

CORRELATION OF CLINIC-HISTOPATHOLOGICAL FINDINGS IN DIFFERENT FORMS OF APPENDICITISYashwanth C. N¹, Dileep C. N²¹Assistant Professor, Department of Surgery, KMC, Palakkad.²Resident, Department of Emergency Medicine, SSIMS, Davanagere.**ABSTRACT****BACKGROUND**

The existence of recurrent and chronic appendicitis is still doubted by many. This study is intended to study correlation of clinical findings, operative findings and the histopathological findings among the different {{(acute and chronic (recurrent))}} forms of appendicitis, to study the recurrence of appendicitis in patients with acute appendicitis who were treated non-surgically at first presentation, to compare the operative and histopathological findings in acute and chronic (recurrent) forms of appendicitis.

MATERIALS AND METHODS

A total of 100 consecutive cases of suspected appendicitis who were admitted, investigated and treated were taken up for the study. Data related to the objectives of the study were collected. After detailed examination and investigations the clinical, sonological, operative and histopathological findings were correlated.

RESULTS

1. Age group of patients ranged from 5 yrs. to 60 yrs. with a mean age of 25.35 yrs. with an S. D. of 9.3 yrs.
2. The sex distribution was almost equal with 49% males and 51% females.
3. Maximum occurrence of appendicitis was in the age group of 21 - 30 yrs.
4. There was history suggestive of acute appendicitis in the past, which was managed non-surgically was present in 81% of the patients.
5. Right iliac fossa tenderness was the predominant sign present in 100% of patients. It was mildly tender in 55% of patients suggestive of a chronic (recurrent) form and moderate-to-severely tender in 45% of patients suggestive of an acute form of appendicitis.
6. Per-operatively, the appendix appeared non-inflamed in 57% of patients suggestive of a chronic (recurrent) form and inflamed in 43% of patients suggestive of an acute form of appendicitis.
7. The histopathological studies revealed chronic inflammatory cells in 63% of the resected specimens, suggestive of chronic appendicitis and acute inflammatory cells in 37% of the specimens suggestive of acute appendicitis.

CONCLUSION

We conclude that the Clinical findings, Operative findings and the Histopathological findings correlate with one another ($P < 0.001$). The surgeon's clinical and operative findings have specificity of around 87.30% and 90.47% respectively. Hence, the diagnostic accuracy of the surgeon is directly dependent on the surgeon's expertise and there is no substitution for an experienced surgeon's judgement.

KEYWORDS

Acute Appendicitis, Chronic Appendicitis, Recurrent Appendicitis, Recurrence, Operative Findings, Histopathological Findings.

HOW TO CITE THIS ARTICLE: Yashwanth CN, Dileep CN. Correlation of clinic-histopathological findings in different forms of appendicitis. J. Evolution Med. Dent. Sci. 2016;5(92):6824-6828, DOI: 10.14260/Jemds/2016/1544

BACKGROUND

Appendicitis is still the most common reason for abdominal surgery. The diagnosis may be wrongly made or initially overlooked in case of acute appendicitis. The first error leads to an unnecessary operation and the second to delay.¹

Acute appendicitis, perhaps the most common surgically correctable cause of abdominal pain: the diagnosis of which remains difficult in many instances. Arriving at the correct diagnosis is essential, however, as a delay may allow

progression to perforation and significantly increased morbidity and mortality. Incorrectly diagnosing a patient with appendicitis, although not catastrophic often subjects the patient to an unnecessary operation.²

The diagnosis of acute appendicitis is essentially clinical; however, a decision to operate based on clinical suspicion alone can lead to removal of a normal appendix in 15 - 30% cases.³

The existence of recurrent and chronic appendicitis is still doubted by many. It has been suggested by many that perforating and non-perforating appendicitis are separate entities and that resolving episodes represents attacks of non-perforating appendicitis. A recent study of treatment of appendicitis with antibiotics alone found that 95% resolved, but 35% represented with appendicitis within a period of 17.2 months.⁴

Financial or Other, Competing Interest: None.

Submission 28-10-2016, Peer Review 09-11-2016,

Acceptance 11-11-2016, Published 17-11-2016.

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DOI: 10.14260/jemds/2016/1544



Objectives

1. To correlate the clinical presentation of chronic (recurrent) appendicitis with the sonological findings, operative findings and confirmed with histopathological studies.
2. To study the recurrence of appendicitis in patients with acute appendicitis who were treated non-surgically at first presentation.
3. To correlate the clinical presentation of acute appendicitis with the sonological findings, operative findings and confirmed with histopathological studies.
4. To compare the operative and histopathological findings in acute and chronic (recurrent) appendicitis.

Inclusion Criteria

1. Patients with classic history of migratory pain (which is initially in the periumbilical/epigastric region, which later localises to the right lower quadrant) with other constitutional symptoms of nausea/vomiting, anorexia, who are provisionally diagnosed as appendicitis (acute forms).
2. Patients presenting with recurrent attacks (chronic forms) of right lower abdominal pain in whom other pathologies are excluded.
3. Patients provisionally diagnosed as appendicitis and who are fit for surgery.
4. Patients who are willing for surgery.

Exclusion Criteria

1. Right lower abdominal pain due to involvement of other viscera like urinary tract infection, ureteric stone, acute gastroenteritis, Meckel’s diverticulitis, disease of the urogenital systems, intussusception, Crohn’s enteritis, caecal typhlitis, gynaecological disorders – pelvic inflammatory disease, ruptured ectopic, torsion of ovarian cysts.
2. Patients not fit for surgery due to various causes like appendicular mass, appendicular abscess and patients with generalised peritonitis due to appendicular perforation.
3. Patients not willing for surgery.

RESULTS

Collection of Data

A total of 100 consecutive cases of suspected appendicitis who were admitted, investigated and treated were taken for the study. After detailed examination and investigations the clinical, sonological, operative and histopathological findings were correlated.

Age (Years)	No. of Cases	No. of Males	No. of Females
001 - 10	3	1	2
011 - 20	26	15	11
21 - 30	51	24	27
31 - 40	15	8	7
41 - 50	4	1	3
51 - 60	1	0	1
Mean +/- SD	25.35 +/- 9.3		

Table 1. Depicting the Age Distribution among the Study Group

Interpretation

In our study, the patient’s age group ranged from 5 to 60 yrs. The mean age was 25.35 yrs. with an S. D. of 9.3. The youngest

was a 5-year-old male, while the oldest patient was a 60-year-old female. The highest occurrence (51%) was seen in age group of 21 - 30 years.

Sex	No. of Cases
Male	49
Female	51

Table 2. Depicting the Sex Distribution among the Study Group

Interpretation

Among males the highest occurrence (24%) was seen in age group of 21 - 30 years. Among females the age group affected most (26%) was 21 - 30 years.

Pain	No. of Cases
+	57
++	28
+++	15

Table 3. Depicting the Distribution of Pain in Right Iliac Fossa according to the Severity among the Study Group

Interpretation

The predominant symptom seen in the present study was pain in the right iliac fossa. Pain was present in 100% of cases, but its degree varied from mild-to-severe.

Vomiting	No. of Cases
-	37
+	42
++	21

Table 4. Depicting the Frequency of Vomiting among the Study Group

Fever	No. of Cases
-	43
+	47
++	10

Table 5. Depicting the Frequency of Fever among the Study Group

Interpretation

The 3rd predominant symptom seen in the present study was fever. It was present in 57% of cases and absent in 43% of cases.

Past History Suggestive of AA	No. of Cases
Absent	19
Present	81

Table 6. Depicting the Distribution History Suggestive of Acute Appendicitis (AA) among the Study Group

Interpretation

In our study, there were 81% of patients with history suggestive of AA and 19% of patients presented with complaints of pain abdomen for the first time.

Tenderness	No. of Cases
+	55
++	32
+++	13

Table 7. Depicting the Distribution of Tenderness in Right Iliac Fossa among the Study Group

Interpretation

The predominant sign seen in the present study was tenderness and rebound tenderness in right iliac fossa. Tenderness was present in 100% of cases.

Ultrasonographic Probe Tenderness	No. of Cases
-	28
+	72

Table 8. Depicting the Frequency of Ultrasound Probe Tenderness in Right Iliac Fossa among the Study Group

OR Findings	No. of Cases
Inflamed	43
Non-inflamed	57

Table 9. Depicting the Distribution of Operative Findings (OR) among the Study Group

Interpretation

The appendix was inflamed in 43% and not inflamed in 57% of the cases.

Histopathology Report	No. of Cases
Acute	37
Chronic	63

Table 10. Depicting the Distribution of HPR among the Study Group

Interpretation

Histopathology of the resected specimen was taken as the gold standard. The appendix was acutely inflamed in 37% and chronically inflamed in 63% of the cases.

Tenderness	Ultrasound Probe Tenderness Present	Ultrasound Equivocal (Probe Tenderness Absent)	Total
+	28 (51)	27 (49)	55 (100)
++	31 (97)	1 (3)	32 (100)
+++	13 (100)	0	13 (100)
Total	72	28	

Table 11. Depicting the Relation between Tenderness and Ultrasound Probe Tenderness Distribution among the Study Group

X² = 27.01; P < 0.001 HS

Sensitivity = 100%, Specificity = 44.44%

Past History Suggestive of AA	Histopathology Report		Total
	Acute	Chronic	
Absent	18 (95)	1 (5)	19 (100)
Present	19 (23)	62 (77)	81 (100)
Total	37	63	

Table 12. Depicting the Association of Past History Suggestive of AA with HPR Findings among the Study Group

X² = 30.5; P < 0.001 HS

Tenderness	OR Findings		Total
	Inflamed	Non-Inflamed	
+	5 (9)	50 (91)	55 (100)
++	25 (78)	7 (22)	32 (100)
+++	13 (100)	0	13 (100)
Total	43	57	

Table 13. Depicting the Relation between Tenderness and Operative Findings among the Study Group

X² = 59.14; P < 0.001 HS

Tenderness	Histopathology Report		Total
	Acute	Chronic	
Positive (++, +++)	37 (82)	8 (18)	45 (100)
Negative (+)	0	55 (100)	55 (100)
Total	37	63	100

Table 14. Depicting the Association between Tenderness and Histopathological Findings among the Study Group

X² = 71.78; P < 0.001 HS

Sensitivity = 100

Specificity = 87.30

The patients with rebound tenderness were compared with the histopathology findings, which were considered as gold standard for the final diagnosis.

OR Finding	Histopathology Report (HPR)		Total
	Acute	Chronic	
Inflamed	37 (86)	6 (14)	43 (100)
Non-inflamed	0	57 (100)	57 (100)
Total	37	63	

Table 15. Depicting the Relation between Operative (OR) Findings and HPR Distribution among the Study Group

Specificity: 90.47%; Sensitivity: 100%. X²=74.2; P < 0.001 HS

DISCUSSION

Appendicitis is the most common reason for abdominal surgery. The diagnosis may be wrongly made or initially overlooked in case of acute appendicitis. The first error leads to an unnecessary operation and the second to delay.¹

The existence of recurrent and chronic appendicitis is still doubted by many. A recent study of treatment of appendicitis presenting with antibiotics alone found that 95% resolve, but 35% represented with appendicitis within 17.2 months.⁴

It is a clinical scenario in which a patient with pathologically confirmed acute appendicitis relates to one or more prior episodes of identical symptoms that resolved without surgical intervention.⁵

In our study, the patient's age group ranged from 5 to 60 yrs. The mean age was 25.35 yrs. with an S. D. of 9.3. The youngest was a 5-year-old male patient, while the oldest patient was a 60-year-old female. The highest occurrence (51%) was seen in age group of 21 - 30 years. The next age group affected (26%) was 11 - 20 years. Overall, (77%) of the cases were seen in the age group 11 - 30 years.

In our study the sex distribution was with 49% males and 51% females, while in the study conducted by Addiss DG, Shaffer N, Fowler BS et al, there was a slight male-to-female predominance (M:F 1.2 to 1.3:1).^{6,7}

The predominant symptom was pain in the right iliac fossa. Though pain was present in 100% of the cases, their degree varied from mild, moderate and severe.

The 2nd predominant symptom was vomiting, which was present in 63% of the cases.

Fever was 3rd predominant symptom present in 57%. The history suggestive of previous acute appendicitis was present in 81% cases, who had not undergone surgical treatment at that initial setting for various reasons. The shortest history was 6 weeks and the longest history was 6 yrs. In previous studies the recurrence was estimated at 35%, but the duration was within 17.2 months.⁴ In the present study, the duration being longer upto 6 yrs. The recurrence is being reported at 81%. The past history suggestive of acute appendicitis was correlated with HPR using chi square test ($X^2 = 30.5$; $P < 0.001$) and was found to be statistically significant.

The rebound tenderness was present in 100% of the cases, but the degree varied from mild, moderate and severe tenderness in the right iliac fossa. Tenderness was mild in 57% of the cases and they were categorised as chronic (recurrent) form of appendicitis and the moderate-to-severe tenderness present in 43% were categorised as acute form of appendicitis.

The cases were then sonologically examined and 72% of them had probe tenderness to graded compression suggestive of appendicitis. In the remaining 28%, sonography was equivocal.

It was found in our study that the ultrasonographic findings had a sensitivity of 100% and a specificity of 44.44% as compared to the clinical diagnosis of appendicitis. This low specificity is attributed to the low specificity among chronic cases who exhibited no probe tenderness (equivocal) in 49% of the total 55 cases. Ultrasonography has the limitation of variable reliability and well known operator dependency. It appears that ultrasonogram may be most useful in excluding potential pelvic abnormality in equivocal cases.⁸ Furthermore, in other studies only acute cases were taken in for the study purpose, while in our study majority of the cases belonged to the chronic (recurrent) appendicitis. In one study conducted by Rao PM and Colleagues, the diagnostic accuracy of ultrasonogram was reported to range from 71 to 97%.⁹

However, ultrasonogram has the limitation of variable reliability and has a well-known operator dependency and it is frequently unable to visualise the normal appendix.¹⁰

The correlation of ultrasonographic findings with the clinical findings using the chi² test ($X^2 = 27.01$; $P < 0.001$) was found to be statistically significant.

The gross per-operative findings were 43% inflamed appendix suggesting an acute form, while 57% of the appendices were found to be not inflamed suggesting a chronic form of appendicitis.

The histopathological reports of these operated specimens showed acute inflammation in 37% of the cases and chronic inflammatory cell infiltrate in 63% of the cases.

The patients with rebound tenderness were correlated with the gross findings per-operatively.

Among 55 patients with mild rebound tenderness denoted by "+" in the right iliac fossa 5 patients showed associated

inflammation of the appendix, while 50 patients showed no inflammation.

Among 32 patients with moderate rebound tenderness denoted by "++" in the right iliac fossa, 25 patients showed associated inflammation of the appendix, while 7 patients showed no inflammation.

The rebound tenderness was very severe in 13 patients and all showed inflammation of the appendix.

Using the X^2 test, the value $P < 0.001$ was found to be statistically significant.

The clinical finding of rebound tenderness were compared with the histopathology findings, which were considered as gold standard for the final diagnosis.

Among 45 patients with moderate rebound tenderness denoted by "++" or severe tenderness denoted by "+++" in the right iliac fossa, 37 patients showed associated acute inflammation of the appendix, while 8 patients showed chronic inflammation of the appendix.

Among 55 patients with mild rebound tenderness denoted by "+" in the right iliac fossa, no patients showed associated acute inflammation of the appendix, while all 55 patients showed associated chronic inflammation of the appendix. It was found that the surgeon's findings had a sensitivity of 100% and a specificity of 87.30%. Using the X^2 test, the P value was found to be highly significant.

The per-operative gross appearance of the appendix was compared with the histopathology findings, which was considered as gold standard for the final diagnosis.

Among 43 patients with grossly inflamed appendix 36 patients showed associated acute inflammation of the appendix, while 6 patients showed chronic inflammation.

Among 57 patients with grossly non-inflamed appendix 0 patients showed associated acute inflammation of the appendix, while 57 patients showed chronic inflammation. It was found that the surgeon's findings had a sensitivity of 100% and a specificity of 90.47%. Using the X^2 test, the value $P < 0.001$ was found to be statistically significant.

CONCLUSION

Our study included 100 patients who were diagnosed to have appendicitis, who underwent surgical intervention. From the present study, we conclude that the Clinical findings, Operative findings and the Histopathological findings correlate with one another. The surgeon's clinical and operative findings have specificity of around 87.30% and 90.47% respectively. The surgeon was better in diagnosing the chronic forms both clinically and per-operatively 100%, while the acute forms were clinically diagnosed at 86% and per-operatively at 82%. Hence, the diagnostic accuracy of the surgeon is directly dependent on the surgeon's expertise and there is no substitution for an experienced surgeon's judgement. Ultrasonography of abdomen is a useful tool in avoiding negative appendectomy rates, particularly in females and should be used in equivocal clinical findings as ultrasonography has the limitation of variable reliability and has a well-known operator dependency.

REFERENCES

1. Ooms HWA, Koumans RKJ, Ho Kang You PJ, et al. Ultrasonography in the diagnosis of acute appendicitis. *Br J Surg* 1991;78(3):315-8.

2. Smink DS, Soybel DI. Appendix and appendectomy. In : Zinner MJ, Ashely SW, eds. Maingot's abdominal operations. 11th edn. McGraw Hill 2007:589-612.
3. O' Connel PR. The vermiform appendix. In: Russell RCG, Willaims NS, Bulstrode CJK, eds. Bailey and Love's short practice of surgery. 24th edn. London: Hodder Arnold 2004:1210-11.
4. Barber MD, McLaren, Rainey JB. Recurrent appendicitis. Br J Surg 1997;84(1):110-2.
5. Sarosi GA, Turnage RH. Appendicitis. In : Feldman M, Friedman LS, Sleisenger MH, eds. Sleisenger and Fordtran's GI and liver disease, pathophysiology, diagnosis and management. 7th edn. Pennsylvania: Saunders Elsevier 2002:2089-97.
6. Addiss DG, Shaffer N, Fowler BS, et al. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol 1990;132(5):910-25.
7. Korner H, Sondenaa K, Soreide JA, et al. Incidence of acute non perforated and perforated appendicitis: age-specific and sex-specific analysis. World J Surg 1997;21(3):313-7.
8. Lee SL, Walsh AJ, Ho HS. Computed tomography and ultrasonography do not improve and may delay the diagnosis and the treatment of acute appendicitis. Arch Surg 2001;136(5):556-62.
9. Wilson EB, Cole JC, Nipper ML, et al. Computed tomography and ultrasonography in the diagnosis of appendicitis: when are they indicated. Arch Surg 2001;136(6):670-5.
10. Rao PM, Rhea JT, Novelline, et al. Effect of computed tomography of the appendix on treatment of patients and use of hospital resources. N Engl J Med 1998;338(3): 141-6.