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Original Article

Clinical, Diagnostic, and Operative Correlation of Acute Abdomen

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Abstract

Introduction: The term acute abdomen refers to signs and symptoms of abdominal pain and tenderness, a clinical presentation that often requires emergency surgical therapy. The correct interpretation of abdominal pain is one of the most challenging demands to any surgeon. Since proper therapy often requires surgent action, the luxury of the leisurely approach suitable for the study of other conditions is frequently denied.

Aims and Objectives: This study aims to compare the preoperative diagnosis based on clinical examination and investigation with the operative diagnosis in non-traumatic acute abdomen.

Materials and Methods: The study was conducted from August 2015 to September 2017 over a period of 23 months conducted at Mahatma Gandhi Memorial Hospital, Warangal, Telangana, 100 patients with various causes of acute abdomen were included in the study. All the patients attending the emergency department (causality) with the clinical feature suggestive of non-traumatic acute abdomen within the study period were included in the study.

Results: A total number of 100 patients were included in this study. All these patients underwent emergency laparotomy (surgery) with the provisional diagnosis of acute abdomen. 66% of the patients were male and 34% were female.

Conclusion: Total leukocytes count and differential leukocytes count were most sensitive in evaluating patients with acute appendicitis and peritonitis while plain X-ray abdomen had highest sensitivity in evaluating patients with bowel obstruction and acute peritonitis as well. Acute appendicitis was the most common cause (60%) of patient presenting to emergency and casualty as acute abdomen.

Key words: Acute abdomen, Laparotomy, Diagnosis

INTRODUCTION

The term acute abdomen refers to signs and symptoms of abdominal pain and tenderness, a clinical presentation that often requires emergency surgical therapy. Acute abdominal pain generally refers to previously undiagnosed pain that arises suddenly and is of <7 days' (usually <48 h) duration = 3.1. The correct interpretation of abdominal pain is one of the most challenging demands to any surgeon. Since proper therapy often requires surgent action, the luxury of the leisurely approach suitable for the study of other conditions is frequently denied. The complexity of situation is enhanced by the various types of intra- and extra-abdominal pathology that contributes to the complaint of abdominal pain.

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Abdominal pain that persists for 6 h or longer is usually caused by disorders of surgical significance.[1] The primary goals in the management of patients with acute abdominal pain are[2] to establish a differential diagnosis and a plan for confirming the diagnosis through appropriate imaging studies, to determine whether operative intervention is necessary, and[3] to prepare the patient for operation in a manner that minimizes perioperative morbidity and mortality.

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The proper management of patients with acute abdominal pain requires a timely decision about the need for surgical operation. This decision requires evaluation of the patient's history and physical findings, laboratory data, and imaging tests. Many diseases, some of which do not require surgical treatment, produce abdominal pain, so the evaluation of patients with abdominal pain must be methodical and careful. All patients with abdominal pain should undergo evaluation to establish a diagnosis so that timely treatment can minimize morbidity and mortality.[3-5]

Correct pre-operative diagnosis of acute abdomen with limited resources is very crucial to minimize the morbidity and mortality in the developing countries like ours, where the facilities of diagnosis are limited and not economical, the clinical skills play a pivotal role in the diagnosis and management of acute abdomen.[6,7] Thus, the surgeon in the developing countries needs to improve the diagnostic acumen and the decision-making, in the management of acute abdomen.

Aims and Objectives

This study aims to compare the pre-operative diagnosis based on clinical examination and investigation with the operative diagnosis in non-traumatic acute abdomen.

Measurement

At the end of the study, following variables were measured: Sensitivity, specificity, positive predictive value, and negative predictive value of different investigations results. Diagnostic accuracy of acute abdomen is confirmed by operative findings, rate of negative laparotomy.

MATERIALS AND METHODS

All the patients attending the emergency department (casualty) with the clinical feature suggestive of non-traumatic acute abdomen within the study period were included in the study. A well-designed pro forma had been used that recorded all the detailed history, including present complaint, history, drug and treatment history, and another relevant history. A detail in clinical findings and investigation results were also included in the study. At that time, the pre-operative diagnosis is made which is recorded, and subsequently, the operative finding also recorded after performing surgery.

Methodology

All the patients attending the emergency department with the clinical features suggestive of non-traumatic acute abdomen within the period will be included. A pro forma form would be designed to record detailed history, clinical examination findings, and investigation results.

Study Design

This is a prospective observational study conducted in the General Surgery Department of Surgery, M.G.M. Hospital, Warangal.

Inclusion Criteria

All the patient with clinical diagnosis of acute abdomen, Patient with no history of recent trauma, Patient requiring surgery for acute abdomen, Age group from above13 years.

Exclusion Criteria

Traumatic acute abdomen will be excluded from the study. Although laparoscopy which is of both diagnostic and therapeutic, best tool with approximately no mortality and least morbidity, we are not provided with equipment in emergency operation theater, so it was excluded from the study.

Clinical examination of the patient was done thoroughly at the emergency and casualty department and investigated appropriately. Final diagnosis was then confirmed, the decision to operate was made, and the operative findings were recorded.

The study was conducted from August 2015 to September 2017 over a period of 23 months. 100 patients with various causes of acute abdomen were included in the study.

Statistical Analysis

Pre-operative diagnosis based on clinical examination and investigations were compared with the operative diagnosis based on operative findings.

Specificity, sensitivity, positive predictive value, and negative predictive value of the investigations were calculated. Statistical analysis was done using SPSS11.5, Version.

$P < 0.05$ was considered statistically significant.

RESULTS

A total number of 100 patients were included in this study. All these patients underwent emergency laparotomy (surgery) with the provisional diagnosis of acute abdomen. 66% of the patients were male and 34% were female [Table 1].

Table 1: Showing sex distribution of the patient

Sex	Frequency (%)
Male	66 (66.0)
Female	34 (34.0)

60% of the total patients of acute abdomen comprised acute appendicitis, 26% peritonitis due to hollow viscus perforation, and 14% of the cases were due to bowel obstruction.

All the patients were subjected to total leukocytes count (TLC), differential leukocytes count (DLC), urine analysis, serum amylase, and plain X-ray abdomen examination. Selected patients were subjected to abdominal ultrasonography (USG) and computed tomography (CT) of abdomen.

TLC was found raised in 78% of patients and DLC in 92%. Serum amylase was significant in 30% of the patient of acute abdomen, whereas plain X-ray abdomen was positive in 43% of patients [Table 2].

Abdominal USG was performed in 84 patients and 62% of reports had positive findings. CT of abdomen was done in only 26 patients, of which 22 reported with positive finding comprising 84% of the patients.

Among the 60 patients diagnosed as acute appendicitis, seven turned out to be negative in which were later diagnosed as urinary tract infection, pelvic inflammatory diseases (PID), and non-specific abdominal pain and ovarian cyst [Table 3].

Similarly, in five patients with acute pancreatitis, psoas abscess and bilateral basal pneumonia presented with features of peritonitis where laparotomy was not actually necessary.

In two patients with abdominal tuberculosis who presented with features of bowel obstruction where no sites of obstruction were found, laparotomy was not actually necessary. Thus, the percentage of negative laparotomies in the study group was 14%.

Highest diagnostic accuracy of 85% was seen with the patient of acute intestinal obstruction with no statistically significant difference ($P = 0.65$). Lowest diagnostic accuracy of 65% was observed with causes of peritonitis. Acute appendicitis had the diagnostic accuracy was of 80%.

Overall, diagnostic accuracy was 77%. There was statistically significant difference between the pre-operative and operative diagnosis ($P = 0.00032$) [Tables 4 and 5].

12 of 60 patients were not confirmed as an acute appendicitis but were made highly suspicious among which five were absolutely normal with no other diagnosis could make out among other two patients had PID while two had ureteric stone, one twisted ovarian cyst, one urinary tract infection, and one Meckel's diverticulitis as the cause of acute abdomen. In one patient, no cause of acute abdomen was established and was thus diagnosed as having non-specific abdominal pain.

Similarly, in nine patients, the causes of peritonitis were pancreatitis,[4] Meckel's diverticulum perforation,[2] bilateral basal pneumonia,[3] and appendicular perforation[6] which were not diagnosed accurately preoperatively.

In two patients, the causes of acute bowel obstruction were carcinoma colon[1] and abdominal tuberculosis[1] that were not accurately diagnosed preoperatively.

Table 2: Investigation performed to diagnose causes of acute abdomen

Investigation	Positive finding	Percentage value
TLC (100)	78	78
Differential leukocytes count (100)	92	92
Urine analysis (100)	22	22
Serum amylase(100)	30	30
Plain X-ray abdomen (100)	43	43
Ultrasonogram (84)	52	62
CT scan (26)	22	84
DLC (100)	92	92

DLC: Differential leukocyte count, TLC: Total leukocyte count

Table 3: Total number of negative laparotomy and their percentage

Cases	Negative laparotomy	Percentage value	*P*
Appendicitis (60)	7	11.6	0.0018203
Peritonitis (26)	5	19.2	0.033281
Obstruction (14)	2	14.3	0.3297645
Total (100)	14	14	0.0010062

Table 4: Total number of cases with correct pre-operative diagnosis (% of correct diagnosis)

Pre-operative diagnosis	Correct diagnosis	Percentage value
Acute appendicitis (60)	48	80
Acute peritonitis (26)	17	65
Intestinal obstruction (14)	12	85
Total (100)	77	77

Table 5: *P* significance of different etiology with acute abdomen

Cases	Mean±SD	*P*
Acute appendicitis	1.40±0.492	0.0049
Peritonitis	1.74±0.441	0.0044
Intestinal obstruction	1.86±0.349	0.065

SD: Standard deviation

Of 100 patients studied, 60 patients presented with diagnosis of appendicitis. Male-to-female ratio was 2:1.90% of patients were of 13–39 years. Highest incidence of acute appendicitis was seen in the age of 20–29 years (43.3%).

Operative finding of the patients with the provisional diagnosis of appendicitis showed that acutely inflamed appendix was found in 31, phlegmonous in 7, gangrenous in 7, and perforated appendix in 3. 12 patients operated with the provisional diagnosis of appendicitis had other causes 12 of 60 patients operated with provisional diagnosis of acute appendicitis. Among of them, five were absolutely normal with no other diagnosis could make out. In other seven members, two patients had PID while two had ureteric stone, and one each had twisted ovarian cyst, Meckel's diverticulitis. In one patient, no cause of acute abdomen was established and was thus diagnosed as having non-specific abdominal pain.

Table 6: Investigation performed to diagnose acute appendicitis

Investigation	Positive finding	Percent positive
TLC (60)	44	73
DLC (60)	51	85
Urine analysis (60)	6	10
Plain X-ray abdomen (60)	6	10
Serum amylase (60)	12	20
USG abdomen (53)	24	45
CT scan abdomen (15)	13	86

DLC: Differential leukocyte count, USG: Ultrasonography, CT: Computed tomography, TLC: Total leukocyte count

Table 7: *P*-value of different test to diagnose acute appendicitis

Investigation	Mean±SD	95% Confidence interval of the difference		*P*
		Lower	Upper	
TLC	0.11±0.650	−0.02	0.24	0.044
Ultrasound abdomen	−0.42±0.819	−0.58	−0.26	0.000
DLC	0.25±0.609	0.13	0.37	0.000
Plain X-ray abdomen	−0.24±0.889	−0.42	−0.06	0.008
Urine analysis	−0.46±0.642	−0.59	−0.33	0.000
Serum amylase	−0.31±0.748	−0.46	−0.16	0.000
CT scan abdomen	0.61±0.92	0.62	0.38	0.001

DLC: Differential leukocyte count, SD: Standard deviation, CT: Computed tomography, TLC: Total leukocyte count

TLC and DLC were raised in 73% and 85% of patients, respectively, while urine analysis had positive findings in only 10% of the patients. In 10% of patients, plain abdominal X-ray had positive finding while in 45% of patients, abdominal USG had positive result. However, CT scan was diagnostic in 86% of the patients Tables 6-8.

DLC had the highest sensitivity of 90.55 while USG abdomen had the highest specificity in evaluating patients with acute appendicitis. USG abdomen had the highest positive predictive value as well as negative predictive values, but if available CT scan is the best of all modalities with highest sensitivity and specificity as well as reproducible in diagnosis of acute appendicitis.

Acute Peritonitis

Of 100 patients, 26 patients presented with clinical features suggestive of peritonitis. Males were 62% and females were 38% comprising the sex ratio 1.4:1. Highest incidence of peritonitis was observed in the age of 30–39 years (34.6%), while15% each in the age groups of 13–19 years and 20–29 years and 19% in the age range of 40–49 years. Duodenal perforation was the cause of peritonitis in 33% of patients while in 28% and 20% of patients the causes of peritonitis were gastric ulcer perforation and ileal perforation, respectively.

Other less common causes of peritonitis were appendicular perforation 6% and Meckel's diverticulum perforation 2%.

Acute pancreatitis 4%, pelvic abscess 4%, and others (3%) also presented with features of peritonitis.

Investigations to Diagnose Cases of Peritonitis

TLC was raised in 73% while DLC was raised in 88% of the patients. Urine analysis showed positive findings in 30.7% and plain abdominal X-ray had positive finding in 69.2% of patients. Serum amylase was suggestive in 50% of patients. USG abdomen was done in 17 patients and in 58.8% it showed abnormality while CT scan was not done in any cases diagnosed as peritonitis [Table 9].

Predictive Values of Investigations for Peritonitis

DLC had the highest sensitivity and negative predictive value while plain X-ray abdomen had highest specificity

Table 8: Predictive values of investigations to diagnose acute appendicitis

Investigation	TLC	DLC	Urinalysis	PAX	Amylase	USG	CT scan
Sensitivity	84.2	90.5	52.2	52.2	71.3	71.3	92
Specificity	68.2	83.6	32.2	32.2	54.7	90.4	88.4
Positive predictive value	66.7	61.3	30.18	30.18	30.7	78.6	91.2
Negative predictive value	69.8	64.5	60.8	60.18	69	80.5	95

TLC: Total leukocyte count, DLC: Differential leukocyte count, USG: Ultrasonography, CT: Computed tomography

Table 9: *P*-value of different investigations to diagnose cases of peritonitis

Investigation	Paired differences					*P*
	Mean	SD	SE	95% Confidence interval of the difference		
				Lower	Upper	
Peritonitis -total leukocytes count	0.45	0.642	0.064	0.32	0.58	0.000
Peritonitis differential leukocytes count	0.59	0.552	0.055	0.48	0.70	0.000
Peritonitis -urine analysis	−0.12	0.477	0.048	−0.21	−0.03	0.014
Peritonitis serum amylase	0.03	0.540	0.054	−0.08	0.14	0.580
Peritonitis -plain X-ray abdomen	0.10	0.503	0.050	0.00	0.20	0.049
Peritonitis -ultrasound abdomen	−0.08	0.907	0.091	−0.26	0.10	0.380

SD: Standard deviation, SE: Standard error

Table 10: Investigations to diagnose cases of acute intestinal obstruction

Investigation	Number of positive cases	Percentage positive
TLC (14)]	9	64.2
DLC (14)	11	78.45
Urine analysis (14)	0	0
Plain X-ray abdomen (14)	12	85.7
Serum amylase (14)	4	28.5
USG abdomen (10)	4	40
CT abdomen (11)	9	81

P-value of different investigations to diagnose cases of acute intestinal obstruction. TLC: Total leukocyte count, DLC: Differential leukocyte count, USG: Ultrasonography, CT: Computed tomography

and positive predictive value in evaluating patients with causes of peritonitis.

Acute Intestinal Obstruction

Fourteen patients presented with features of bowel obstruction with male constituting 60% and females 40%. Patients presenting with features of bowel obstruction were widely distributed in relation to age with highest numbers of patients in the age range of 4th–5th decade of life.

Distribution of different causes for acute intestinal obstruction: Band adhesion and groin hernia were the most common causes of obstruction constituting 54% and 30%, respectively. Other causes were malignant growth and intussusceptions, which constituted 5% each. TB abdominal so manifested with acute abdomen in 2% of patients, whereas sigmoid volvulus constitutes 4% of patients.

In 78.45% of patients with bowel obstruction, DLC and plain abdominal X-ray showed positive finding while in 64.25% of patients TLC was raised. Ultrasound abdomen was done in 10 patients and had positive finding in 40%. Serum amylase was raised only in 28.5% of patients with acute intestinal obstruction [Table 10].

Predictive Values of Investigation for Acute Intestinal Obstruction

Plain X-ray abdomen had the highest sensitivity, specificity, and CT scan had highest negative predictive value.

CONCLUSION

Following Conclusions were drawn from this Study

- Diagnostic accuracy was 77%. Highest diagnostic accuracy was seen with bowel obstruction (85%) and lowest with peritonitis due to hollow viscous perforation (65%). Thus, clinical and preoperative diagnostic difference was statistically significant ($P = 0.003712$).
- Overall, negative laparotomy rate was 14%. Highest negative laparotomy rate was seen with acute peritonitis (19.2%), while the least is with acute appendicitis (11.6%).
- TLC and DLC were most sensitive in evaluating patients with acute appendicitis and peritonitis while plain X-ray abdomen had highest sensitivity in evaluating patients with bowel obstruction and acute peritonitis as well.
- USG abdomen had high specificity as well as positive and negative predictive values in evaluating patients with acute appendicitis. However, if feasible CT scan abdomen has the highest sensitivity (95%) and specificity (92%), in diagnosis of acute abdomen and acute intestinal obstruction. Further study with large sample is necessary to evaluate its importance in diagnosis of cause of acute abdomen.
- Acute appendicitis was the most common cause (60%) of patient presenting to emergency and casualty as acute abdomen.

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