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Original Research Article

TO EVALUATE THE ACCURACY OF IMAGING IN IDENTIFYING THE CORRECT ANATOMICAL LOCATION OF CYSTIC ABDOMINAL MASSES IN ADULTS.

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Abstract

Background & Methods: The aim of the study is to evaluate the accuracy of imaging in identifying the correct anatomical location of cystic abdominal masses in adults. Every case underwent a trans-abdominal sonography of the abdomen with the patient fasting overnight and then with a full urinary bladder. The scans were performed on BPL E cube 15 Platinum Alpinion.

Results: Anatomic location of cystic abdominal mass was correctly identified in majority of cases (21/25) i.e 84.0% cases.

Conclusion: Anatomic location of cystic abdominal mass was correctly identified in majority of cases (21/25) i.e 84.0% cases.

Keywords: accuracy, anatomical location, cystic & abdominal masses.
Study Design: Analytical Study.

1. Introduction

With the advent of cross-sectional imaging, cystic lesions are being recognized as an incidental finding in a variety of organs. These lesions can be benign, pre-malignant or potentially malignant[1]. When the cystic lesions are small, it can be difficult to characterize them radiologically. It is important to correlate with the clinical history to accurately characterize the lesion.

Some cystic lesions need prompt surgical treatment e.g. torsion of an ovarian cyst, while some can be managed by an imaging follow up e.g. a functional ovarian cyst. So a careful clinico-radiological evaluation of these lesions is necessary.

Discriminating between benign and malignant ovarian tumours is very important for planning management. In addition to imaging criteria, the value of CA-125 has been extensively studied with controversial results. Some studies have even highlighted the significance of pelvic physical examination[2].

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There is an extensive list of lesions that may appear cystic, making it difficult to render a specific diagnosis on the basis of imaging findings alone. In these cases, correlation of radiologic features with clinical findings can somewhat narrow the differential diagnosis[3]. It can be difficult to radiologically discriminate between benign complex cystic lesions and cystic degeneration of solid tumors, which can be malignant[4]. Thus in this study an attempt will be made to use a clinico-radiological approach to facilitate the correct diagnosis and proper management of cystic abdominal masses in adults[5].

2. Material and Methods

The study was conducted in cases recruited from the out-patient departments and wards of Shridevi Institute of Medical Sciences and Research Hospital, Tumkur for 2 Years, the study was carried out in the Department of Radio-Diagnosis, Shridevi Institute of Medical Sciences and Research Hospital, Tumkur, along the following lines:

- A detailed history, general physical examination, systemic examination and local examination findings were recorded.

Laboratory investigations were conducted as per requirement and availability.

- The clinical diagnosis was recorded.
- Previous imaging studies, if available, were reviewed and findings were recorded.
- Every case underwent a trans-abdominal sonography of the abdomen with the patient fasting overnight and then with a full urinary bladder. The scans were performed on the available ultrasound machines BPL E cube 15 Platinum Alpinion.
- Transvaginal Sonography was done using curved array transducer, wherever required.
- Doppler study was done in all cases to evaluate the cystic mass.

Selection criteria:

Cases who presented with a palpable cystic lump or a cystic abdominal mass on any imaging modality (Sonography/CT Scan/ MRI) were included.

a) The cystic abdominal lesions may be single or multiple.

b) The cystic masses should measure >/= 2.0cms in diameter and

c) At least 3/4th of the lesion (75%) should be cystic on imaging.

Exclusion criteria:

Cases of cystic abdominal masses with an obvious diagnosis were excluded e.g. liver abscesses, gall bladder lesions, pseudopancreatic cysts, simple renal cysts, polycystic liver and kidneys, hydronephrotic kidney, pyonephrosis, pelvi-ureteric junction obstruction.

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3. Result

Table 1: Imaging features of Cystic Abdominal masses on Sonography & CT Scan

Characteristic	Sonography (n=37)		CT Scan (n=30)*	
	No. of cases	Percentage	No. of cases	Percentage
1.Single cyst	35	94.6	28	93.3
2.Multiple cysts	2	5.4	2	6.6
3. Shape				
a. Round	7	18.9	5	16.6
b. Oval	17	45.9	16	53.3
c. Oblong	1	2.7	0	0
d. Bizzare / irregular	2	5.4	0	0
e. Dumbbell	1	2.7	0	0
f. Lobulated	7	18.9	6	20.0
g. Elongated	1	2.7	0	0
h. Tubular	1	2.7	2	6.6
i. Retort shaped	0	0	1	3.3
4. Size (cm)				
a. 0 to 10	14	37.8	11	36.6
b. 11 to 20	18	48.64	12	40.0
c. 21 to 30	5	13.5	7	23.3
5.Well defined margins	37	100	30	100.0
6.Unilocular	21	56.7	18	60.0
7.Bilocular	2	5.4	3	10.0
8.Multilocular	14	37.8	10	33.3
9.Debris/ internal echoes	15	40.5	4	13.3
10.Solid areas	10	27.0	8	26.6
11.Complex appearance	3	8.1	1	3.3
12.Papillary projections	1	2.7	1	3.3
13.Calcification	2	5.4	5	16.6
14.Fat	1	2.7	1	3.3
15.Air	1	2.7	1	3.3
16.Hemorrhage	1	2.7	1	3.3
17. Vascularity of wall ± septae ± solid areas on Doppler	9	24.3	13	43.3
18. Enhancement on CT scan of wall ± septae ± solid areas	9	24.3	13	43.3

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- Number of cystic lesions (single or multiple) and their well defined margins were depicted equally well on both sonography and CT Scan.
- Majority of the lesions were oval in shape on both sonography and CT scan i.e. 17/37 (45.9%) and 16/30 (53.3%) respectively.
- Most of the cystic lesions were unilocular, 21/ 37 i.e. 56.7% on sonography and 18/30 i.e. 60.0% on CT scan.
- Internal debris was identified better on sonography i.e. in 15/37 (40.5%) cases.
- Calcification was better identified on CT- 5/30 i.e. 16.6% cases.
- Size of majority of the cystic lesions was between 11 to 20 cm on both sonography i.e. 18/37 (48.6%) and CT scan i.e. 12/30 (40.0%), while approximately 37.8 % on sonography and 36.6 % on CT Scan were between 0 to 10 cm in diameter.

Table 2: Sonographic characteristics of Benign versus Malignant cystic abdominal masses (n=24)

S. No.	Sonographic Characteristics	Benign (n=19)	Malignant (n=5)
1	Number of cysts	One in 18 cases, Two in 1 case	One
2	Shape of cyst	Round (5) Oval (8) Oblong (1) Bizarre/irregular (2) Dumb bell (1) Lobulated (2)	Oval (5)
3	Unilocular/bilocular	8- Unilocular 2- Bilocular	1- Unilocular
4	Multilocular	9	4
5	Size of cyst (cm)	2 to 30	3 to 25
6	Minimum Wall thickness(mm)	1.0 to 2.9	1.4 to 2.2
7	Maximum wall thickness(mm)	2.0 to 10	3.4 to 5.3
8	Number of septae	Multiple (5) Few (4) Single (4) Absent (6)	Multiple(1) Few (2) Absent(2)
9	Septae- Complete/ free floating	Complete(9) Incomplete(4) Absent(6)	Complete(3) Absent(2)
10	Septal thickness (mm)	1 to 12	4.0 to 5.7
11	Septal irregularity	4 cases	1 case
12	Solid areas	5	3

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13	Debris	6	4
14	Complex appearance	2	1
15	Papillary projections	0	1
16	Calcification	0	1
17	Fat	1	0

- No significant difference in size of Benign and malignant cysts was obvious .
- Atypical shaped cysts i.e oblong, bizarre / irregular shaped, dumbbell shaped, lobulated were more likely to be benign in nature.
- Bilocular cysts were likely to be benign.
- Number of septae varied from zero to multiple in both benign and malignant cysts.
- Incomplete/ free floating septae were more common in Benign cysts.
- Irregular septae were seen in both benign and malignant cysts in 20% cases each.
- Solid areas were more common in malignant cysts(60%) vs 25% in benign cysts
- Thin septae i.e. <4 mm were seen only in benign cases.

Table 3: Doppler characteristics of benign and malignant cystic lesions.

S. NO.	CHARACTERISTICS	BENIGN (n=19)	MALIGNANT(n=5)
3.	Vascularity in septae	2	3
2	Vascularity in Solid areas	2	5
1.	Vascularity in wall	1	1
4	Pulsatility index (n=9)		
	a. 0 to 0.39	0	1
	b. 0.4 to 0.69	2	2
	c. 0.7 to 1.0	2	2
5	Resistivity index (n=9)		
	a. 0 to 0.39	0	2
	b. 0.4 to 0.69	3	2
	c. 0.7 to 1.0	1	1

- Vascularity in solid areas was seen more commonly in malignant cysts.
- There is no significant difference in Pulsatility Index values between benign and malignant cystic lesions.

Table 4: CT Scan characteristics of Benign versus Malignant Cystic abdominal masses

S. NO.	Characteristics	Benign (n=14)*	Malignant(n=5)
1	Number of cysts	One in 13 cases Two in 1 case	1 in all cases

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2	Unilocular/ bilocular	7-Unilocular 2-Bilocular	1-Unilocular
3	Multilocular	5 cases	4 cases
4	Size of cyst	2.5 to 27 cm	3.7 to 26 cm
5	Min. Wall thickness	Imperceptible to 3 mm	1.3 to 3.2 mm
6	Max. wall thickness	3.0 to 9.0 mm	3.8 to 6.2 mm
7	Min. Wall attenuation- NCCT	10 to 38 HU	15 to 30 HU
8	Max. wall attenuation- NCCT	20 to 50 HU	42 to 51 HU
9	Min. Wall attenuation- CECT	20 to 70 HU	30 to 50 HU
10	Max. wall attenuation-CECT	40 to 106 HU	68 to 94HU
11	Number of septae	Complete (6) Incomplete (2) Complete & Incomplete (1) Absent (10)	Complete (4) Absent (1)
12	Septal thickness	3.0 to 12 mm	3 to 7 mm
13	Septal irregularity	4 cases	1 case
14	Septal enhancement	6 cases	4 cases
15	Min. Septal attenuation –NCCT	20 to 33 HU	16 to 44 HU
16	Max. septal attenuation- NCCT	40 to 64 HU	32 to 60 HU
17	Min. Septal attenuation- CECT	25 to 52 HU	30 to 50 HU
18	Max. septal attenuation- CECT	50 to 82 HU	62 to 98 HU
19	Presence of Solid areas	3 cases	4 cases
20	Enhancement of solid areas	3 cases	4 cases
21	Min.attenuation of solid areas-NCCT	5 to 29 HU	18 to 30 HU
22	Max.attenuation of solid areas-NCCT	48 to 102 HU	50 to 140 HU
23	Min. attenuation of solid areas-CECT	5 to 34 HU	40 to 55 HU
24	Max.attenuation of solid areas-CECT	68 to 125 HU	68 to 144 HU
25	Min.attenuation of contents- NCCT	-116 to -4 HU	-80 to -3 HU
26	Max. attenuation of contents –NCCT	12 to 115 HU	30 to 79 HU
27	Min.attenuation of contents- CECT	-100 to -8 HU	-50 to -3 HU
28	Max. attenuation of contents- CECT	14 to 180 HU	42 to 104 HU
29	Hemorrhage	0	0
30	Air	0	0
31	Fat	1	0
32	Calcification	1	1

- Majority of cystic abdominal masses were solitary cysts except in 1 case on CT.
- Majority of malignant cysts were multilocular on CT – 4/5 i.e. 80%.

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- Amongst benign cysts 7/14 (50.0%) were unilocular and 5/14 (35.7%) were multilocular on CT scan.
- No significant difference seen on CT scan in size of benign and malignant cysts.
- Wall attenuation was measured by scrolling scans, minimum wall attenuation on non-contrast scans , minimum & maximum wall attenuation on contrast enhanced scans were higher in benign masses than malignant.
- Septal irregularity was seen in 4/14(28.6%) of benign cases and 1/5 (20.0%) of malignant cysts on CT scan.
- No significant difference in septal attenuation value was seen in precontrast & post contrast images in between benign and malignant cysts.
- Septal enhancement was seen in 6/14(42.9%) of benign cysts and 4/5(80.0%) of malignant cysts.
- Presence of solid areas and their enhancement was seen in 3/14(21.4%) of benign cysts and 4/5(80.0%) of malignant cysts.
- The maximum attenuation of solid areas was higher on both pre-contrast and post-contrast CT in malignant cysts.
- Maximum attenuation of contents was higher on both pre-contrast and post- contrast CT in benign cysts.

Table 5: Comparison of assessment of Location of Cystic abdominal masses on Imaging studies and Surgery (n =25)

S. No.	Sonography +/ - CT Scan	Operative findings
1*	Retroperitoneum/Intraperitoneal	Retroperitoneum
2	Left ovary	Left ovary
3	Retroperitoneum & intraperitoneal	Intraperitoneal & Retroperitoneal
4	Right ovary	Right ovary
5	Right adrenal gland	Right adrenal gland
6	Intraperitoneal	Intraperitoneal-left ovary
7	Right kidney	Right kidney
8	Left ovary	Left ovary
9	Right ovary	Right ovary
10	Uterus	Uterus
11	Right ovary	Right ovary
12	Right ovary	Right ovary
13*	Intraperitoneal	Retroperitoneum
14	Intraperitoneal	Intraperitoneal
15	Right ovary	Right ovary
16	Right ovary	Right ovary
17	Intraperitoneal	Intraperitoneal-right ovary

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18	Intraperitoneal –right ovary	Intraperitoneal – right ovary
19	Left ovary	Left ovary
20	Uterus and cervix	Uterus and cervix
21	Right ovary	Right ovary
22	Right ovary	Right ovary
23*	Intraperitoneal-right ovary and left fallopian tube	Bilateral fallopian tube and right ovary
24	Right ovary	Right ovary
25	Intraperitoneal fluid collection in right iliac fossa	No intraperitoneal fluid collection

Anatomic location of cystic abdominal mass was correctly identified in majority of cases (21/25) i.e 84.0% cases.

4. Discussion

There was no significant difference in size of benign (2 to 30 cms) and malignant cystic lesions (3 to 25 cms) on sonography. Atypical shaped cysts i.e oblong, bizarre / irregular shaped, dumbbell shaped, lobulated and bilocular cysts were more likely to be benign in nature[6].

Number of septae varied from zero to multiple in both benign and malignant cystic masses. While incomplete/free floating septae and thin septae (4.0 mm) were more common in benign cysts, septal thickness of upto 12 mm was seen in a benign cystic lesion due to tubercular hydrosalpinx[7]. Irregular septae were seen in both benign and malignant cysts in 20% cases each.

Solid areas were more common in malignant cystic masses i.e.in 3/5 cases (60%), while they were seen in only 5/19 (26.3%) benign cystic masses. Wall thickness ranged from 1.0 to10.0 mm in benign cysts and 1.4 to 5.3 mm in malignant cysts[8].

On Doppler study vascularity in the wall was seen in 1/5 (20.0%) malignant cysts and 1/19 (5.2%) benign cysts. Vascularity in septae was seen in 3/5 (60.0%) malignant cysts and 2/19 (10.5%) benign cysts. Vascularity was seen in solid areas in 5/5 (100.0%) malignant cysts and 2/19 (10.5%) benign cysts[9]. Thus vascularity in septae and solid areas were seen more commonly in malignant cystic masses.

On CT scan, the majority of benign cystic abdominal masses were solitary cysts except in a case of a bilateral tubercular hydrosalpinx with right ovarian cyst and another was a case with cyst in gastro splenic ligament and simple cyst in liver[10]. There was no significant difference seen on CT scan in size of benign (2.5 to 27 cm) and malignant cysts (3.7 to 26 cm).

The anatomic location of cystic abdominal mass was correctly identified in the majority (21 /25) i.e 84.0% cases. The per-operative location was right ovary (11), left ovary (4), retroperitoneum (2), intraperitoneal (1), intraperitoneal & retroperitoneal (1), right kidney (1), right adrenal (1), uterus (1), uterus and cervix (1) and bilateral fallopian tube (1).

The diagnosis of location of cystic abdominal masses was incorrect in the following three cases. In a 23 year female presenting with pain abdomen, bleeding per vaginum and fever since 8 days after normal vaginal delivery, a large retroperitoneal hematoma was misdiagnosed on

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sonography as an intraperitoneal hematoma, lying in the subhepatic region anterior to right psoas, extending from the level of lower pole of right kidney to the right iliac fossa. Cysts and cyst-like abdominal masses are difficult to characterize when they are very large and fill most of the abdomen, because they distort normal anatomy, hence their site of origin can be difficult to ascertain[11]. In another case- gross cystic dilatation was present in both fallopian tubes per operatively while on CT Scan it was localized only to the left fallopian tube and on the right side only an ovarian cyst was reported on sonography and CT Scan. Patel et al. in their study on 67 cystic adnexal masses found that hydrosalpinx can be diagnosed with the highest likelihood when a tubular mass with the waist sign or a tubular mass with small round projections is encountered. Incomplete septations and short linear projections are less discriminating findings of hydrosalpinx. In the third case which was diagnosed as mesothelial cyst, preoperatively it was difficult to determine whether the lesion was retroperitoneal (as it was abutting the antero-lateral margin of left psoas muscle) or intraperitoneal (as it was abutting a jejunal loop as well); surgery confirmed it to be retroperitoneal, in close relation to the descending colon[12].

Dhuvuru et al. reported a case of a 23-year-old South Asian Indian male who presented with complaints of acute onset severe right lower abdomen pain and high grade fever for one day. On clinical examination he had tachycardia and a distended abdomen with diffuse tenderness, guarding and rigidity[13]. On ultrasound scan, a midline fluid collection measuring 10 × 9 × 8.6 cm with moving internal echoes was seen. Aspiration yielded frank purulent material. With a clinical suspicion of acute appendicitis complicated by appendicular abscess, a laparotomy was done. Intraoperatively the appendix was normal and no free abdominal fluid was observed. Instead, a cystic lesion measuring 12 × 8 cms attached from the root of the mesentery to the sacral promontory was seen and was excised completely[14]. They concluded that, a retroperitoneal cyst can mimic acute appendicitis with abscess clinically and sonologically and hence a retroperitoneal cyst must be kept in mind if the appendix is normal intraoperatively[15].

5. Conclusion

Anatomic location of cystic abdominal mass was correctly identified in majority of cases (21/25) i.e 84.0% cases.

6. References

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