

Original Research Article

A Clinical Study of Ultrasonographic Diagnosis of Acute Appendicitis

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Abstract: Acute appendicitis is the most common abdominal surgical emergency. The diagnosis may be easy but many times it may be very difficult. The clinical diagnosis of appendicitis is wrongly made many times as it is initially over-looked, leading to unnecessary surgery or delay in surgery. The commonest finding by USG, when appendix was visualized were blind ended tubular structure, non compressible and target lesion. During USG, decrease in probe tenderness was found to be an important finding as all these cases had perforated appendix. Maximum number of cases as detected by USG and operation had retrocaecal appendix. Histopathologically 90% cases had acute appendicitis and rest of the cases had acute on chronic appendicitis. Thus, in the present era, it could be said that USG is an essential investigation whenever suspected case of appendicitis has come.

Keywords: Appendicitis, USG, Retrocaecal appendix.

INTRODUCTION

Acute pain right iliac fossa continue to be a common diagnostic challenge to the surgeon, although many patients with sudden or gradual onset of abdominal pain progress to severe abdominal pain requiring operative intervention, other may have the pain resolve over a period of time with eventual recovery without a surgical procedure.

Acute appendicitis [1] is the most common abdominal surgical emergency. Other appendicitis mimicking conditions are mesenteric lymphadenitis, gynaecological diseases such as persistent or haemorrhagic ovarian cysts, ectopic pregnancy, adnexal torsion and tubo-ovarian abscess, caecal and sigmoid diverticulitis, Chloecystitis, perforated peptic ulcer, Crohn's disease, urological conditions, small bowel obstruction, omental infarction, intussusception, rectus sheath haematoma, ruptured aortic aneurysm, pancreatitis and Meckel's diverticulitis [2].

In 1906 plain radiography was used in the diagnosis of acute appendicitis. Diagnosis of

abnormality of appendicitis was made on the basis of various roentgenographic finding mentioned by the various authors are, air fluid levels or dilatation of terminal ileum, caecum or ascending colon, signs of local paralytic ileus, deformity or obliteration of caecal shadow, blurring or spasm of right psoas muscle, scoliosis of lumbar spine, altered right flank stripe, haziness over the right sacroiliac joint and free intraperitoneal or retro peritoneal gas.

Introduction of USG in medical field in 1940 change the era of diagnosis of appendicitis. Since then there are various changes in USG occurred.

Ultrasound contains waves with a frequency of more than 20,000 cycles/second which the human ears cannot hear. In medical ultrasonography, frequencies used are commonly 2-10 MHz. The transducer or the probe works as both transmitter of sound waves and receiver of echoes. The piezoelectric crystal is the producer of ultrasound waves. Received signals from the patient are fed into the computer which forms the

image. There are three types of ultrasound image display.

- A-mode: Only one dimensional static display as spikes is obtained. It is used only in eye scan.
- B-mode: Two dimensional real time images in the form of grains. It is most widely used type. Using this mode Transverse, Longitudinal or Oblique sections can be taken.
- M-mode: Here images are recorded as dots. It is mainly used in moving parts like echocardiography. M-mode is also called as TM mode, i.e. Time Motion Mode.

Several studies have recently demonstrated the benefit of contrast enhanced or non-enhanced CT Scan over ultrasound and plain radiograph in the diagnosis of acute appendicitis.

AIMS AND OBJECTIVES

The objectives to evaluate the sensitivity and specificity of USG:-

- In the diagnosis of acute appendicitis.
- In the diagnosis of other appendicular pathology.
- To differentiate other pathologies mimicking acute appendicitis.

MATERIAL AND METHODS

The present study conducted in the Department of Surgery, SP Medical College, and PBM Hospital, Bikaner, diagnosed to have appendicitis and operated for the same.

The detailed history and clinical finding of the case were recorded, on a proforma, the cases were then subjected to Routine laboratory, Biochemical, Radiological and Ultrasonography.

100 patients with suspected acute appendicitis were evaluated by ultrasound image 3.5 - 7.5 MHz with graded compression technique.

The purpose of the study was to evaluate the sensitivity and specificity of Ultrasonography (USG).

All ultrasound studies were obtained with 3.5 - 7.5 MHz Linear array Transducer and sector scanner with the patient bladder partially full.

The method of real time examination was similar to that used in graded compression Technique described by Puylaert C.

Graded compression USG was done using 3.5 - 7.5 MHz linear - array transducers according to the situation. The following accepted criteria were considered for the diagnosis of an inflamed appendix.

- Visualization of non-compressible appendix as a blind ending tubular aperistaltic structure
- Target appearance of 6mm (6 millimeters) in the total diameter on cross section maximal mural wall thickness 2mm.
- Diffuse hypoechogenesity (associated with a higher incidence of perforation).
- Lumen may be distended with anechoic / hyper echoic material.
- Loss of wall layers.
- Visualization of appendicolith
- Localized peri-appendiceal fluid collection.
- Prominent hyper echoic mesoappendix /pericaecal fat.
- Free pelvic fluid.

All patients were routinely asked the site of maximal pain in right lower quadrant (RLQ) with single finger, scanning of this area was often helpful in identification of aberrantly located appendixes.

The examination was initiated after applying gelly (US) and scanning U.S. image 3.5 - 7.5 MHz in Transverse plane in the lateral right mid abdomen just above the level of the umbilicus, the examination was continued caudally in Right Lower quadrant with gradually increasing compression, compression was increased until all bowel gas and/or fluid could be expressed from the ascending colon and caecum.

An attempt was made to image the caecal tip in transverse plane by scanning caudally to the approximate insertion of the Terminal ileum, gently reducing and increasing the pressure of Transducer readily allowed assessment of compressibility of normal bowel the normal caecum and Terminal ileum could easily be compressed with moderate pressure, care was taken so that pressure of the Transducer was gradually reduced so as to not elicit pain because of rebound tenderness.

The inflamed appendix was most often visualized at the base of caecal tip during maximal graded compression.

The examination was continued caudally with identification of psoas and iliacus muscles and the external iliac artery and vein, longitudinal and oblique scans were than obtained of lower Right Quadrant again with graded compression and assessed the position echo texture of wall, lumen and target appearance of appendix, mural thickness of wall (The mural thickness of wall was not used as diagnostic criteria in the study as there are no published ultrasonographic criteria for normal wall thickness).

The examination was considered diagnostic if all bowel gas and fluid could be manually expressed with

the Transducer from the cacum and terminal could not be adequately compressed.

The ultrasound criteria for the diagnosis of acute appendicitis was visualization of non-compressible appendix, the presence of appendicolith and localized periappendiceal fluid was noted as confirmatory finding for diagnosis of acute appendicitis. In women the pelvis was imaged in longitudinal and transverse planes with the patient bladder partially full.

OBSERVATIONS & DISCUSSION

The present study was carried out on 100 patients of suspected cases of appendicitis admitted in the wards of department of General Surgery of P.B.M. Govt. Hospital, Bikaner during the year 2014-2015. The observations have been presented as follows:

Table-1: Table showing incidence of presenting symptoms in the study (n=100)

Symptoms	No. of patients	Percentage
Pain right iliac fossa	100	100%
Pain epigastric region	20	20%
Pain umbilical region	80	80%
Nausea/Vomiting/Anorexia	90	90%
Fever	70	70%
Dysuria/Frequency	12	12%
Diarrhoea	15	15%
Constipation	05	5%
Epigastric discomfort	05	5%
Abdominal distension	05	5%
H/o of previous attack	22	22%

The pain right iliac fossa was universally present in all patients, pain epigastric and umbilical region was present in 20% and 80% respectively, nausea, vomiting, anorexia were present in 90 percent cases and fever was present in 70 percent cases.

Other symptoms such as dysuria with frequently of micturition, diarrhea, constipation,

epigastric discomfort, abdominal distention were occasionally present in our study.

A history of past attack of appendicitis was found in 22 percent of cases.

Incidence of presenting symptoms in the study

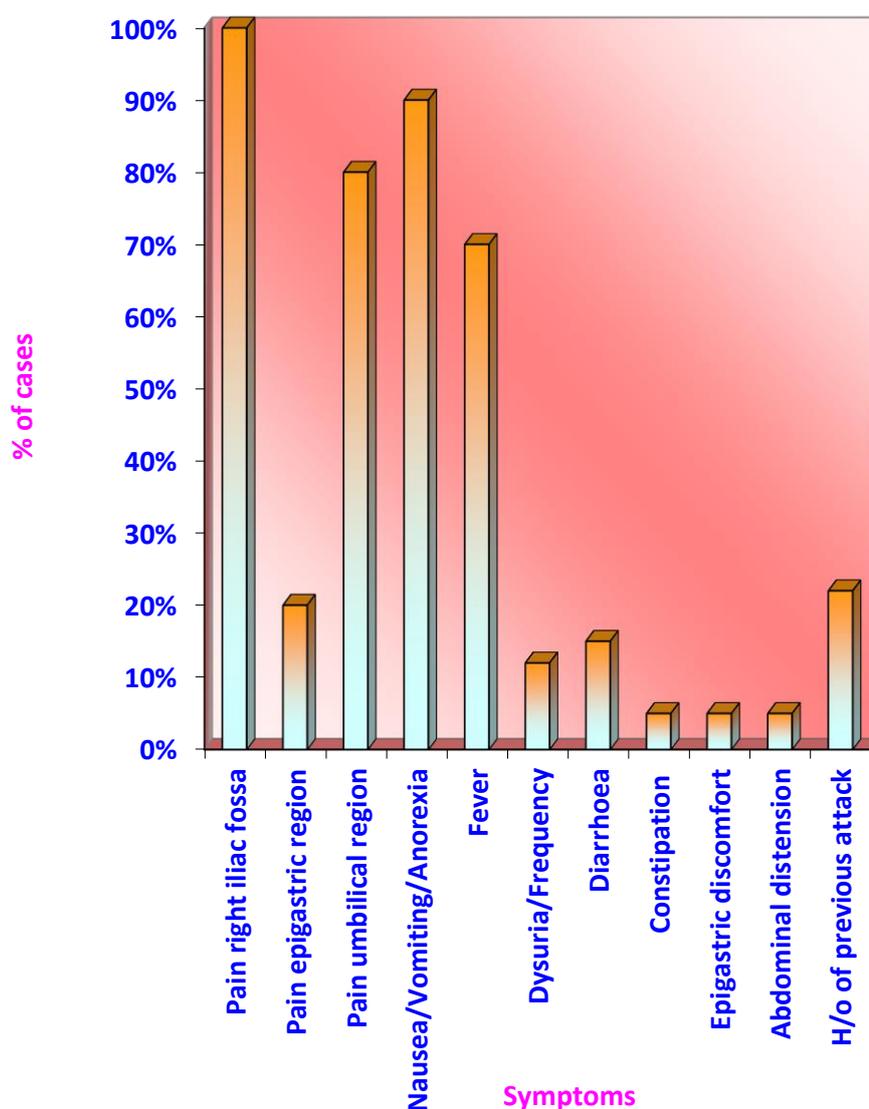


Fig-1: Incidence of presenting symptoms in the study

Table-2: Table Showing clinical findings in cases of Appendicitis (n=100)

Signs	No. of Cases	Percentage
Tenderness in Right Iliac Fossa	100	100%
Rigidity/Guarding in Right Iliac Fossa	68	68%
Epigastric Tenderness	20	20%
Lump	10	10%
Generalized Peritonitis.	5	5%

On clinical examination, tenderness in right iliac fossa was found in 100 (100%) cases, followed by guarding and rigidity 68 (68%) cases, epigastric

tenderness 20 (20%), lump 10 (10%) and generalized peritonitis 5 (5%) cases.

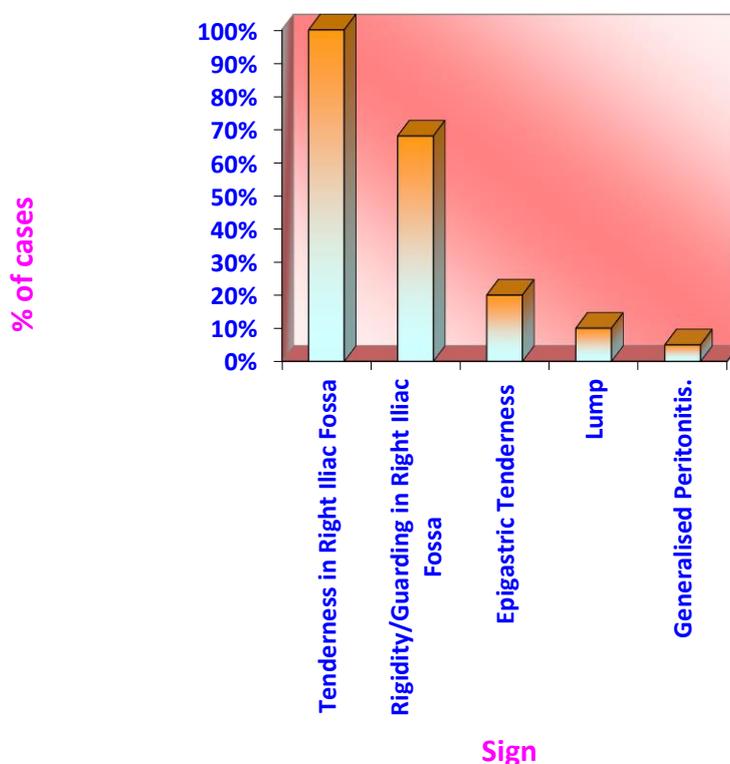


Fig-2: Clinical findings in cases of Appendicitis

Table-3: Table showing Ultrasonography Finding in Appendicitis (n=100)

S.No.	Findings Detected	No. of patients	Percentage
1	Blind ended tubular structure	87	87%
2	Non compressible & target lesion	87	87%
3	Probe tenderness	100	100%
4	Position of Appendix	67	67%
5	Peri appendicular fluid	15	15%
6	Lump	10	10%
7	Appendicolith	18	18%

Blind ended tubular structure, non compressible & target lesion (Bull eye) and position of appendix were seen in 87% cases. Probe tenderness was present in 100% of cases. Peri appendicular fluid, lump

and position of appendix were detected ultrasonographically in 15% and 10% & 67% cases respectively.

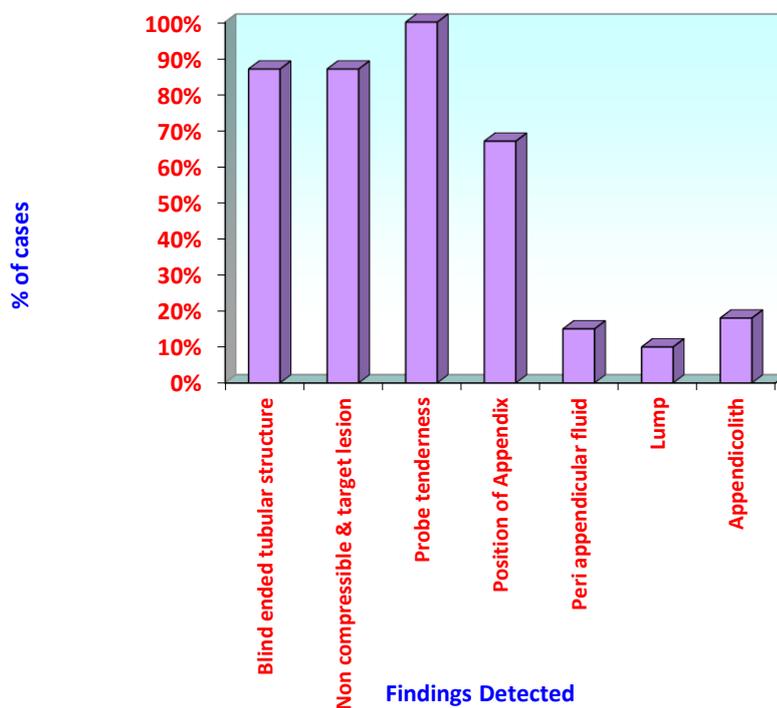


Fig-3: Ultrasonography Finding in Appendicitis

Table-4: Table showing ultrasonographical diagnosis (n=100)

S.No.	Diagnosis	No. of patients	Percentage
1	Acute Appendicitis	53	53%
2	Acute appendicitis with pregnancy	2	2%
3	Acute appendicitis with ovarian cyst	4	4%
4	Acute appendicitis with splenomegaly	1	1%
5	Probe tenderness with acute on chronic	17	17%
6	Probe tenderness with splenomegaly	2	2%
7	Probe tenderness with renal calculus	4	4%
8	Acute appendicitis with uterine fibroid	1	1%
9	Acute appendicitis with enlarged prostate	1	1%
10	Probe Tenderness & Appendicular lump	10	10%
11	Probe Tenderness with peritonitis	5	5%

Among the 100 cases, 53 (53%) were acute appendicitis, 17 (17%) probe tenderness with acute on

chronic appendicitis, 10 (10%) appendicular lump and 5 (5.00%) were perforated appendix.

Ultrasonographically diagnosed (n=100)

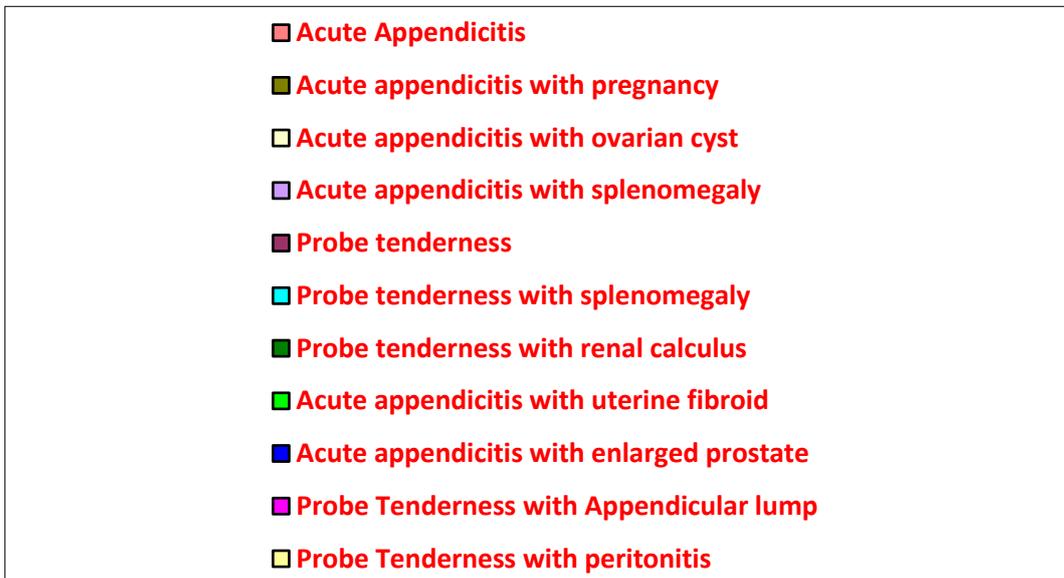
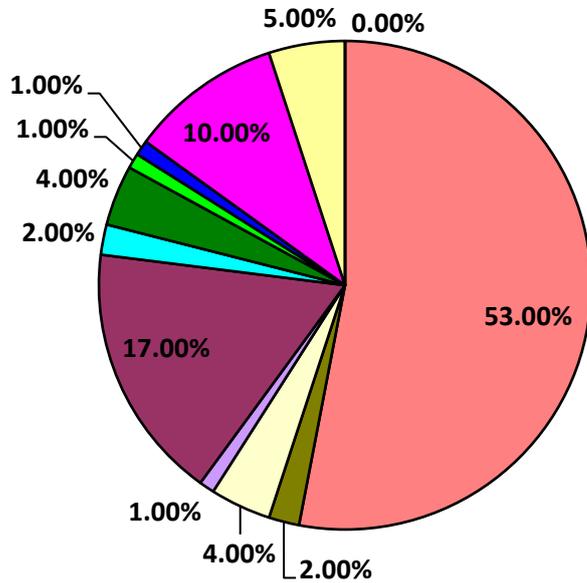


Fig-4: Ultrasonographical diagnosis

Table-5: Table showing Operative findings (n=100)

S.No.	Operative findings	No. of patients	Percentage
1	Acute appendicitis	66	66.00%
2	Attenuated appendix	14	14%
3	Lump	10	10%
4	Perforated appendix	5	5%
5	Gangrenous appendix	4	4%
6	Mucocele	1	1%

During operation among 100 cases, acute appendicitis, Attenuated appendix and lump were 66%, 14% and 10% respectively.

Perforated appendix was found in 5 cases (5%), gangrenous appendix and mucocele were found in 4(4%) one case (1%) each respectively.

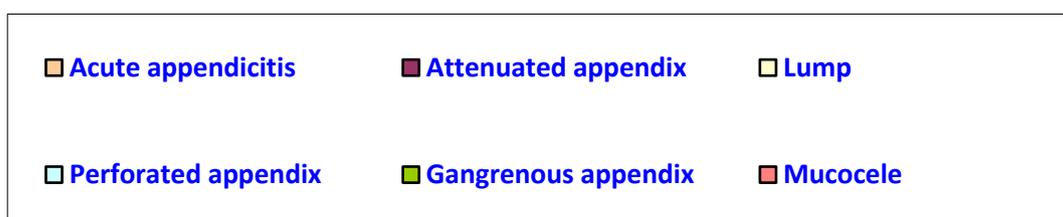
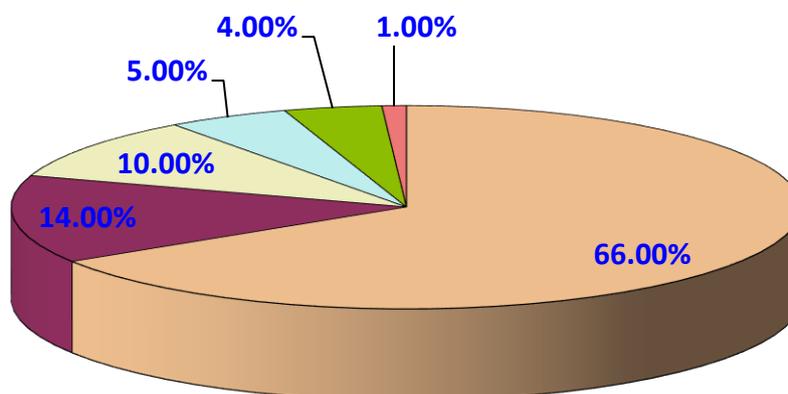


Fig-5: Operative findings

CONCLUSION

The present study was conducted in General surgery department of P.B.M. Hospital Bikaner during the year 2014-15.

- The maximum number of cases was found in age group 21-30 (58%) years.
- Males (72) were affected nearly thrice than females (28).
- Hindus (92%) were most commonly affected.

- Pain in right iliac fossa was present in all (100%) patients, which was followed by symptoms of nausea/vomiting (90%) and gastric upset in 80% of cases.
- Tenderness in right iliac fossa was present in all (100%) cases and it was followed by rigidity/guarding in 68% cases.
- Maximum number of patients (42%) had hemoglobin 12.1-13 gm%.

- 75% of cases had more than 11,000 TLC counts and in only 25% it was less than 11000/mm³.
- Probe tenderness was present in 100% cases in ultrasonographic evaluation.
- Appendix could be visualized in 85 (85%) cases by U.S.G.
- Maximum number of patients had retrocaecal appendix i.e. in 75 cases (75%) as detected by USG.
- By USG, when appendix was visualized, the commonest characteristic findings were blind ended tubular structure, non compressible and target lesion.
- Probe tenderness alone was found to be an important finding during USG and it was found in 100 cases out of which 100 later proved to cases of appendicitis.
- Associated pathology in other organs i.e. ovarian cyst, pregnancy, uterine fibroid, renal/ureteric calculus and enlarged prostate could be detected by USG.
- 95 (95%) cases had increase in probe tenderness during USG examination and decrease in probe tenderness was detected in 5 cases (5%) and all these 5 cases later proved to be of perforated appendix.
- In maximum number of cases i.e. 35 (35%) the diameter of appendix was 8-10 mm as detected by USG.
- During operation, maximum number of cases (75%) was found to have retrocaecal appendix.
- Histopathologically, 90 (90%) cases were diagnosed as acute appendicitis and 10 (10%) cases as chronic appendicitis.

The maximum number of patients of appendicitis was in young age group and males. Hindus were mostly affected. Pain in right iliac fossa and nausea/vomiting was commonest symptoms. Most common clinical finding was tenderness in right iliac fossa followed by rigidity/guarding. Whenever probe tenderness in right iliac fossa was present, all cases later proved to be of appendicitis. In almost more than half the cases appendix could be visualized and its position, diameter, wall thickness could be detected on USG. The commonest finding by USG, when appendix was visualized were blind ended tubular structure, non compressible and target lesion. During USG, decrease

in probe tenderness was found to be an important finding as all these cases had perforated appendix. The USG was found to have advantage that pathology in other organ could also be detected. Maximum number of cases as detected by USG and operation had retrocaecal appendix. Histopathologically 85% cases had acute appendicitis and rest of the cases had chronic appendicitis. Thus, in the present era, it could be said that USG is an essential investigation whenever suspected case of appendicitis has come.

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