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Research Article

Ultrasound Evaluation of Appendicular Pathologies

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Abstract: The objective of the study was to evaluate the role of ultrasound in evaluation of appendix and to correlate with surgical and histo-pathological findings. This is a prospective study and was carried out between February 2014 to July 2014 at the Department of Radiology, P.D.U. Govt. Medical College and civil hospital, Rajkot. Abdominal ultrasound & Doppler study with clinical & pathological correlation of 80 cases was done for diagnosing pathologies involving appendix accurately. Out of 80 patients diagnosed by ultrasound, the most common pathologies seen in our study were-acute appendicitis, lump formation, perforation, mucocele and carcinoid. The diagnosis given on ultrasound was confirmed on per-op & histo-pathological findings. Ultrasound is useful in the diagnosis of appendicitis and should suffice as the modality of choice whenever the appendix is identified. The decision to perform appendectomy or to treat a patient conservatively should be made in association with clinical findings.
Keywords: Appendicitis, Ultrasound, Lump, Mucocele, Treatment, Carcinoid

INTRODUCTION

Appendicular pathologies are most frequently found cause of right iliac fossa pain. Ultrasound assessment of appendix is very accurate in diagnosis. Ultrasound has its best role in assessing appendix & its inflammation, surrounding inflammation, nodal enlargement, abscess formation and peri-appendicular collection. It is also used to see other structures near appendix to rule out the other diagnosis like colitis, vesico-ureteric junction stone and adnexal pathologies.

Ultrasound is almost confirmatory for appendicular pathologies but sometimes CT scanning is used for confirmation in complicated cases like perforation and appendicular masses, gangrenous appendicitis and evaluation of retro-caecal appendix.

Aims of the study

- To evaluate the role of ultrasound in diagnosis of pathologies involving appendix.
- To discuss the imaging spectrum of common pathologies of appendix.
- To correlate with surgical and histological findings.
- To discuss the traditional treatment methods.

MATERIALS AND METHODS

The study includes cases of appendicular pathologies diagnosed on ultrasonography. All patients were evaluated clinically and subjected to imaging and findings were confirmed with per-operative and histo-pathological findings.

Place of study: Department of Radiology, P.D.U. Govt. Medical College and Civil Hospital, Rajkot.

Duration of Study: 6 months (1-02-2014 to 30-06-2014)

Type of Study: Prospective Study

Ultrasound Machines and transducer used: Phillips IU22 Linear (7-9MHz), Esaote MyLab 50 and Esaote My Lab 20 Linear (7.5-12MHZ).

Inclusion Criteria

All cases of right iliac fossa pain and clinically suspected of appendicular pathologies and proven after USG were included in the study.

Exclusion Criteria

All cases suspected clinically but having other possible differential proven on ultrasound with normal appendix were not included in this study.

RESULTS

A total of 80 cases of appendicular pathologies were studied,

Table 1: Distribution of cases diagnosed by ultrasound with surgical and histological correlation

Ultrasound diagnosis	No. of Cases	Percentage	Ultrasound diagnosis confirmed by operative and histological findings	Sensitivity	Specificity
Acute appendicitis	62	78%	55	100	73
Appendicular lump	12	15%	--		--
Mucocoele	5	6%	5	100%	100%
Carcinoid of appendix	1	1%	1	100%	100%
Total	80	100%	68	100%	100%

Histo-pathological examination was accepted as final confirmatory diagnosis and out of 62 patients of acute appendicitis 55 were confirmed with findings of acute appendicitis and 7 had changes of chronic appendicitis.

Table 2: Sex distribution of appendicular lesions

Sex	No. of Patients	Percentage
Male	49	62%
Female	31	38%
Total	80	100%

- The cut off diameter for appendicitis in our study was taken as greater than 6mm.The number of patients having appendicular diameter between 6-9mm was 50 and 12 patients had diameter above 10mm.
- The age range for acute appendicitis in our study was between 12-65 years.
- Out of 62 patients of acute appendicitis, 28 patients were diagnosed with perforation on ultrasound. All of them underwent surgery and 17 were confirmed operatively. Thus, ultrasound showed a specificity of 76% and sensitivity of 100 % for diagnosis of perforation. 7 patients showed gangrenous changes and 6 patients showed appendicolith on ultrasound all of which were confirmed on surgery. Although presence of an abscess or collection was highly specific for perforation, the sensitivity was low. Presence of enlarged lymph nodes in right iliac fossa had low specificity for appendicitis.

DISCUSSION

Acute appendicitis

Acute appendicitis is the most common surgical abdominal emergency with a life time prevalence of one in seven [1]. The diagnosis is mainly clinical but because of myriad presentation it is correct in up to 80% of the patients [2]. This resulted in negative appendicectomy rate of 20 to 30% that had been considered acceptable [3]. This concept is being challenged at present day of quality assurance. The removal of normal appendix is not a benign procedure and negative appendicectomy carries a definitive morbidity [4]. With incorporation of new diagnostic modalities in clinical decision making, low negative appendicectomy rate can be achieved without increasing the rate of perforation [8]. The most widely studied new diagnostic modalities are CT Scan, Ultrasonography and Laparoscopy [9-11]. We have selected the Ultrasound because of its wide availability, simplicity, low cost, noninvasiveness and lack of need of ionizing contrast material.

The ultrasound for diagnosis of acute appendicitis was first popularized by Puylaert in 1986, hundred years after the publication of acute appendicitis by Fitz [5, 6]. Graded compression technique was used by him, where a uniform pressure is applied in right iliac fossa by a hand held ultrasound transducer. With this technique, normal and gas filled loops of intestine are either displaced from the field of vision or compressed between anterior and posterior abdominal walls. Inflamed appendix is incompressible is seen optimally as a blind ended tubular structure with laminated wall arising from the base of caecum. It is aperistaltic, non-compressible and its diameter should be more than 6mm. Similarly there may be increased echogenicity of the peri-appendicular mesenteric fat. The sensitivity of 89% and specificity of 100% of this technique was reported for diagnosis of acute appendicitis [6]. Ultrasonic probe tenderness can be elicited and patient himself can localize the most tender point and hence the site of inflamed appendix [7].

When appendix was normal, ultrasound played a useful role in finding the cause of right pain like mesenteric lymphadenitis, VUJ calculus or hemorrhagic ovarian cyst.

Findings on ultrasound suspicious of appendix perforation include loculated peri-cecal fluid, phlegmon or abscess, prominent peri-cecal or peri-appendicular fat, and circumferential loss of the sub mucosal layer of the appendix [12].

Gangrenous appendicitis shows changes of acute appendicitis with necrosis of the wall of the appendix, most commonly developing in obstructive appendicitis and frequently causing perforation and acute peritonitis. On ultrasound, the appendix appears enlarged, shows air foci within the lumen and wall with thickening of the wall, loss of bowel gut sign and echogenic peri caecal fat.

The treatment is early operation and appendectomy as soon as the patient can be prepared. Appendectomy is increasingly accomplished laparoscopically and may have some benefits over the

open technique. Preparation for operation rarely takes more than 1 to 2 h in early appendicitis but may require 6 to 8 h in cases of severe sepsis and dehydration associated with late perforation.

Appendicular lump

If acute attack of appendicitis is not treated adequately,body tries to contain the infection. In this process, nearby intestine and omentum try to isolate the infection of infected appendix by surrounding it from all sides and in the process a mass or lump is formed inside and is felt on examination in lower abdomen and on ultrasound appendix appears inflamed and is surrounded by non compressible echogenic mesentery fat with inflamed terminal ileum and caecum representing lump formation. There is also free fluid and lymph nodes in right iliac fossa.

The only circumstance in which operation is not indicated is the presence of a palpable mass 3to 5 days after the onset of symptoms [17]. Should operation be undertaken at that time, a phlegmon rather than a definitive abscess will be found, and complications from its dissection are frequent [18].

Such patients treated with broad-spectrum antibiotics, parenteral fluids, and rest usually show resolution of the mass and symptoms within 1 week and are kept on follow-up and interval appendicectomy may be done [13].

Mucocele

Mucocele typically produces large, hypoechoic, well-defined right lower quadrant cystic masses with variable internal echogenicity, wall thickness, and wall calcification. The internal contents often show a laminated or whorled appearance. These masses are frequently retro-cecal and may be mobile. Although their sonographic appearance is not always specific, the diagnostic possibility of mucocele should be considered when an elongated oval cystic mass is found in the right lower quadrant in any patient with an appendix [14].

Mucocele with free base and upto 2 cm are treated surgically with appendectomy and lymphadenctomy. If size is more than 2 cm and it compresses the base and lesion is extending into caecum then typhlectomy and specimen is send for histopathology and if found malignant then hemi-colonectomy is done. If benign lesion is found then patient is kept on follow-up.

Carcinoid

Carcinoid tumour of appendix is most common malignancy and most commonly occurs at tip rather than base of appendix because they probably arise from sub-epithelial neuro-endocrine cells that are present in lamina propria which are abundant at distal end. 80% of them are less 1cm in size. On ultrasound, there is hypoechoic mobile mass at the tip of the appendix which shows internal vascularity on color Doppler. Appendicular carcinoid rarely shows metastasis. The primary site of metastasis is liver and carcinoid metastasis is hypervascular [15].

Simple appendectomy is adequate treatment for patients with apparently localizd tumours<2cm in largest dimension and is also appropriate treatment for lesions>2cm in elderly patient and in those at high operative risk. Right hemicolonectomy is justified only in young patient with tumour >2cm and at low risk of morbidity and mortality [16].

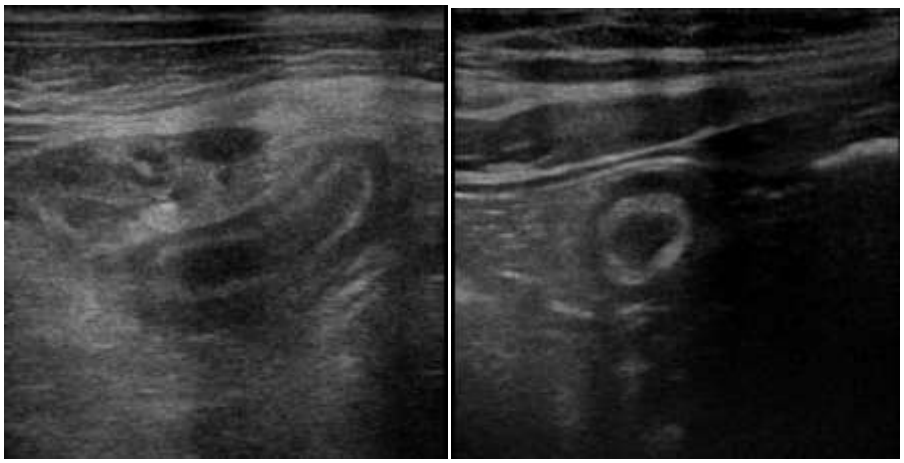

Fig.1: Acute appendicitis - Longitudianl and axial scan showing blind ended,tubular,distended, appendix with hypoechoic wall suggestive of inflammed appendix

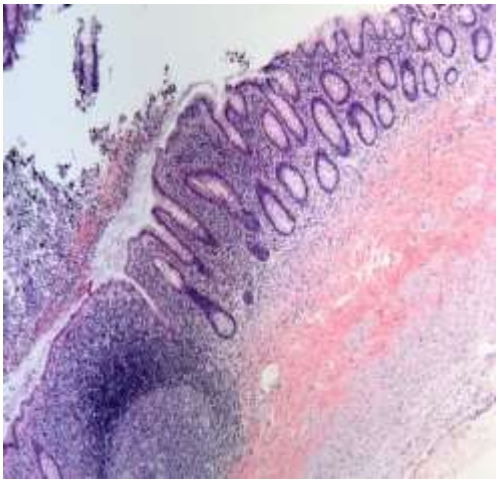

Fig. 2: Histopathological slide of appendix shows redominenetly polymorphs cell and few eosinophis & lymphocytes suggestive of acte inflamatory changes of appendix

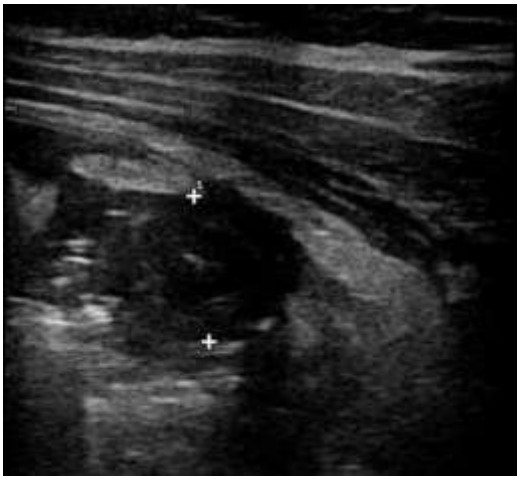

Fig. 3: Perforated appendix – Scan shows inflamed appendix with possible rent in its wall and peri-appendicular free fluid with echogenic mesentry

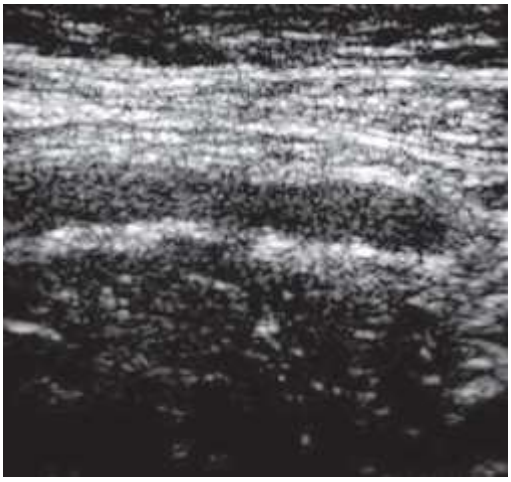

Fig. 4: Gangrenous Appendicitis – longitudinal scan showing loss of "bowel gut sign" and prominent ecogenic pericecal fat

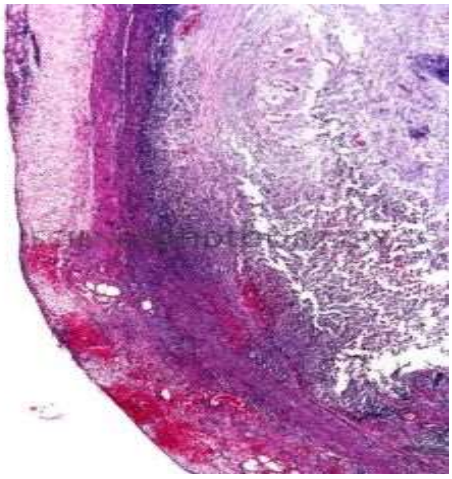

Fig. 5: Histopathological slide of appendix shows predominantly polymorphs cellularity and gross specimen appear blackish suggestive of gangrenous changes

Fig. 6: Mucocele –longitudinal scan shows distended appendix with lumen filled with low level internal echoes and mildly thickened wall suggestive of mucocele formation

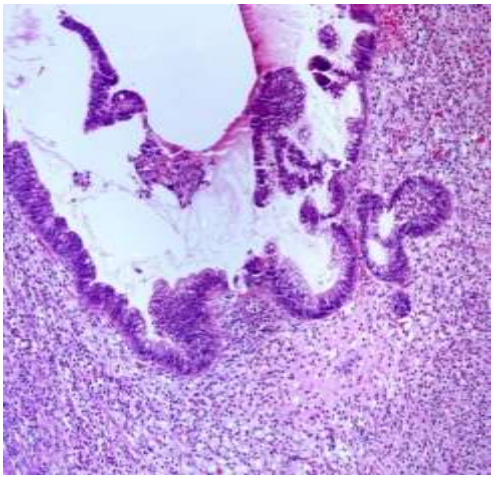

Fig. 7: Histopathological specimen shows distended lumen filled with pink homogenous material with few inflammatory cells suggestive of mucocele formation

Fig. 8: Appendicular carcinoid- Ultrasound image shows well defined hypoehcoic lesion noted at tip of appendix which shows internal vascularity on color Doppler suggestive neoplastic etiology-Carcinoid is more likely

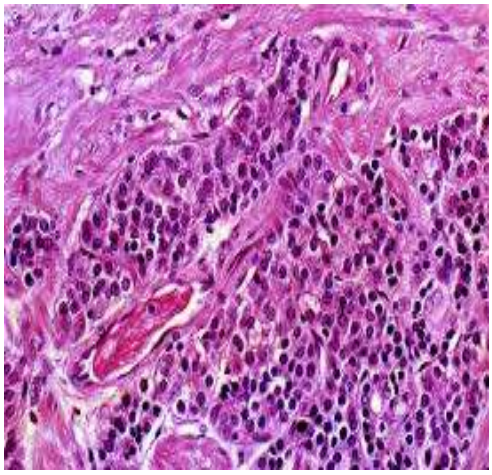

Fig. 9: Histopathological slide shows cells arranged in cords and nests and show polymorphism with powdery nucleus and scanty cytoplasm, possibility of carcinoid

CONCLUSION

Ultrasound has high sensitivity and specificity for diagnosis of appendicitis and should suffice as the modality of choice whenever the appendix is identified. The decision to perform appendectomy or to treat a patient conservatively should be made in association with clinical findings. Since ultrasound has low specificity in detecting perforation of appendix - CT should be reserved for complicated cases in which the appendix is not identified or the presence or absence of perforation cannot be determined with ultrasound and histopathology should remain as gold standard.

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