sensitivity, 93% and 100% vs. 77% and 67%, respectively).<sup>23</sup> But in present study, USG in detecting iliac lymphadenopathy had sensitivity of 100%, specificity of 100%. The percentage of USG sensitivity with respect to CT scan for iliac lymphadenopathy in our study is 100 as compared to 62.5 in the study of Madhushankar et al.<sup>2</sup> Our work had some drawbacks, one of which was lack of surgical outcome correlation. Due to lack of follow up and lots of referral from our hospital, surgical correlation could not be established. Last but not the least, we examined a hospital population that might not be typical of a rural or primary care context.

## **CONCLUSION**

Right iliac fossa mass was common in 20 to 60 years of age group. Overall incidence was more common in males as compared to females (2.5:1). Appendicular pathology and carcinoma caecum were more common in males as compared to females. Ileo-caecal tuberculosis was equally common in both males and females. Appendicular pathology (71.42%) either in the form of appendicular mass (51.42%) or appendicular abscess (20%) were the commonest cause of mass in the right iliac fossa. Ileo-caecal tuberculosis (17.14%), carcinoma caecum (5.71%) were the other common causes of mass in the right iliac fossa. Ultrasound abdomen was the essential investigation and it had a sensitivity of 88.9% and specificity of 94.11% in diagnosis of appendicular mass, sensitivity of 71.42% and specificity of 96.42% in diagnosis of appendicular abscess, sensitivity of 66.7% and specificity of 96.6% in diagnosis of ileo-caecal tuberculosis, sensitivity of 50% and specificity of 100% in diagnosis of carcinoma caecum, sensitivity of 100% and specificity of 100% in diagnosis of both psoas abscess and iliac lymphadenopathy compared to CT scan, p value was significant at <0.05 in all cases.

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