



CO-RELATION BETWEEN PRE-OPERATIVE IMAGING FINDINGS AND PER-OPERATIVE FINDINGS IN ACUTE ABDOMEN

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ABSTRACT

The term acute abdomen refers to a sudden, severe abdominal pain that is less than 24 hours in duration. It is in many cases an emergent condition requiring urgent and specific diagnosis. Several causes need surgical treatment. Abdominal pain can be one of the symptoms associated with transient disorders or serious disease. Making a definitive diagnosis of the cause of abdominal pain can be difficult, because many diseases can result in this symptom. Abdominal pain is a common problem. Most frequently the cause is benign and/or self-limited, but more serious causes may require urgent intervention.

Many new diagnostic and management aids have been introduced into the surgical decision-making process over the past decade or so to improve clinical performance. Correct pre-operative diagnosis of acute abdomen remains challenging despite good history taking and clinical examination, and improvement in new imaging techniques including computer-aided diagnosis, ultrasound imaging, computed tomography and laparoscopy.

These new imaging techniques need sophisticated equipments and specialist expertise round the clock which is not feasible in our part of the world. Hence we have tried studying the accuracy of clinical correlation between these newer modalities of diagnosis and intraoperative diagnosis.

AIM AND OBJECTIVES

All the abdominal emergencies which cause acute pain in the abdomen and requires surgical intervention:

1. To assess the intra-operative findings in the cases after the pre-operative work-up including imaging techniques.
2. To co-relate between pre-operative diagnosis by imaging and intra-operative findings.
3. To assess whether there is discrepancy in the pre-operative diagnosis and per-operative findings :
 - a) In the pre-operative imaging diagnosis with intraoperative findings.
 - b) Whether additional investigation/ investigations(imaging techniques) would have made significant improvement in diagnostic accuracy.

KEYWORD

Abdominal Pain, Acute Abdomen, Laparotomy, Ultrasonography

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INTRODUCTION

The combination of improved diagnostic tools, safe anaesthesia, better preoperative assessment with thorough knowledge of clinical and laboratory findings and operative management has decrease the morbidity and mortality of patients of acute abdomen. Previous studies have demonstrated that management errors can be significantly reduced by accurate preoperative diagnosis in acute abdomen.

Many new diagnostic and management aids have been introduced into the surgical decision-making process over the past decade or so to improve clinical performance. This has been stimulated by the fact that in many instances the reliance on an exploratory laparotomy or indiscriminate period of observation and/or investigation is no more than a gamble; this is particularly so for the condition often referred to in common parlance as 'query appendicitis' For example, figures well in excess of 25 per cent for the rate of removal of a normal appendix are not uncommon', despite continuing evidence that the complications which follow such an

operation are not insignificant. With the patients welfare at stake and alternative aids available to improve clinical decision-making, the old adage that, a certain percentage of normal appendices must be removed if one is not to miss an acute/perforated, is no longer acceptable.

Correct pre-operative diagnosis of acute abdomen remains challenging despite good history taking and clinical examination, and improvement in new imaging techniques including computer-aided diagnosis, ultrasound imaging, computed tomography and laparoscopy. These new imaging techniques need sophisticated equipments and specialist expertise round the clock which is not feasible in our part of the world.

OBSERVATION AND RESULTS

Table 1: SEXWISE DISTRIBUTION OF ACUTE ABDOMEN CASES

GENDER	NO OF CASES	%
Male	62	62
Female	38	38

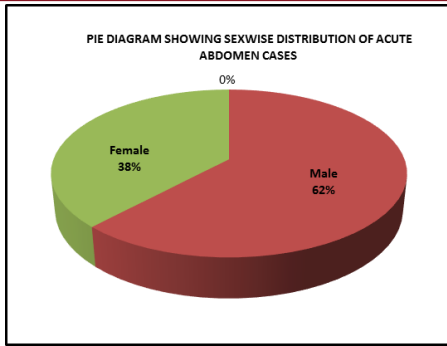


Table 2 : Distribution of Acute Abdomen cases out of 100 patients.

Cases of acute abdomen	Out of 100	%
Acute appendix	46	46
Perforation	20	20
Gangrenous bowel	04	04
Intestinal obstruction	26	26
Ovarian torsion	02	02
Meckel's diverticulum	04	04
TOTAL	101	101

Out of 100 cases of acute abdomen it was found that meckel's diverticulum was seen along with acute appendicitis due which the total number of cases seen are 101.

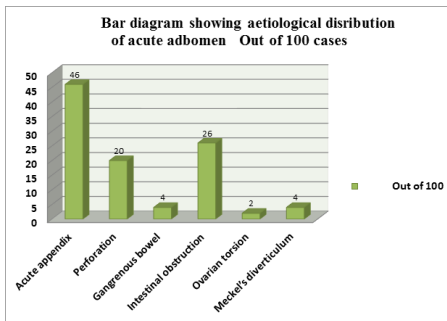


Table 3 : Correlation between sex and acute abdomen in study group

CASES OF ACUTE ABDOMEN	MALE	FEMALE	Total %
Acute appendicitis	26	20	46
Perforation	14	06	20
Intestinal obstruction	16	10	26
Gangrenous small bowel	02	02	04
Meckel's diverticulum	03	01	04
Ovarian torsion	---	02	02

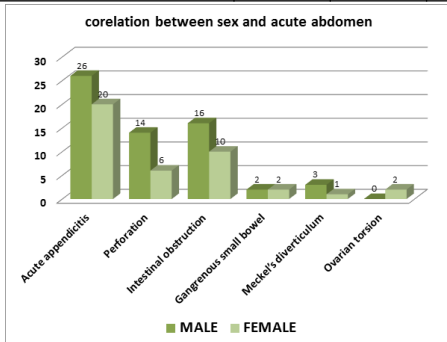


Table 4 : Age wise no. of cases of acute abdomen in study group of 100 cases

Age groups	No of cases of acute abdomen	%
0 - 10	11	11
11 - 20	16	16
21 - 30	34	34

31 - 40	19	19
41 - 50	08	08
51 - 60	03	03
61 - 70	09	09

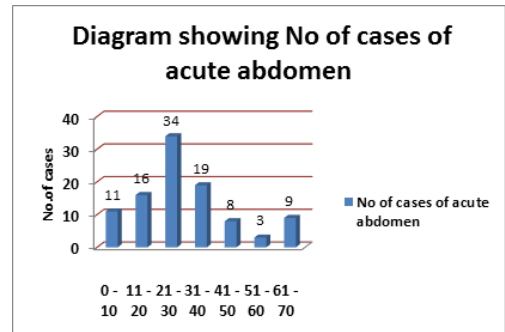


Table 5 : Age wise cases of acute abdomen in group study

Cases of acute abdomen	Age group						
	0-10	11-20	21-30	31-40	41-50	51-60	61-70
Acute appendicitis	2	12	24	07	0	0	1
Perforation	0	1	7	3	3	1	1
Intestinal obstruction	10	1	6	3	2	2	1
Gangrene	1	1	0	0	1	0	1
Ovarian torsions	1	0	0	1	0	0	0
Meckel's diverticulum	0	1	0	2	0	0	0
Total	14	16	37	16	6	3	4

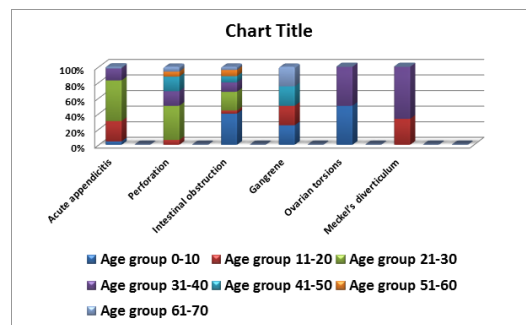


Table 6 : Correlation of TLC with acute abdomen

Acute Abdomen	Normal TLC	NORMAL %	RAISED TLC	RAISED %
Acute Appendicitis	25	54.35%	21	45.65%
Perforation	10	50.00%	10	50.00%
Intestinal obstruction	16	61.54%	10	38.46%
Gangrenous small bowel	02	50.00%	02	50.00%
Meckel's diverticulum	01	25.00%	03	12.00%
Ovarian torsion	02	100%	00	00

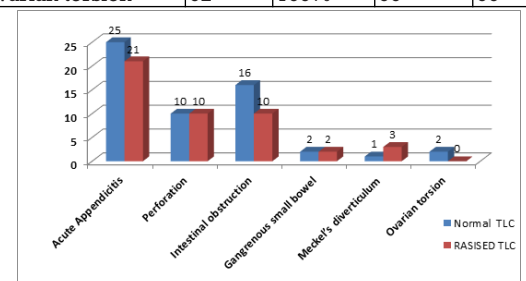


Table7: Correlation of Investigations with different etiologies of Acute Abdomen

Cases Of Acute Abdomen	No Of Cases	X-RAY	USG	CT Scan	Other Investigations
Acute appendicitis	46	01	36	-	04
Perforation	20	14	12	-	03
Gangrenous bowel	04	-	-	-	-
Intestinal obstruction	25	12	14	03	04
Ovarian torsion	02	-	02	-	-
Meckel's diverticulum	04	-	-	-	-
Total	103	27	64	03	11

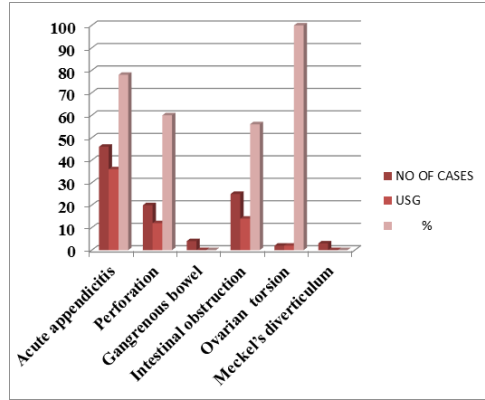


Diagram for correlation of investigations with different etiologies in acute abdomen

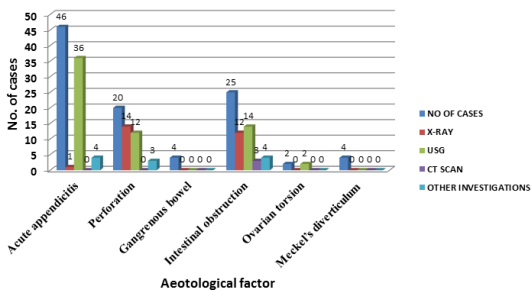


Table 7a :Correlation of X-rays with Acute Abdomen

CASES OF ACUTE ABDOMEN	NO OF CASES	X-RAY	%
Acute appendicitis	46	01	02
Perforation	20	14	70
Gangrenous bowel	04	-	00
Intestinal obstruction	25	12	48
Ovarian torsion	02	-	00
Meckel's diverticulum	03	-	00

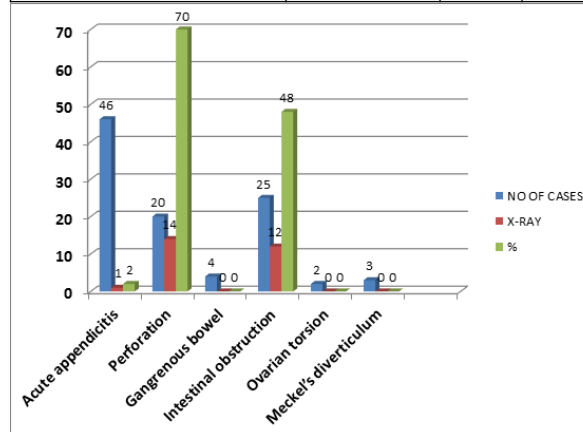


Table 7b: Significance of USG in cases of Acute Abdomen in group study

CASES OF ACUTE ABDOMEN	NO OF CASES	USG	%
Acute appendicitis	46	36	78
Perforation	20	12	60
Gangrenous bowel	4	-	0
Intestinal obstruction	25	14	56
Ovarian torsion	02	02	100
Meckel's diverticulum	03	00	00

Table 7c :Significance of CT Scan in acute abdomen cases

CASES OF ACUTE ABDOMEN	NO OF CASES	CT SCAN	%
Acute appendix	46	00	00
Perforation	20	00	00
Intestinal obstruction	04	03	75
Gangrenous small bowel	25	00	00
Meckel's diverticulum	02	00	00
Ovarian torsion	04	00	00

CT scan was done in 4 cases of suspected intestinal obstruction and rest were done in trauma

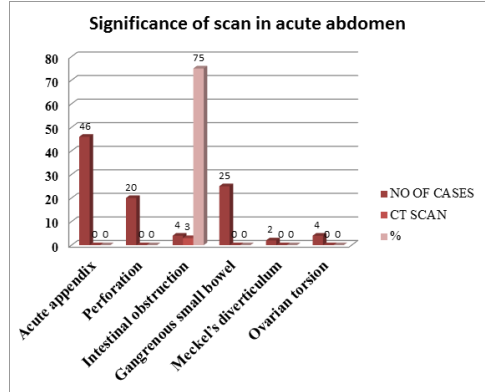
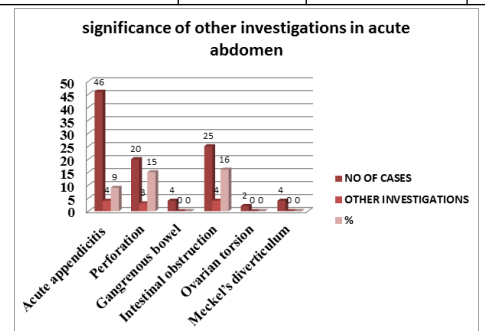


Table 7d: Significance of other investigations acute abdomen

Cases Of Acute Abdomen	No Of Cases	Other Investigations	%
Acute appendicitis	46	04	9
Perforation	20	03	15
Gangrenous bowel	04	-	0
Intestinal obstruction	25	04	16
Ovarian torsion	02	-	0
Meckel's diverticulum	04	-	0



DISCUSSION

Acute abdomen has been the most common emergency in a surgeon's life and also most interesting and challenging job. In spite of clinical knowledge and all the old & new techniques

of investigations sometimes it still becomes difficult to diagnose. Over a period of time imaging techniques and other investigations have helped surgeon to reduce negative laparotomy rate drastically

In our present study we have followed up 100 cases of acute abdomen. Along with clinical diagnosis we investigated them with different imaging techniques to reach the preoperative diagnosis. This was then correlated with intraoperative findings.

This study was carried out in Bharati Hospital and Research centre in Pune, over a period of two and half years. During the study the patients were admitted, thoroughly examined and a baseline clinical diagnosis was achieved. Routine blood investigations were sent and different modalities of imaging techniques were carried out as per the availability, necessity and affordability of the patients. X-rays and ultrasonography of abdomen were carried out in every patient in our study.

Medical, urological, acute cholecystitis and acute pancreatitis were excluded from this study. Though we have encountered cases of acute pancreatitis, not a single case of pancreatitis developed pancreatic necrosis which requires laparotomy and necrosectomy.

Once patient admitted and baseline clinical diagnosis was achieved, blood investigations were sent and patient was then clinically stabilized. IV access was secured, IV Fluids and appropriate IV antibiotics were delivered. Ryle's tube and Foleys were inserted in indicated cases and then imaging techniques were carried out.

1) X-RAY ABDOMEN ERECT :

It is done by establishing the projection of the film, virtually every abdominal X-ray is an AP film, i.e. the beam passes from the front to the back with the film behind the patient, who is lying down with the X-ray machine overhead, but these are frequently accompanied by erect or even decubitus views (also APs).

The radiographer will mark the film with a badge or write on it by hand 'SUPINE' or 'ERECT' to guide us. A standard 35/43cms cassette is used for an adult to include diaphragm to groins. Where as in obese patients cassettes may have to be used transversely, i.e. in landscape or larger size plate.

We had done X-ray erect abdomen in all the cases, and we found that in perforation 70% of x-rays were significant in giving an accurate preoperative diagnosis followed by intestinal obstruction 48%. In cases of acute abdomen only one case in favour of acute appendicitis due to fecolith visualised in the x-ray with sensitivity of 2.17% only. Similarly gangrenous bowel, meckel's diverticulum and ovarian torsions could not be appreciated on x-ray erect abdomen. Thus x-ray erect abdomen proved to be the diagnostic imaging modality in cases of acute perforative peritonitis and relatively diagnostic in acute intestinal obstruction^{3,5,6,7}.

In study by Chhetri R.K.^{26,27}, it was found that plain X-ray abdomen showed the highest specificity (88.8%) and positive predictive value (88.6%) in diagnosing acute abdomen. It being highly diagnostics in bowel obstruction (82.4%) and hollow viscous perforation was (69%). In our study we too found X-ray to have high sensitive (70%) as in them it was (88.8%).

We routinely carried out erect X-ray abdomen in every case of acute abdomen. Erect X-ray abdomen were found to be inconclusive in our study in cases of acute appendicitis, meckel's diverticulum, gangrenous bowel and ovarian torsion cases (sensitivity being 2.17%, 00%, 00%, 00% respectively),

we totally agree with the study done by Linda H. Harpole⁸ and team who came to a conclusion that in response to evidence-based critiques providers they were reluctant to cancel their order to carry out erect X-ray abdomen routinely in acute abdomen, but were more willing to change to different views. Similar study was also carried out by Dr Rishi Aryal²⁷ who had come to similar conclusion.

2) ULTRASONOGRAPHY OF ABDOMEN/PELVIS:

It has an increasingly important role in the initial evaluation of the acute abdomen. Many trauma centres recognize the value of ultrasound as a first-line investigation in properly trained hands. Small portable scanners now offer bedside assessment that can speed the process, whereas higher-specification scanners enable the experienced operator to diagnose detailed pathology in the acute abdomen. There is little doubt that the accuracy of the ultrasound scan is directly attributable to the skill and experience of the operator and the underlying pathology

In our study we carried out USG in every patient of acute abdomen, and we found that it was significantly diagnostic in cases of acute appendicitis (78%) followed by intestinal perforation (60%) and intestinal Obstruction (56%) whereas we had come across only two cases of ovarian torsion and both the cases were detected on ultrasonography alone (100%). Cases like intestinal obstruction and perforation were more readily picked up on an X-ray itself, and USG gave an added confirmation for the same. But cases like ovarian torsion were diagnostic only on USG and plain X-ray abdomen failed to diagnose the same.

In a study done by Wade DS^{9,10,11,12,13} and his team it was concluded that the efficacy of ultrasonography using the simple criteria was superior to that of the surgeon's initial clinical impression and that their ultrasonographic criteria for the diagnosis of appendicitis are simple to use and efficient, similarly in our study we found out that ultrasonography was definitely a relatively efficient diagnostic modality for appendicitis, perforation and obstruction cases after clinical assessment. Whereas ovarian torsions were diagnostic only on ultrasonography.

In a study by Dr. Rishi^{27,28} it was observed that out of 84 patients in 52 patients USG showed some abnormality (62% 25). It had high specificity; positive predictive value and negative predictive value in patients of acute appendicitis whereas it was not helpful in evaluating patients with intestinal obstruction. X-ray abdomen had more predictive value in case of peritonitis than USG abdomen. In comparison to this study we found X-ray more sensitive to perforation cases (70%) where USG showed less sensitivity (60%), and in intestinal obstruction X-rays showed sensitivity (48%) and USG showed (56%) but cases of appendicitis did have high sensitivity to USG (78%). Thus USG does hold a golden standard as an adjunct to clinical diagnosis of acute appendicitis. Study of Dr Ramchandra¹¹ and colleagues and Dr Crihton¹² also concluded the same. Thus USG has proved to be the adjunct diagnostic imaging modality to clinical diagnosis in cases of acute appendicitis.

3) CT SCAN ABDOMEN/PELVIS:

Computed tomography uses X-rays to make detailed pictures of structures inside of the body. During the test, patient is made to lie on a table that is attached to the CT scanner, which is a large doughnut-shaped machine. The CT scanner sends X-rays through the body area being studied. Each rotation of the scanner takes less than a second and provides a picture of a thin slice of the organ or area. All of the pictures are saved as a group on a computer. They also can be printed. An iodine dye (contrast material) is often used to make structures and organs easier to see on the CT pictures. The dye may be used to check blood flow, find tumors, and look for other problems. The dye can be used in different ways. It may be put in a vein

(IV) in your arm (IM), or it may be placed into other parts of your body (such as the rectum or a joint) to see those areas better. For some types of CT scans you drink the dye. CT pictures may be taken before and after the dye is used. A CT scan can be used to study all parts of your body, such as the chest, abdomen, pelvis, or an arm or leg. It can take pictures of body organs, such as the liver pancreas, intestines, kidneys, bladder, adrenal glands, lungs, and heart. It also can study blood vessels, bones, and the spinal cord. Fluoroscopy CT is a special test that is not widely available. It uses a steady beam of X-rays to look at movement within the body. It allows the visualisation organ movements or to guide a biopsy needle or other instrument into the right place inside your body.

In our study we have done eight CT Scans abdomen /pelvis where diagnosis was uncertain on erect x-ray abdomen and USG abdomen /pelvis .Out of which in six CTscan correct diagnosis could be made preoperatively and it had a diagnostic accuracy of 75% whereas four correlated along with X-ray and USG findings along with the intraoperative findings (50%) of cases were positively diagnosed. Thus the study revealed that at places where X-ray and USG were insignificant or biased about making a diagnosis we underwent CT scan and came up with a conclusive preoperative diagnosis (SENSITIVITY 75%). Thus time and again CT scan has proved itself to be of help in diagnosing an acute abdomen where simple imaging modalities failed diagnose and/or correlate with the clinical diagnosis. But at the same time CT scan also helped us to know the grades of trauma to the organs by which it helped us to decide whether to operate or conserve in traumatic acute abdomen cases. Similar conclusion was drawn in study done by Button G.C and team^{13,14,15,16,17,18}.

4) DYE STUDY:

In paediatric age groups where X-rays were inconclusive and USG or CT scan could not be done, (due to poor socioeconomic status and/or exposure to radiation due to series of X-ray's) a dye study was carried out in which the intestinal obstructions were diagnosed. We carried out dye study (with thin contrast material) on three babies in this study and it was noticed to be 100% sensitive in diagnosing intestinal obstruction.

5) NON IMAGING INVASIVE TECHNIQUES:

Non imaging and invasive techniques like four quadrant tapping and diagnostic laparoscopy were carried out in few cases having inconclusive diagnosis and where CT scan could not be done due to low socioeconomic status of the patient.

In this study it was also found that where CT scan failed to diagnose the clinically suspected case of perforative peritonitis, and where patient could not be given an erect position for x-ray abdomen and lateral decubitus x-ray failed too (for e.g. in cases of polytrauma), we carried out a non imaging invasive technique of four quadrant tapping, which was bilious in one case and feculent in the other and proved our clinical and intraoperative diagnosis to be strongly positive for perforation peritonitis.

Whereas places where CT scan could not be carried out for e.g. in low socioeconomic class of people visiting our hospital and where our clinical diagnosis was not going hand in hand with the other imaging modalities we underwent a non imaging invasive technique of diagnostic laparoscopy^{20,21} to have a pre-operative confirmed diagnosis of acute surgical abdomen to avoid the least possible chance of negative laparotomy.

CONCLUSION

- Acute abdomen was more commonly seen between age group of 21-30yrs (34%). Maximum incidence is from age

group of 11-40 yrs.

- Total Leucocytes count was raised in only 45% of cases of acute appendicitis and 50 % cases of peritonitis/gangrenous bowel.
- Highest diagnostic accuracy was seen with acute appendicitis (80%) with imaging techniques on the contrary gangrenous bowel and meckel's diverticulum could not be diagnosed with imaging techniques.
- Plain X-Ray abdomen had highest sensitivity in evaluating patients with acute perforative peritonitis (70%) and obstruction (48%).
- USG is more sensitive in diagnosis of acute appendicitis (78%) , plain X-ray (erect) abdomen being least sensitive (2%).
- CT scan is the most useful diagnostic modality to rule out grades of trauma to solid organs within the abdomen and where the USG and X-RAY findings are inconclusive.
- In doubtful situations diagnostic laparoscopies and four quadrant abdominal tapping helps in avoiding a negative laparotomy .Due to this we could achieve 0% negative laparotomy rate.
- Though we have got limited cases of ovarian torsion (2 cases), in both the cases USG was found to be effective .

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