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Original Article

Role of Plain Abdominal Radiography and Ultrasonography in Evaluation of Nontraumatic Acute Abdomen

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ABSTRACT

Introduction : Non traumatic Acute abdominal pain is caused due to a number of causes like acute appendicitis, diverticulitis, cholecystitis, renal calculus etc. The diagnosis of nontraumatic acute abdomen is a team work of radiologist and clinician. Nontraumatic acute abdominal conditions require precise radiological diagnosis to achieve excellent results to reduce morbidity and mortality.In the earlier part of the twentieth century, plain x-ray of abdomen was the only such investigation which was introduced as a diagnostic tool in clinical practice,s there is tremendous advancement in scientific fields, more and more diagnostic facilities like ultrasonography, endoscopy, MRI, CT scan, radionuclide scan and other sophisticated investigations have developed which can give more information than the plain x-ray. As air is a bad conductor of sound waves, the pathology can be missed in such conditions, which can still be picked up by a plain x-ray abdomen where ultrasound has failed to detect the lesion. So with this view a study was planned to analyze the findings of plain x-ray and ultrasound in non traumatic acute abdomen, to evaluate the acute abdominal conditions by using plain x-ray and ultrasound.

Aims and Objectives:

1) To study the various plain radiographic findings associated with nontraumatic acute abdomen.
2) To study the various ultrasonographic findings associated with nontraumatic acute abdomen.
3) To analyze the efficacy of plain x-ray and ultrasonography in the diagnosis of nontraumatic acute abdomen and to compare their individual merits and their superiority in the diagnosis. Both plain x-ray and ultrasonographic findings were correlated with final diagnosis which was done either by other mode of investigation, clinical correlations or laparotomy.
4) To reduce the investigation time and to facilitate early management of the patient to reduce the morbidity and mortality associated with nontraumatic acute abdominal conditions.

Materials and Methods: The study conducted was a non-randomized, prospective study. for a period of 12 months patients clinically having acute onset of pain abdomen attending the department of Radio-diagnosis Andhra medical College, Visakhapatnam Sample size of 50 cases who presented to us with nontraumatic acute abdomen were admitted to the hospital in the above-mentioned period and were subjected to plain x-ray of abdomen and ultrasonography of abdomen. Patients were admitted in various wards like general wards, special wards.

Result: Based on clinical history and clinical examination provisional clinical diagnosis was made. According to clinical diagnosis there were cases (32%) of renal and ureteric pathology, 13 cases (26%) of Intestinal obstruction, 7 cases (14%) hepatobiliary pathology, 5 cases[10%] of intestinal perforation, 4 cases[8%]of acute appendicitis,2 cases[4%]of acute gastritis,3 cases(6%)of other causes [1 case of acute pancreatitis, splenic pathology and appendicular mass.

Key Words: *Non traumatic, Acute abdomen, X-ray, USG, appendicitis, cholecystitis, renal calculi, pancreatitis.*

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INTRODUCTION

The diagnosis of nontraumatic acute abdomen is a team work of radiologist and clinician. Nontraumatic acute abdominal conditions require precise radiological diagnosis to achieve excellent results to reduce morbidity and mortality. In the earlier part of the twentieth century, plain x-ray of abdomen was the only such investigation which was introduced as a diagnostic tool in clinical practice, even though x-rays are shadows and not the true images. It turned out plain x-ray was useful in diagnosis of 40% of acute abdominal cases. We are grateful to our father of x-ray Sir. W.C.

Roentgen as even after 100 years of detection of x-rays by him no other modality of investigation is able to show the G.I. perforation as a plain x-ray of the abdomen can. As there is tremendous advancement in scientific fields, more and more diagnostic facilities like ultrasonography, endoscopy, MRI, CT scan, radionuclide scan and other sophisticated investigations have developed which can give more information than the plain x-ray. Investigations such as CT scan, MRI and radionuclide scan are very costly and require special training. Ultrasound is a small machine, which does not require many accessories and trained staff is easily available all over the world. It can be installed easily and with less space. Portable ones can also be taken to the places where required. Another most important thing is that ultrasound is a non-invasive procedure. 1 This technique has gained acceptance as a major diagnostic tool largely because of the technological development of real time units and M and B mode sector scanners, with high resolution value to visualize intra-abdominal structures has led to its usefulness as one of the major imaging techniques in most nontraumatic acute abdominal conditions except in few where bowel loops are largely distended with air. As air is a bad conductor of sound waves, the pathology can be missed in such conditions, which can still be picked up by a plain x-ray abdomen where ultrasound has failed to detect the lesion. So with this view a study was planned to analyze the findings of plain x-ray and ultrasound in non-traumatic acute abdomen, to evaluate the acute abdominal conditions by using plain x-ray and ultrasound.

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4) To reduce the investigation time and to facilitate early management of the patient to reduce the morbidity and mortality associated with nontraumatic acute abdominal conditions.

MATERIAL AND METHODS

Study Population

50 cases of clinically suspected non traumatic acute abdomen referred to the radiology department of ANDHRA MEDICAL COLLEGE, VISAKHAPATNAM. For plain x ray of abdomen and ultrasonography

Source of Data

50 clinically suspected cases of non traumatic acute abdomen referred to the radiology department of ANDHRA MEDICAL COLLEGE, as per inclusion and exclusion criteria.

Method of Data Collection

- Duration of Study: 12 MONTHS
- Sample size: convenient sampling of 50 clinically suspected patients of non traumatic acute abdomen referred to DEPARTMENT of RADIOLOGY was taken.

INCLUSION CRITERIA

1) The patients selected for the study presented with pain abdomen, lump in the abdomen, hematuria, fever, vomiting and so on. Only those patients evaluated and followed up personally were included in the study.
2) All individuals irrespective of age and sex.

Exclusion criteria:

1) Critically ill patients, pregnant ladies and patients with trauma abdomen were excluded from the study.

METHODOLOGY

After history taking and physical examination, all patients underwent plain x-ray abdomen and ultrasonography of abdomen. Confirmation of final diagnosis was done either by surgery wherever possible or by relevant specific investigation

Imaging Protocol

Plain x-ray abdomen AP view with horizontal beam in upright position were taken. This film included both domes of diaphragm and pelvis up to the symphysis pubis. On certain occasions plain x ray abdomen AP view in supine position and plain x ray abdomen left lateral decubitus were taken as clinical condition warranted. Confirmation of final diagnosis was done either by surgery wherever possible or by relevant specific investigation. Finally, effort was made to study the sensitivity of plain x-ray and ultrasonographic findings to final diagnosis: efficacies of both were analyzed.

Procedure and technique of Plain radiography of abdomen:

The technical factors for taking X-ray films vary from centre to centre. We have employed the following standard technique for taking plain x ray in nontraumatic acute abdomen.

a) Appropriate size of the film was used so that it includes both domes of diaphragm and pelvis. For adults usually 14x17" size films were used.
b) Film focusing distance: 90 cms for both AP and lateral views.
c) Kilovolt peak (kvp) approximately 70-80 kvp was used for both AP and lateral views.
d) Bucky films were taken wherever required.

Procedure and technique of Ultrasonography of abdomen:

Sonological equipment used:

SAMSUNG USG Machine with multi-frequency linear array transducer (7.5MHz10.0MHz) and curvilinear transducer (3.5MHz-7.0MHz) was used for our study (wherever necessary transvaginal probe was used for detailed scan of pelvis for gynecological causes).

Statistical analysis

The data obtained will be entered using MS Excel and it will be statistically analyzed using the statistical package for Social Sciences SPSS version 16 for MS windows. Descriptive Statistical Analysis will be carried out to explore the distribution of several categorical and quantitative variables will be summarized with n%, while quantitative variables summarized by +/- SD. All the results will also be presented in tabular form and also graphically using bar diagram or pie diagram, as appropriate.

Inferential statistics- the difference in the two groups will be tested for statistical significance using parametric tests such as the't' test. Categorical variables will be tested by Chi square test. P-value less than 0.05 is considered to be statistically significant.

RESULTS

Total numbers of patients included in our study were 50 out of which 34 patients were males (68%) and 16 patients were females (32%). Age of the patients varied from 5 years to 90 years, and most of the cases were in the age group of 20-40 years.

Table 1: Sex distribution of studied patients

SEX	Total no. of cases	Percentage
Males	34	68%
Females	16	32%
Total	50	100%

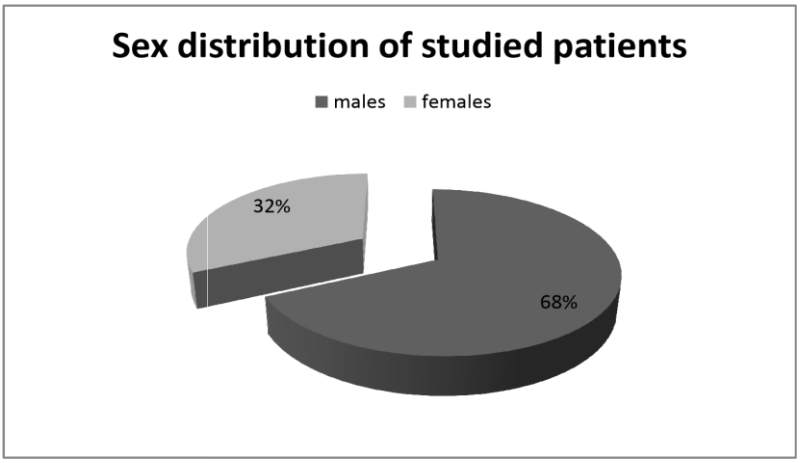

Chart 1: Sex distribution of studied patients

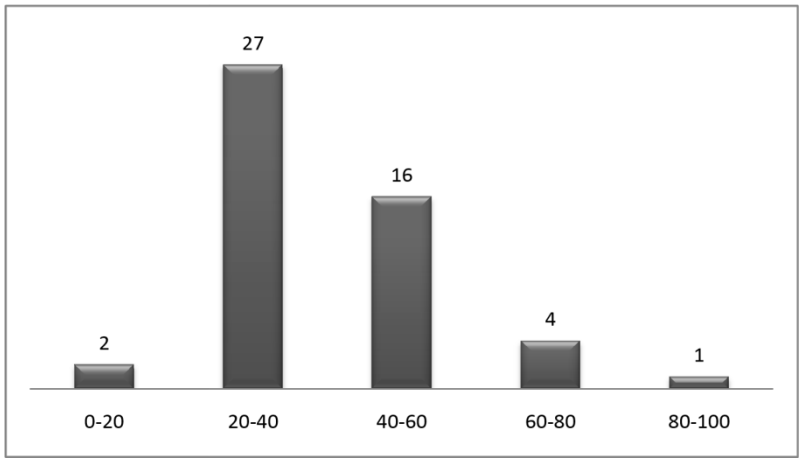

Chart 2:

All patients in our series presented with pain abdomen among them (19 cases) 38% of patients presented with diffuse pain abdomen,(7 cases)14% with right hypochondrium pain,(8cases)16% in the right loin pain & loin pain radiating to groin,(7 cases)14% with left loin pain & loin pain radiating to groin, (3cases)6% epigastric pain,(5 cases)10% right iliac fossa pain and (1 case)2% with left hypochondrium pain.

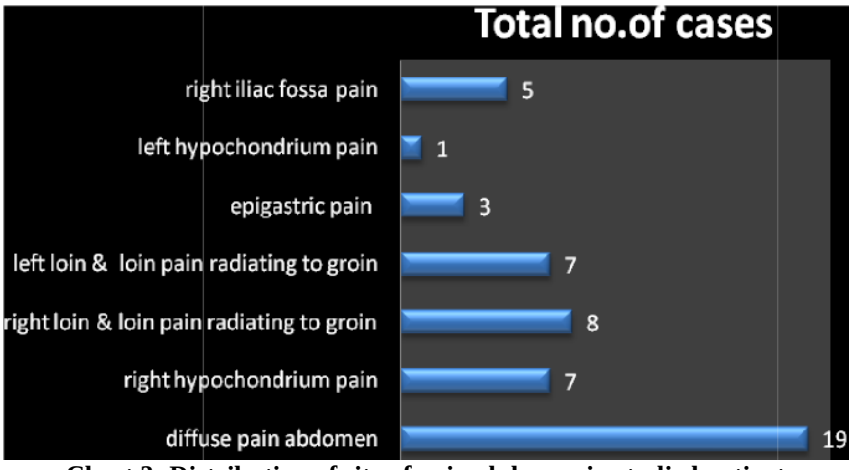

Chart 3: Distribution of site of pain abdomen in studied patient

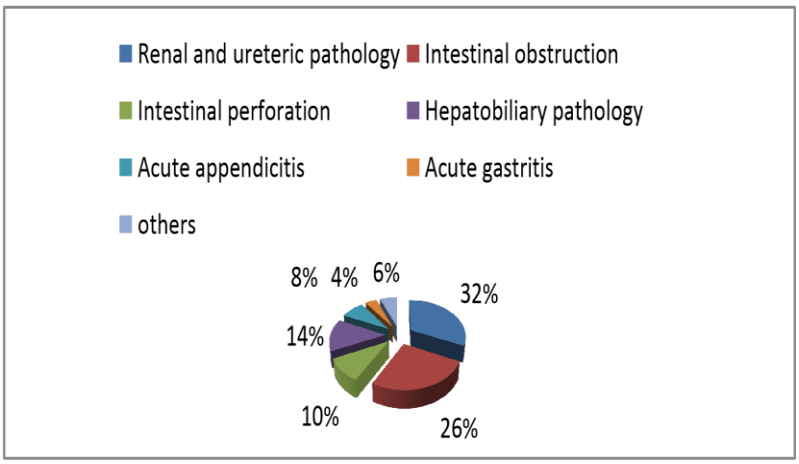

Chart 4: Distribution of causes of nontraumatic acute abdomen according to clinical diagnosis in our study

Table 2: Distribution of causes of nontraumatic acute abdomen according to clinical diagnosis in our study

Clinical diagnosis	No. of cases	percentage
Renal and ureteric pathology	16	32%

Intestinal obstruction	13	26%
Hepatobiliary pathology	7	14%
Hollow viscus perforation	5	10%
Acute appendicitis	4	8%
Acute gastritis,	2	4%
Acute pancreatitis,	1	2%
Splenic pathology	1	2%
Appendicular mass	1	2%
Total	50	100%

Table 3: Distribution of causes of nontraumatic acute abdomen in our study according to final diagnosis

Cause of acute abdomen	No. of cases	Percentage of No. of cases
Intestinal obstruction	13	26%
acute ureteric/renal and vesical calculi	16	32%
GI perforations	6	12%
Acute cholecystitis and cholelithiasis	5	10%
Acute appendicitis	2	4%
Liver abscess	2	4%
acute gastritis	2	4%
Acute pancreatitis	1	2%
appendicular abscess	1	2%
splenic abscess	1	2%
Acute gynecological cause	1	2%
Total	50	100%

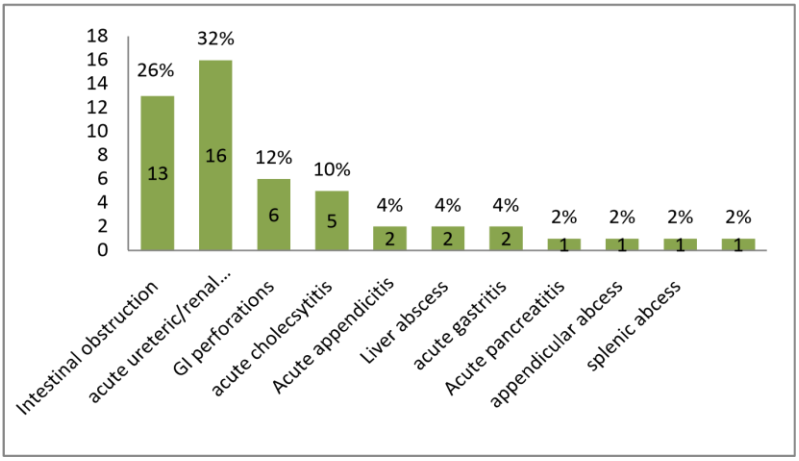

Chart 5: Distribution of causes of nontraumatic acute abdomen in our study according to final diagnosis

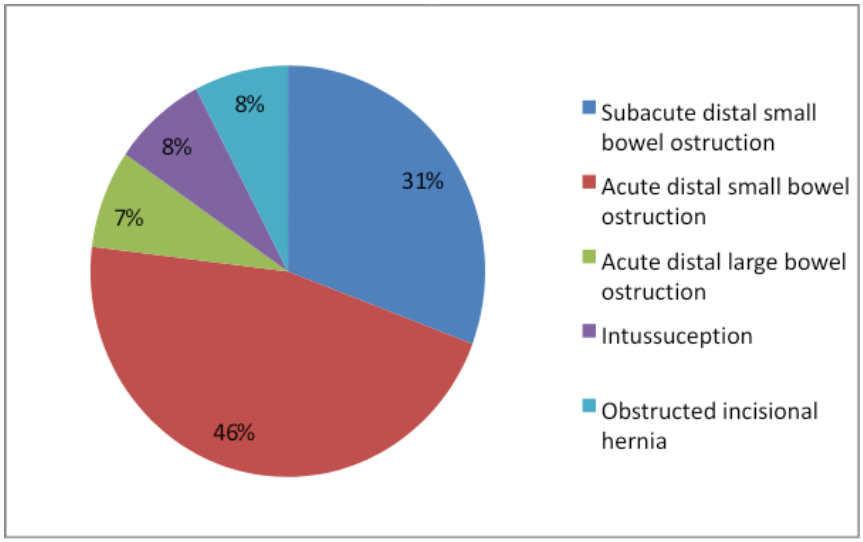

Chart 6: Distribution of causes of intestinal obstruction in our study (Total no. cases of intestinal obstruction-13)

Table 4: Distribution of causes of intestinal obstruction and diagnostic accuracy of x ray and USG

	No. of cases	X- ray diagnostic accuracy	USG diagnostic accuracy
Sub acute distal small bowel obstruction	4(30.7%)	(3)75%	(1)25%
Acute distal small bowel obstruction	6(46.1%)	(2)33.33%	(6)100%
Acute distal large bowel obstruction	1(7.7%)	(1)100%	(1)100%
Intussusception	1(7.7%)	0%	(1)100%
Obstructed incisional hernia	1(7.7%)	(1)100%	(1)100%
Total	13(100%)	(7)53.8%	(10)76.92%

Acute ureteral/ vesical/renal with ureteric calculi:

Table 5: Distribution of calculi in KUB region in studied patients

	No. of cases	percentage
ureteric calculi	8	50%
renal with ureteric calculi	3	18.7%
renal calculi	3	18.7%
Vesical calculus	1	6.25%
calculus in PUJ	1	6.25%
total	16	100%

Hollow viscus perforation:

Among total 6 cases, duodenal perforation cases were 4 (66.66%). Ileal perforation case was 1 (16.6%) and 1 case (16.6%) of appendicular perforation.

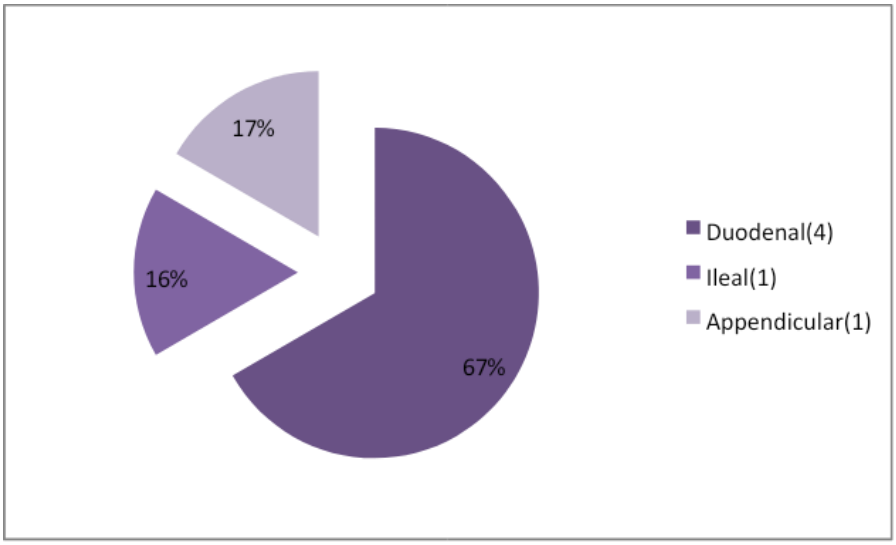

Chart 7: Distribution of cases according to site of perforation in our study. (Total no. of cases of hollow viscus perforation-6)

Acute cholecystitis and cholelithiasis:

Acalculous cholecystitis cases were 3 (60%) and one case each of cholelithiasis (20%) and cholelithiasis with cbd calculi (20%).

Among them, sonographic Murphy's sign and thickening of the gallbladder wall more than 3mm was seen in 3 cases of acalculous cholecystitis. In 2 cases of cholelithiasis calculi were seen as mobile echogenic foci with or without acoustic shadows in the dependent portion of lumen of gallbladder. Among these 2 cases, one case showed dilatation of cbd (>8mm) with distal cbd calculi. So, all cases were diagnostic on USG with diagnostic accuracy of 100%.

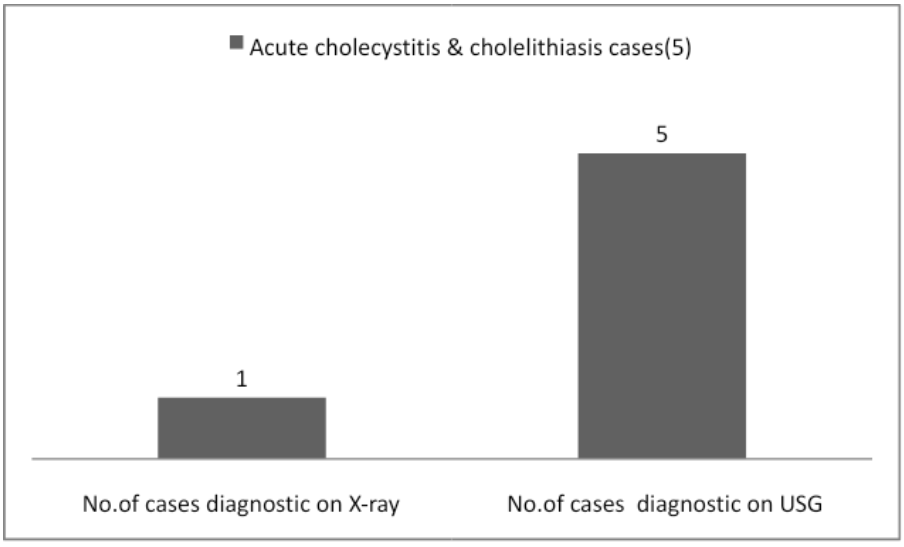

Chart 8: Showing no. of diagnostic cases on X-ray and USG among total acute cholecystitis & cholelithiasis cases

Table 6: Distribution of causes of nontraumatic acute abdomen and no. of cases diagnostic & diagnostic accuracies of X-ray and USG

S.no	Cause of nontraumatic acute abdomen	No. of cases	X-ray diagnostic cases	Diagnostic accuracy of X-ray	USG diagnostic cases	Diagnostic accuracy of USG
1	Intestinal obstruction	13	7	53.84%	10	76.9%
2	Renal/vesical/ureteral calculi	16	11	68.7%	16	100%
3	Hollow viscus perforation	6	5	83.33%	6	100%

4	Acute cholecystitis and cholelithiasis	5	1	20%	5	100%
5	Acute appendicitis	2	0	0%	2	100%
6	Appendicular abscess	1	0	0%	1	100%
7	Acute pancreatitis	1	0	0%	1	100%
8	Acute gastritis	2	0	0%	0	0%
9	Hepatic and splenic abscess	3	0	0%	3	100%
10	Gynecological cause	1	0	0%	1	100%
	TOTAL	50	24	48%	45	90%

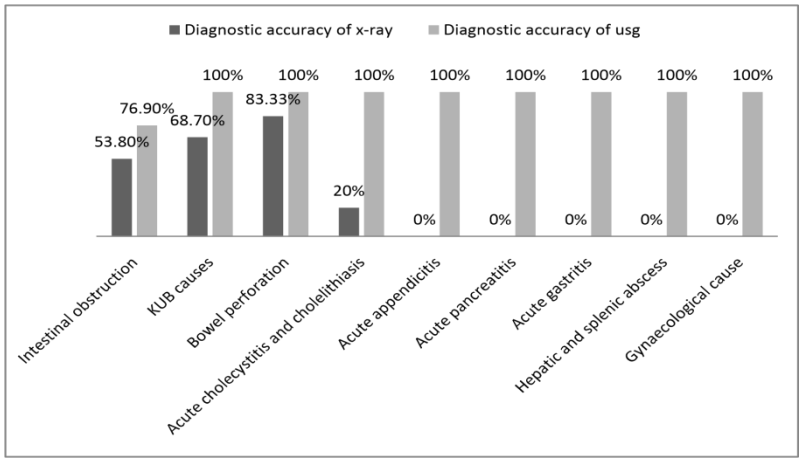

Chart 9: Showing diagnostic accuracy of X-ray and USG of different causes of nontraumatic acute abdomen.

DISCUSSION

The accurate diagnosis of acute abdominal conditions is crucial in the management of patients in emergency. The varieties of conditions requiring immediate management vary widely in their clinical presentation and laboratory findings. In the last decade real time ultrasonography has become a choice of investigation for clinical problems within the abdomen. It is non-invasive, safe, easy to carry out, convenient for the patients, and is showing increasing accuracy and specificity when compared to a plain x-ray abdomen. However, in few abdominal conditions in which bowel loops are largely distended with air, ultrasound has failed to detect abdominal lesions in such cases as air is a bad conductor of sound waves. However, merits and demerits of ultrasonography and plain x-ray abdomen are discussed here in each system and effort has been made to know the efficiency of both in the diagnosis of nontraumatic acute abdomen.

CONCLUSION

Sonography is a valuable imaging tool in patients who may have specific gastrointestinal disease such as appendicitis, sigmoid diverticulitis, Crohn's disease, colitis, infectious ileocecitis, right-sided colonic diverticulitis, bowel malignancy presenting acutely, small bowel obstruction, intussusception, omental infarction, and epiploic appendagitis 1#puylaert

In 1984 Field et al 2#fields emphasized that in spite of the recent proliferation of other imaging techniques, plain films still retain their position as one of the most useful initial investigations in acute abdomen.

In 1986,Seibert et al 3 emphasized ultrasonography has great value in evaluating a child with distended and gasless abdomen, in detecting ascites, unsuspected masses and abnormally dilated loops of small bowel.

In 1987 Abu yousef M. Monzer, et al 4 #abu, published a study regarding the role of high-resolution sonography in the evaluation of patients with an equivocal clinical diagnosis of acute appendicitis. This technique was found to be accurate in the diagnosis of acute appendicitis with a specificity of 95%, sensitivity of 80% and accuracy of 90%. The predictive value of a positive test was 91% and that of a negative test was 89%18.

In 1994 Grassi et al 5 #catalano showed that in perforation US had lower sensitivity than radiography (76% vs 92%, respectively). Therefore, we believe plain abdominal films to be still the method of choice to study the patients with suspected gastrointestinal perforation. Thus, US should be used in selected cases only--i.e., clinical conditions preventing radiographs from being performed correctly, persisting clinical suspicion with negative or questionable radiographic

findings, the exclusion of other acute abdominal conditions, and 7 finally the presence of pneumoperitoneum in the patients referred for different clinical reasons.

In 2003, Jain KA et al 6 #jain emphasised on spectrum of sonographic findings associated with haemorrhagic ovarian cysts. A haemorrhagic cyst is a common and important entity to recognize and diagnose correctly, and because it can be confused with more ominous conditions, it is important to recognize its specific diagnostic patterns.

In 2005 K Gupta, RK Bhandari, R Chander et al 7#gupta conducted comparative study of plain x-ray film abdomen and ultrasound in non-traumatic acute abdomen on 50 patients. Ultrasound was highly accurate in diagnosing the exact cause of acute abdomen with high overall predictive accuracy of 98.3% and sensitivity of 90%. Plain x-ray abdomen was 100% diagnostic in GIT 10 perforation, GIT obstruction, psoas abscess (caries spine) and renal colic with overall predictive accuracy of 4.1% and sensitivity of 60%

In 2012 Sidharth, BP Singh, D Singh, A Gupta et al 8 #sid showed that Plain x-ray is less sensitive in the evaluation of nontraumatic acute abdomen so it should be used together with ultrasound abdomen in order to arrive at a correct diagnosis. Prospective study was conducted and Ultrasound yielded an overall sensitivity and specificity of 78.7% and 84.6.6% respectively. The AAS interpretations yielded an overall sensitivity and specificity of 23.4% and 38.40% respectively.

Age incidence in our study: Age of the patients varied from 5 years to 90 years, and most of the cases were in the age group of 20-40 years.

Sex distribution in our study: Total numbers of patients included in our study were 50 out of which 34 patients were males (68%) and 16 patients were females (32%).

Incidence of chief complaint: Patients in our study presented with chief complaint of pain abdomen and majority of patients presented with diffuse pain abdomen (38%)

Distribution of causes of nontraumatic acute abdomen among patients in our study:

In our study majority of cases were of GIT pathology 24(48%) followed by renal causes (32%) and hepatobiliary pathology (14%) when compared to studies done on 50 patients of nontraumatic acute abdomen and Gupta #gupta et al where most of cases were of hepatobiliary pathology.

Intestinal obstruction: Plain x-ray abdomen in acute intestinal obstruction can distinguish between small and large bowel obstruction. In our series it was diagnostic in 7 cases out of 13 cases hence, with accuracy rate of 53.8%. 68 Ultrasonography, in suspected mechanical obstruction is not that helpful in subacute intestinal obstruction cases but in other causes of acute intestinal obstruction there were dilated bowel loops (>3cms) with to and fro peristalsis on real time ultrasonography. Most common causes for intestinal obstruction are strictures and adhesions which are not visible on ultrasonography. Presence of abundant gas in the intestinal lumen is characteristic in most patients with obstruction, frequently producing sonograms of nondiagnostic quality. However, in few patients with mechanical obstruction, who do not have significant gaseous distension sonography may be helpful. In our series it was diagnostic in 10 cases out of 13 cases of intestinal obstruction with 76.9% accuracy.

Acute ureteric/renal/vesical calculi: 90% of stones in urogenital system are radio opaque and 10% are radiolucent. There is 10% chance that stones can be missed on plain X-ray KUB. Ultrasound can pick up such radiolucent stones. In our study, in 5 patients plain X-ray has failed to detect renal/ureteric stones, in these cases ultrasonography has picked up the calculi, which was confirmed by CT KUB. Ultrasound has picked up the stones in almost all cases in our study. In one case bladder calculus was picked up on both plain X-ray KUB and ultrasonography. Most of cases had calculus in proximal ureter so it was mostly picked up on USG without difficulty. In the urinary disease especially urolithiasis USG and plain X-ray are almost complementary to each other but more diagnostic accuracy to detect 69 a calculus is seen with combined use of both plain X-ray and USG. Middleton et al 10 #middleton showed that sensitivity of detection of ureteric calculi by ultrasonography was 96% and in a study by patlas et al 9 #patlas showed sensitivity of 93% for detection of renal stones by ultrasonography which is almost comparable to our study(sensitivity of 100% for ultrasonography).

Hollow viscus perforation: In our study of 4 duodenal perforations and 1 ileal perforation cases which showed gas under the domes of diaphragm in erect posture plain abdominal X-ray film. Grassi et al showed USG had lower sensitivity than radiography (76% vs 92%, respectively) but in our study USG had more sensitivity when compared to plain X-ray abdomen(100% vs 83.3%%, respectively). Appendicular perforation in our series has not shown gas under

diaphragm. Nonspecific signs such as localized ileus was seen. Ultrasonography in GI perforations showed free fluid in the peritoneal cavity, few distended intestinal loops and hyperechoic specks with dirty shadowing in peritoneal cavity (suggestive of air in peritoneal cavity). With these findings in conjunction with clinical features, a probable diagnosis was made.

Hepatobiliary system: In the diseases of hepatobiliary system especially cholelithiasis and cholecystitis clinical diagnosis cannot be made sure. Ultrasonography and plain X-ray are useful tools of investigations. In our study of out of 5 cases, in 70 one case gallstones were visible on plain film and in 4 cases, nonspecific signs were seen on plain radiography. Ultrasound findings in our study out of 5 cases, gallstones were seen in 2 cases with one case showing cbd calculus along with gallstones and there were 3 acalculus cholecystitis cases. Slowly moving material within the gallbladder with homogeneous echo pattern in the absence of acoustic shadowing is considered as sludge. In our study, thickening of gallbladder wall (>3mm in distended GB), sonographic Murphy's signs were seen. In one case the gallbladder was distended enormously with stone in Hartmann's pouch. Two cases of hepatic abscess were seen in our study, ultrasonography showed positive findings with accuracy of 100% but plain radiography was not conclusive. Acute appendicitis and other appendicular pathologies: In our study 2 cases were of acute appendicitis and one case of appendicular abscess. Plain x-ray abdomen was not diagnostic in any of the cases. Ultrasonography has reported sensitivities of 75 to 90 % and specificities of 86 to 100 percentages in diagnosing acute appendicitis. In our study it was around 100%. This was due to the small number of cases with acute appendicitis. Puylaert's of using graded compression is the most popular method of examination. The inflamed appendix is seen as a blind ending a peristaltic, non compressible, tubular structure >6 mm in diameter arising from the base of the caecum. 71 Ultrasonography was able to pick up appendicular abscess, and the serial ultrasonography helped us to know whether the abscess is resolving or increasing in size. Thus, ultrasonography is not only helpful in the diagnosis of appendicular abscess but also helps in the follow up of appendicular abscess in conservative treatment.

Acute Pancreatitis: In our study, one case was diagnostic of pancreatitis. Ultrasonography showed increased size of the pancreas with hypoechoic echotexture. Some times in ultrasonography, enlargement of the pancreatic duct, stone in the pancreatic duct with or without acoustic shadow may be seen. In our study, no such findings were seen on ultrasonography. Pancreatic abscess shows anechoic mass containing debris, sometimes bright echoes from gas bubbles may be seen, but in our study no such findings were seen. Plain X-ray did not reveal any positive signs.

Splenic abscess: Plain X-ray showed no positive findings related to condition but ultrasound was 100% accurate in detecting the condition in our study. Acute gynaecological causes: In our study one case of haemorrhagic cyst was seen with 100% accuracy on ultrasonography. Jain et al showed different spectrums of haemorrhagic cyst on sonography. In our case it showed well defined cyst with 72 multiple thin septations giving the appearance of fish net pattern in the left adnexa on ultrasonography.

Acute gastritis: Neither plain X-ray abdomen nor ultrasonography showed conclusive features related to condition. Abdominal radiography has historically been the first imaging examination performed in the emergency department in evaluating abdominal pain. Interpretation of these radiographs may present a formidable challenge to the radiologist. While in many cases a specific diagnosis can be made, plain radiographs are often nonspecific or even misleading. Other imaging modalities like Ultrasound and computed tomography (CT) are used increasingly in cases where there is diagnostic difficulty or clinical uncertainty. Present study was aimed to analyze the efficacy of plain x-ray and ultrasonography in the diagnosis of nontraumatic acute abdomen and to compare their individual merits and their superiority in the diagnosis. In our study, overall accuracy of ultrasound was 90% and accuracy of x-ray was 48%, when compared to Gupta et al #gupta where the accuracy for usg and x-ray was 98.3 and 4% respectively. Another study done by Singh BP, Singh D, Gupta A et al #gupta showed sensitivity of 78.7% for ultrasonography and sensitivity of 23.4% for plain radiography. Compared to Singh BP, Singh D, Gupta A et al our study showed slightly more sensitivity of both ultrasonography and X-ray. Sensitivity of our study for X-ray and USG are almost comparable to Gupta et al#gupta study in the study of 50 patients with nontraumatic acute abdomen following where the significant findings:

1) A total of 50 patients were studied of which 34 patients (68%) were males and 16 patients (32%) were females.
2) Age range varied from 5 years to 90 years. Most cases were in the age group of 20-40 years. 3) All patients underwent a plain x-ray abdomen AP view at the earliest, ultrasonography of abdomen and other investigations were also done as required. The plain radiography and ultrasonographic signs in these patients and their significance were studied.
4) Plain X-ray was helpful in 24 patients with 48% diagnostic accuracy. Ultrasonography was helpful in 45 patients with 90% diagnostic accuracy. When combined with plain X-ray and ultrasonography accuracy rate increased to 96%.
5) Plain x-ray was really helpful in cases such as intestinal obstruction, bowel perforation and was also helpful in diagnosing ureteral/renal/vesical calculi. Because of its lack of specificity, it has limited value in the diagnosis of hepatobiliary disease, such as acute cholecystitis and is also not very helpful in diagnosis of conditions like appendicitis, Appendicular abscess, splenic abscess, acute pancreatitis and acute gynecological conditions.

6) Ultrasonography in the diagnosis of nontraumatic acute abdomen, it was found to be an excellent diagnostic tool for the diagnosis of hepatobiliary diseases such as acute cholecystitis, both calculus and acalculous and it is also helpful in acute ureteric/renal/vesical calculus, acute appendicitis, appendicular abscess and acute pancreatitis.

7) In acute renal/ureteral/vesical calculus, ultrasonography has distinct advantage over plain x ray radiography because it not only shows the level of obstruction but also helps in knowing the back pressure changes, corticomedullary differentiation

8) Similarly, ultrasonography has additional advantages like appendicular abscess and pancreatitis can be assessed by follow up for conservative management.

9) Plain x ray has accuracy rates almost comparable to Ultrasonography in hollow viscus perforation and intestinal obstruction in our study.

10) This study shows that ultrasonography of the abdomen has more accuracy rate than Plain abdominal radiography in diagnosing nontraumatic acute abdomen conditions. But when both investigations are combined accuracy rate further increases to 96%

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