



ASSOCIATION BETWEEN ULTRASONOGRAPHIC, CLINICAL AND HISTOPATHOLOGICAL EXAMINATION FINDINGS IN ACUTE APPENDICITIS

General Surgery

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ABSTRACT

Background: Vague abdomen pain is the most commonly encountered symptom in the emergency department at any hospital. The present study was conducted to assess association between ultrasonographic, clinical and histopathological examination findings in acute appendicitis. **Materials & Methods:** 100 patients with clinical presentation of acute appendicitis between the age group of 18 – 45 years, over the period of 3 years between 2020 to 2023, in the department of General Surgery, Sri Aurobindo Medical College and Postgraduate Institute, Indore (M.P.) were recruited for the study. A routine USG and CT were performed. **Results:** Out of 100, males were 69 and females were 31. Ultrasound was normal in 14 and positive in 86. Out of 14 normal cases, inflamed appendix was seen in 7 and normal in 7 on histopathology. Out of 86 cases of positive, 84 had inflamed appendix and 2 had normal. The difference was significant ($P < 0.05$). Sensitivity was 0.94, specificity was 0.45, positive predictive value was 0.93 and negative predictive value was 0.50. Surgical examination revealed inflamed appendix in 98 and normal appendix in 2 cases. Inflamed appendix was seen in 91 and normal in 9 cases. Out of 98 surgically confirmed appendix, histopathology had 91 as inflamed and normal in 7 cases. Sensitivity of surgical findings was 1, and specificity was 0.22, PPV was 0.93 and NPV was 0.50. **Conclusion:** It is concluded that USG is sensitive, specific in diagnosing cases of appendicitis.

KEYWORDS

Abdomen pain, USG

INTRODUCTION

Vague abdomen pain is the most commonly encountered symptom in the emergency department at any hospital.¹ It may be associated with vomiting, fever and diarrhoea but the most distressing symptom is the pain. As the pain threshold varies from person to person the severity of the disease could not be evaluated taking, only this symptom into account.²

The various cause of the abdomen pain may vary from benign to life threatening disease. Diagnosing and treating the condition in time is in the hands of the surgeons or the physician who handle them. Time is a very important factor as any delay may lead to grievous consequences like perforation and may lead to morbidity and in some case also mortality. Hence timely diagnosis is crucial and remains a challenge to the people in medical field.³

Appendicitis is the most common cause of abdomen pain in patients admitted at the emergency department.⁴ Diagnosing this in young male patient is mostly straight forward, but the same becomes a problem in premenopausal women with similar clinical history and symptoms.⁵ This is mainly due to the reason that number of gynaecological problems in women can present with abdominal pain mimicking appendicitis. So it becomes a real challenge to exclude the diagnosis in women more than diagnosing a positive case of appendicitis.^{6,7} The present study was conducted to assess association between ultrasonographic, clinical and histopathological examination findings in Acute appendicitis.

MATERIALS & METHODS

100 patients with clinical presentation of acute appendicitis between the age group of 18 – 45 years, over the period of 3 years between 2020 to 2023, in the department of General Surgery, Sri Aurobindo Medical College and Postgraduate Institute, Indore (M.P.) were recruited for the study. Patient with inflammatory focus like mesenteric adenitis found through initial USG screening and history, PID, non specific enterocolitis, patients who were in need of immediate surgery and no time for imaging modality, non consenting patient and patients who had only one imaging done or no imaging done were excluded. Informed consent was obtained from each participating patient and the protocol was approved by the institutional ethical committee.

A routine USG was done for the upper abdomen and pelvis using a 3–5-MHz convex transducer to rule out alternative abnormalities related to solid organs and to rule out free fluid. Then graded compression and colour Doppler sonography of the right lower quadrant giving attention to the site of maximal tenderness was performed using a linear transducer. No oral contrast was used. Results were analysed statistically.

RESULTS

Table I Age distribution

Age in years	Number
18-19	6
20-29	41
30-39	28
40-49	16
50-59	8
60-69	0
70-79	1
80-89	0

Table I shows that age group 18-19 years had 6, 20-29 years had 41, 30-39 years had 28, 40-49 years had 16, 50-59 years had 8, 60-69 years had 0, 70-79 years had 1 and 80-89 years had 0 patients.

Table II Gender wise distribution

Gender	Number	P value
Male	69	0.01
Female	31	

Table II shows that out of 100, males were 69 and females were 31. The difference was significant ($P < 0.05$).

Table III Ultrasonography findings

Ultrasound	frequency	Percentage
Normal	14	14
Positive	86	86
Total	100	100

Table III shows that ultrasound was normal in 14 and positive in 86.

Table IV Ultrasound and histopathological examination

	Histopathological	Inflamed appendix	Normal	Total
Ultrasound	Normal	7 (50 %)	7 (50 %)	14 (100 %)
	Positive	84 (97.7%)	2 (2.3%)	86 (100%)

Table IV shows that out of 14 normal cases, inflamed appendix was seen in 7 and normal in 7 on histopathology. Out of 86 cases of positive, 84 had inflamed appendix and 2 had normal. The difference was significant ($P < 0.05$).

Table V Sensitivity and specificity of ultrasonography findings with diagnosing appendicitis

Parameters	Value
SENSITIVITY	0.94
SPECIFICITY	0.45
POSITIVE PREDICTIVE VALUE	0.93
NEGATIVE PREDICTIVE VALUE	0.50

Table V shows that sensitivity was 0.94, specificity was 0.45, positive predictive value was 0.93 and negative predictive value was 0.50.

Table VI Surgical correlation

SURGICAL EXAMINATION	FREQUENCY
INFLAMMED APPENDIX	98
NORMAL	2
TOTAL	100

Table VI shows that surgical examination revealed inflamed appendix in 98 and normal appendix in 2 cases.

Table VII Histopathology Examination

HISTOPATHOLOGY EXAMINATION	FREQUENCY
INFLAMMED APPENDIX	91
NORMAL	9
TOTAL	100

Table VII shows that inflamed appendix was seen in 91 and normal in 9 cases.

Table VIII Comparison between surgical and histopathological examination

	HISTOPATHOLOGICAL EXAMINATION		TOTAL
	INFLAMMED APPENDIX	NORMAL	
Inflamed appendix	91 (50 %)	7 (50 %)	98 (100 %)
Normal	0 (93.33%)	2 (6.66%)	2 (100%)

Table VIII shows that out of 98 surgically confirmed appendix, histopathology had 91 as inflamed and normal in 7 cases.

Table IX Sensitivity and specificity of surgical findings with diagnosing appendicitis

Parameters	Value
SENSITIVITY	1.0
SPECIFICITY	0.22
POSITIVE PREDICTIVE VALUE	0.93
NEGATIVE PREDICTIVE VALUE	0.50

Table IX shows that sensitivity of surgical findings was 1, and specificity was 0.22, PPV was 0.93 and NPV was 0.50.

Table X ALVARADO scoring with diagnosing appendicitis

ALVARADO SCORE	FREQUENCY
<6	8 (8%)
6	23 (23%)
7	32 (32%)
8	29 (29%)
9	7 (7%)
10	1 (1%)

Table X shows that out of 100, 8 (8%) have ALVARADO score of <6, 23 (23%) had score of 6, 32 (32%) had score of 7, 29 (29%) had score of 8, 7 (7%) had score of 9, 1 (1%) had score of 10.

Table XI Comparison between ALVARADO scoring and histopathological examination

	HISTOPATHOLOGICAL EXAMINATION		TOTAL
	INFLAMMED APPENDIX	NORMAL	

Inflamed appendix (ALVARADO ≥ 6)	91 (99 %)	1 (1 %)	92 (100 %)
Normal (ALVARADO < 6)	7 (87.5%)	1 (12.5%)	8 (100%)

Table XI shows that out of 92 clinically confirmed appendix with ALVARADO scoring of ≥ 6 , histopathology had 91 as inflamed appendix and normal in 1 case and of lower ALVARADO scoring of < 6 had 7 as inflamed appendix and normal in 1 case.

Table XII Sensitivity and specificity of clinical findings with diagnosing appendicitis

Parameters	Value
SENSITIVITY	0.92
SPECIFICITY	0.50
POSITIVE PREDICTIVE VALUE	0.98
NEGATIVE PREDICTIVE VALUE	0.125

Table XII shows that sensitivity of surgical findings was 0.92, and specificity was 0.50, PPV was 0.98 and NPV was 0.125.

DISCUSSION

We found that among the total of 100 patient 37 were female and 63 were male. The common age group under the presentation was 21 - 30 years with 33 of 63 (52%) in male and 11 of the 37 (29%) in female falling in this age group. The next common age group is < 20 years with 22 of 63 (34%) in male and 13 of 37 (35%) in female. Considering the overall percentage of age group 44% falls in 21 to 30 year, 35% < 20 years, 15% in 31 to 40 years, 4% in 41 to 50 years and 2% in 51 to 60 years of age. So the study showed that the diagnosis of acute appendicitis was common in 21 to 30 year both in male and female patient.

Ultrasound was normal in 14 and positive in 86. Out of 14 normal cases, inflamed appendix was seen in 7 and normal in 7 on histopathology. Out of 86 cases of positive, 84 had inflamed appendix and 2 had normal. Poortman et al¹⁰ compared the accuracy of CT and sonography in a general community teaching hospital for the diagnosis of acute appendicitis in patients with suspected acute appendicitis. One hundred thirty-two patients had acute appendicitis at surgery, and 67 patients did not. The sensitivity of CT and sonography was 76% and 79%, respectively; the specificity was 83% and 78%; the accuracy was 78% and 78%; the positive predictive value was 90% and 87%; and the negative predictive value was 64% and 65%.

We found that sensitivity was 0.94, specificity was 0.45, positive predictive value was 0.93 and negative predictive value was 0.50. Surgical examination revealed inflamed appendix in 98 and normal appendix in 2 cases. Inflamed appendix was seen in 91 and normal in 9 cases. Out of 98 surgically confirmed appendix, histopathology had 91 as inflamed and normal in 7 cases. Sensitivity of surgical findings was 1, and specificity was 0.22, PPV was 0.93 and NPV was 0.50. Crocker et al¹¹ evaluated 790 patients who underwent US, CT, or both for evaluation of suspected appendicitis. A total of 473 of 562 US examinations had indeterminate findings (overall test yield, 15.8%); sensitivity and specificity in the 89 diagnostic examinations were 98.5% and 54.2%, respectively. Thirteen of 522 CT examinations were indeterminate (overall test yield, 97.5%); sensitivity and specificity in the remaining 509 CT examinations were 98.9% and 97.2%, respectively. Taking indeterminate studies into account, the accuracy was 13.7% for US and 95.6% for CT. The negative appendectomy rates were 17.7% (11/62) for US and 3.3% (9/276) for CT ($p = 0.0002$). Time to surgery was longer for patients who underwent US and CT (mean $\pm$ SD, 17.7 ± 8.9 hours) than US alone (12.9 ± 6.4 hours; $p = 0.002$) but was not longer for patients who underwent CT alone (16.3 ± 8.4 hours; $p = 0.45$).

ALVARADO scoring was done for the patients and of them 8 (8%) have ALVARADO score of <6, 23 (23%) had score of 6, 32 (32%) had score of 7, 29 (29%) had score of 8, 7 (7%) had score of 9, 1 (1%) had score of 10.

CONCLUSION

Ultrasonography and clinical examination has a high degree of accuracy in the diagnosis of acute appendicitis. Ultrasonography is more specific and NPV (negative predictive value) in identification of

diagnosis of acute appendicitis as compared to clinical examination while clinical examination is more specific and have more positive predictive value in identification of acute appendicitis.

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