ROLE OF SONOLOGICAL AND PLAIN ABDOMINAL RADIOGRAPHY IN EVALUATION OF ACUTE ABDOMEN

Harish Krishnappa¹, Radha Harish²

¹Consultant, Department of Radio-diagnosis, Sri Krishna Rukmini Hospital, Bangalore, Karnataka.
²Postgraduate, Department of Pharmacology, M. S. Ramaiah Medical College, Bangalore, Karnataka.

ABSTRACT

BACKGROUND
Acute abdominal pain is a common complaint of patients presenting at the Emergency Department. Plain X-Ray as well as ultrasonography are the two most commonly used modalities in diagnosing the causes of acute abdomen. Objectives- To correlate radiological and ultrasonographic findings associated with acute abdomen.

MATERIALS AND METHODS
The study was carried out for a period of two years including 50 patients in total. Plain x-ray and ultrasonographic findings of acute abdomen were noted and compared.

RESULTS
Thirty-two patients were males (64%) and 18 patients were female (36%). Age of the patients varied from 12 years to 80 years, most of the cases were in the age group of 20-60 years. Most common causes for acute abdomen were acute ureteric/renal and vesicle calculi (34%) followed by intestinal obstruction (28%) and gastrointestinal perforations (14%).

CONCLUSION
Plain x-ray was helpful in 30 patients (60%). Ultrasonography was helpful in 43 patients (86%). When pain x-ray was combined with ultrasonography, accuracy rate increased to 90-95%.

KEYWORDS
Acute Abdomen.


BACKGROUND
Acute abdominal pain is a common complaint of patients presenting at the Emergency Department. It can be caused by a variety of diseases ranging from mild and self-limiting to life-threatening diseases. An early and accurate diagnosis results in more appropriate management and subsequently leads to better outcomes. The diagnosis of acute abdomen is a team work of radiologist and clinician. Acute abdominal condition requires precise radiological diagnosis to achieve excellent result to reduce morbidity and mortality.

In earlier part of twentieth century, plain x-ray of abdomen was the only such investigation, which was introduced as a diagnostic tool in clinical practice. Plain x-ray was useful in diagnosis of 40% of acute abdominal cases. Investigations such as CT scan, MRI and radionuclide scans provide better information than plain-x ray but are very costly and require special training. But ultrasound does not require many accessories, it is non-invasive and trained staff is easily available all over the world. It can be installed easily and less space occupying.

Ultrasonography is one of the major imaging techniques in most of the acute abdominal condition except in few cases of largely distended bowels. Air is a bad conductor of sound waves; the pathology can be missed in such conditions, which can still be picked up by plain x-ray abdomen, where ultrasound has failed to detect the lesion. Thus, this study was planned to analyse the findings of plain x-ray and ultrasound in acute abdomen, to correlate the radiological and ultrasonographic findings associated with acute abdomen.

MATERIALS AND METHODS
The study was carried out for a period of two years from September 2006 to August 2008. In this study, plain x-ray and ultra sound evaluation in the diagnosis of acute abdomen was done. The study was conducted at Adichunchanagiri Institute of Medical Sciences (AIMS), B. G. Nagar, Mandya. Fifty patients who presented to us with an acute abdomen were admitted to the hospital in the above-mentioned period and were subjected to plain x-ray abdomen or ultrasonography of abdomen subject to the availability of the latter.

A detailed history was taken from each of the patient included in the study and were examined thoroughly. Informed written consent was taken from each of the patients prior to the study. Physical examination and...
investigation findings were recorded as per proforma. After history taking and physical examination, all patients underwent plain x-ray abdomen or ultrasonography abdomen. In plain x-ray abdomen, AP view with horizontal beam in upright position was taken. On certain occasion plain x-ray abdomen AP view in supine position and plain x-ray abdomen left lateral decubitus were taken as clinical condition warranted.

Wherever possible patients were asked to be nil by mouth for 6-8 hours prior to the ultrasonographic examination. Patients with suspicion of gall bladder disease, were asked to avoid fat containing foods for 12 hours prior to the procedure. Prior to the commencement of scanning the history and physical findings were reviewed once again.

Real time ultrasound scanning was done with a 3.5 MHz sector probe. Patients were examined either in supine or prone position or both as required.

Confirmation of final diagnosis was done either by surgery wherever possible or by relevant specific investigation.

Both x-ray and ultrasonographic findings were classified into 3 categories:
1. Diagnostic: Plain x-ray/ultrasonographic findings were diagnostic that mean confirmation with final diagnosis.
2. Suggestive of diagnosis: one or more plain x-ray/ultrasonographic signs suggestive of diagnosis but were not pathognomonic of final diagnosis.
3. Not suggestive of diagnosis: plain x-ray/ultrasonographic were not pathognomonic or suggestive of final diagnosis.

RESULTS
Total number of patients included in our study was 50. Thirty-two patients were males (64%) and 18 patients were female (36%). Age of the patients varied from 12 years to 80 years, and most of the cases were in the age group of 20-60 years.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Causes</th>
<th>No. of Causes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Intestinal Obstructions</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>b.</td>
<td>Acute Ureteric/Renal/Vesical Calculi</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>c.</td>
<td>Gastrointestinal (GI) Perforation</td>
<td>07</td>
<td>14</td>
</tr>
<tr>
<td>d.</td>
<td>Acute Appendicitis</td>
<td>02</td>
<td>04</td>
</tr>
<tr>
<td>e.</td>
<td>Acute Cholecystitis</td>
<td>05</td>
<td>10</td>
</tr>
<tr>
<td>f.</td>
<td>Others</td>
<td>05</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1. Causes of Acute Abdomen

Most common cause for acute abdomen was intestinal obstruction among which, sub-acute distal small bowel obstruction cases were 6 in number (42.9%).

Plain x-ray was diagnostic in all 11 cases. Ultrasonography was suggestive of intestinal obstruction in 6 cases, showed as dilated fluid filled bowel loops.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Causes</th>
<th>No. of Causes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ureteric Calculi</td>
<td>10</td>
<td>58.9</td>
</tr>
<tr>
<td>2.</td>
<td>Renal with Ureteric Calculi</td>
<td>04</td>
<td>23.5</td>
</tr>
<tr>
<td>3.</td>
<td>Vesical Calculus</td>
<td>02</td>
<td>11.7</td>
</tr>
<tr>
<td>4.</td>
<td>Calculus in PUJ</td>
<td>01</td>
<td>5.9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>17</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Causes of Intestinal Obstruction

Ureteric calculi were seen in 10 patients (58.9%). Plain x-ray picked up stones in 10 cases seen as radio opaque shadow in the KUB region and it was missed in three cases, which were picked up by ultrasonography and were confirmed by I.V.U. In all 17 cases, ultrasonography picked up stones in the kidney/ureter/urinary bladder.

There were 4 (51.10%) duodenal perforation cases. Ultrasonography was diagnostic in a case of appendicular perforation that is localized collection of fluid in right iliac fossa region, an oedematous tubular structure with blind end and sonographic Mac Burney's tenderness was noted.

Frank acute appendicitis cases on clinical examinations were not included in our study, whenever there is doubt regarding diagnosis of such cases. Plain x-ray did not reveal anything but U.S.G. findings suggestive of acute appendicitis were revealed in 2 cases. Appendicular mass was seen in one case.
Figure 1. X-Ray of Erect Abdomen

Figure 2. Ultrasonography Abdomen

Figure 3. Decubitus

Image 4. Bladder Calculi

Image 5. Common Bile Duct Stone

Image 6. Target Sign in Appendicitis
DISCUSSION
In the last decade real time ultrasonography has become a choice of investigation for clinical problem within the abdomen. It is non-invasive, safe, easy to carryout, convenient for the patients, and is showing increasing accuracy and specificity when compared to plain x-ray abdomen. However, in few abdominal conditions where bowels are largely distended, ultrasound has failed to detect abdominal lesions due to air which is a bad conductor of sound wave.

In intestinal perforation cases plain x-ray abdomen can distinguish between small and large bowel obstruction. In our study, it was diagnostic in 11 cases with accuracy rate of 91.6%. Ultrasonography in suspected mechanical obstruction is not that helpful. In our study, it was diagnostic in 6 cases of intestinal obstruction with 50% accuracy.

Carol M. Rumack\(^1\) suggested that sonography has been helpful, not only in the gasless abdomen but also in a wide variety of other situations. Sonography may add greatly to diagnostic acumen if used in conjunction with plain film radiography, CT and other imaging modalities. Lee et al\(^2\) in their sonography study described well about artefacts between the abdominal wall and the underlying liver to be related to free intra peritoneal gas.

Muradali D, Wilson S, Burn PN et al\(^3\) in their study have suggested that careful peritoneal assessment is best done with a 5 or 7.5 MHZ probe with a focal zone set at the expected level of the peritoneum.

In our study of 4 cases of duodenal perforations and 2 cases of ileal perforations, showed gas under the dome of diaphragm in erect posture film. However, Bergkvist et al detected gas under diaphragm in 75% of gastrointestinal (GI) perforations. Ultrasonography in GI perforations showed free fluid in the peritoneal cavity, and few distended loops of intestinal coils.

In the diseases of the hepatobiliary system especially calculus cholecystitis and acalculous cholecystitis clinical diagnosis cannot be made sure. Ultrasonography and plain x-ray are useful tools investigations. In our series of out of 5 cases, in two cases gall stones were visible on plain film and in 3 cases, nonspecific signs were seen. In rest of the patients plain abdominal radiography was not conclusive. Ultrasound findings in our series out of 5 cases, gall stones were seen in 2 cases and there were 3 acalculous cholecystitis.

Acute appendicitis is the most common diagnosis for the so-called acute abdomen presentation to an emergency department. This may lead to perforation prior to surgery, making it a complicated and difficult procedure, often followed by abscess formation. In the clinical literature, laparotomy resulting in removal of normal, non-inflamed appendices is reported in 16-47% of cases with a mean 26%.

Bendeck et al, found that women in particular, benefit from pre-operative imaging with a statistically significant lower negative appendicectomy rate than women who undergo no preoperative imaging. Both clinical and experimental data support the belief that some patients...
have repeated attacks of appendicitis.\textsuperscript{7,8} Lee et al.\textsuperscript{9} described graded compression sonography with adjuvant use of posterior manual compression technique for the sonographic diagnosis of acute appendicitis.

False positive diagnosis may occur if normal appendix or a thickened terminal ileum is mistaken for an inflamed appendix. Other gynaecological origin diseases may also be misdiagnosed as acute appendicitis.\textsuperscript{10}

The value of sonography in establishing an alternative diagnosis in patients with suspected acute appendicitis was addressed by Gaensler et al.\textsuperscript{11} who found that 70\% of the patients with another diagnosis had abnormalities visualized on the sonograph. One of them was Crohn’s disease in the ileocaecal area or involving the appendix itself.\textsuperscript{12} Crohn’s appendicitis is a self-limited process.\textsuperscript{13,14}

In our series, out of one case which was diagnostic of pancreatitis. Ultrasonography showed hypoechoic areas with increased sized of the pancreas, and peri pancreatic collection. Sometimes in ultrasonography, enlargement of pancreatic duct, stone in the pancreatic duct with or out acoustic shadow may be seen. In our series, 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 series no such findings were seen. Plain X-Ray did not reveal any positive signs.

Ultrasonography not only helps in diagnosing the case but also helps in the management. Ultrasonography will tell us whether haemoperitoneum is progressive or stationary by doing serial ultrasonography of abdomen which reflects on the management of cases.

CONCLUSION

Plain x-ray was really helpful in cases of intestinal obstruction, perforative peritonitis and was also helpful in diagnosing radio opaque ureteric/renal/vesicle calculi. Ultrasonography 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, blunt injury abdomen, acute appendicitis, appendicular mass and acute pancreatitis.

REFERENCES


