ROLE OF ULTRASONOGRAPHY IN BLUNT ABDOMINAL TRAUMA
Sreedhar Reddy Bijjula, Ravindranath Reddy Kamireddy

1Associate Professor, Department of Radiology, Santhiram Medical College and General Hospital, Nandyal.
2Assistant Professor, Department of Radiology, Viswabharathi Medical College, Penchikalapadu, Kurnool.

ABSTRACT

BACKGROUND

Abdominal injury constitutes a significant portion of all blunt and penetrating body injuries. As frequency of intra-abdominal injuries continues to increase worldwide, evaluation of patient with suspected abdominal injury is more complex. Ultrasonography is a fast technique, which can be brought to patient’s bedside and gives rapid information in unstable patients.

Objective of this study is to evaluate role of ultrasound in early diagnosis of intra-abdominal injury in cases of blunt abdominal trauma.

MATERIALS AND METHODS

A total of 100 patients with blunt abdominal trauma who underwent ultrasound examination were included. Ultrasound findings are compared with surgical findings wherever necessary. In few cases, ultrasound findings are confirmed on subsequent scans or by clinical outcome.

RESULTS

Among the 100 cases studied ultrasonography findings are positive in 97 cases, out of which 52 patients underwent surgery and the remaining managed conservatively. The age group of the patients ranging from 1 to 60 years, mean age being 28 years. Male:Female ratio was 94:6 with predominant male preponderance. In this study, the commonest organs affected were liver and spleen accounting for 34% and 26% respectively. The overall sensitivity of ultrasonography in identifying solid visceral organ injury was 80%.

CONCLUSION

Ultrasoundography can be considered as best modality in initial evaluation of blunt abdominal trauma patients. It is non-invasive, readily available and requires minimal preparation time. Portable ultrasonography is useful in haemodynamically unstable bedside patients. Emergency ultrasonography can be concluded as the initial diagnostic modality for blunt abdominal trauma patients.

KEYWORDS

Blunt Abdominal Trauma; Ultrasonography; Solid Organ Injury; Computed Tomography.

HOW TO CITE THIS ARTICLE: Bijjula SR, Kamireddy RR. Role of ultrasonography in blunt abdominal trauma. J. Evid. Based Med. Healthc. 2016; 3(94), 5162-5169. DOI: 10.18410/jebmh/2016/1079

BACKGROUND

Abdominal trauma contributes 10% of overall trauma mortality and considerably more in terms of morbidity. The frequency of intra-abdominal injuries continues to increase worldwide. Motor vehicle accidents account for 75% of abdominal injuries. Emphasis on ultrasound is encouraged because of technical advances and cost containment initiatives. The advents of real time, user-friendly scanners and high quality portable scanners have expanded the use of ultrasound in trauma evaluation and followup of patients in intensive care units. Ultrasonography is a quick, non-invasive, inexpensive and transportable tool, used with increasing frequency in the initial workup of patients with abdominal trauma.

Normal Sonographic Appearances of Abdominal Viscera

In order to appreciate lesions related to trauma, it is necessary to know the normal echo structure of the intra-abdominal viscera.

The Liver

The parenchymal echoes of the liver are a mid-grey and consist of a uniform sponge-like pattern interrupted only by the vessels.

In longitudinal sections, the liver has a triangular shape with a rounded upper surface and a sharp inferior surface. Caudate lobe is seen as an almond shaped structure posterior to the left lobe in longitudinal sections and as an extension of right lobe in transverse section.

The appearance of the vessels at the porta depends on the orientation of the slices viewed. When visualised along the line of the hepatic pedicle, the portal vein is cut...
lengthwise, viewed as a tubular structure and slightly lateral tomograms also visualise the common duct, which is a smaller tubular structure running parallel anterior to the portal vein. Slightly more medial sections image the hepatic artery and it divides at a slightly lower level.

The portal vein branches can be traced at the porta, the right passing more or less transversely for a few centimetres before dividing into main anterior and posterior branches.

Sections high in the liver show the larger hepatic veins, as they have coverage towards the vena cava. The right hepatic vein generally lies in the coronal plane and curves medially to enter the inferior vena cava, a centimetre or so below the diaphragm. The middle hepatic vein is traced from the general position of the gall bladder curving superiorly and posteriorly to enter the anterior part of the inferior vena cava immediately below the diaphragm. The left hepatic vein commonly joins it, so that these two empty together.

The Spleen

Visualisation of the normal spleen has improved with the patient in right lateral decubitus position.

The borders of the spleen are normally well defined, smooth and convex along superior and lateral borders, concave medially. The inferior medial aspect of the spleen is often lobulated, because of focal impressions made on its surface by surrounding viscera. The hilar region is normally umbilicated or lobulated, where the vascular pedicle attaches.

Normal splenic parenchyma displays a homogeneous pattern, which consists of low-level echoes. The splenic hilum returns high-level echoes. Normal splenic tissue generally is of slightly lower reflectivity than hepatic tissue. Splenic measurements can be accurately taken as ultrasound offers 3-D information on splenic morphology. Ultrasound can readily demonstrate splenomegaly and can be used to determine changes in spleen’s size with serial examinations.

The size of the spleen was defined by two parameters (length-largest craniocaudal extension, width axial diameter in the hilus region). A splenic size of < 5 x 11 cm was defined as normal. A size of > 5 x 11 cm was defined as moderate splenomegaly, size of > 6 x 16 cm; high-grade splenomegaly, size of > 8 x 20 cm; massive splenomegaly. The normal cortex has a reflectivity less than liver and spleen, but the degree of difference is variable. The medullary pyramids are less reflective than the cortex and can be identified with modern equipment as echo poor oval structures, evenly distributed around the inner margins of the cortical parenchyma adjacent to sinus echoes.

As the kidney is formed in the foetus from several lobes, these coalesce to such an extent that differentiation is not possible on ultrasound. Occasionally, one or more may remain apparent and produce bulge on the renal outline. The normal pancreas is homogeneous with reflectivity greater than or equal to adjacent liver. After 60 years of age, fatty accumulation in pancreatic tissues is common.

The Kidneys

The normal kidneys are identified easily, because of the difference in echogenicity between the parenchyma and the adjacent fat. The outer margin of the cortex is well defined due to the renal capsule, but the inner margin of the parenchyma adjacent to the sinus fat is less well defined. The normal cortex has a reflectivity less than liver and spleen, but the degree of difference is variable. The medullary pyramids are less reflective than the cortex and can be identified with modern equipment as echo poor oval structures, evenly distributed around the inner margins of the cortical parenchyma adjacent to sinus echoes. As the kidney is formed in the foetus from several lobes, these coalesce to such an extent that differentiation is not possible on ultrasound. Occasionally, one or more may remain apparent and produce bulge on the renal outline. The normal renal sinus is normally seen as an area of high reflectivity (the central echo complex) due to the fact that it surrounds the blood vessels and collecting system.

The Bowel (Small and Large Intestine)

With improved resolution of the ultrasonography, appreciation of the normal anatomy of bowel has increased and therefore a growing knowledge of pathological appearances. The normal appearances of bowel on ultrasound depend not only upon the structure of the individual segment, but more importantly upon its contents and degree of distension. The mucus pattern refers to the classical target sign appearance with a highly reflective core of mucus and trapped gas surrounded by an echo poor halo of bowel wall.

Fluid Pattern

When distended with fluid the bowel appears tubular in long axis and rounded in short axis. Different portions of the bowel may be recognised either by their position within the abdomen or by the specific contribution of the bowel wall to the overall pattern.

Gas Pattern

The shadow from bowel gas usually contains reverberation echoes. This “ring down artefact” often tapers and has been described as the comet tail pattern. These gas artefacts allow its distinction from shadowing due to stones.
Retroperitoneum
Is that part of the abdomen which is bounded anteriorly by the posterior parietal peritoneum, posteriorly by the transversalis fascia and laterally by the lateroconal ligaments. It is largest posteriorly, but continues anteriorly as the properitoneal fat compartment. It extends from the pelvic outlet inferiorly to the diaphragm superiorly. The retroperitoneum contains the adrenals, kidneys and ureters, the duodenal loop and the pancreas, the great vessels with their branches and the ascending and descending portions of the colon including the caecum.
It can be divided into three distinct compartments by the fascial planes it contains.
1. The anterior pararenal space lies between the posterior parietal peritoneum and the anterior renal fascia with the lateroconal ligament laterally, blending with the parietal peritoneum anteriorly. The space is continuous across the midline and contains the pancreas, duodenum, ascending and descending colon and the caecum.
2. The perirenal space is confined by the anterior and posterior renal fascia, which fuse laterally to form the lateroconal ligament. The precise site at which the lateroconal ligament blends with the renal fascia varies widely. The posterior renal fascia (Gerota’s fascia) is generally thick and has at least two layers, the anterior of which is continuous with the anterior renal fascia, while the posterior layer continues into the lateroconal ligament. Superiorly, the renal fascia layers fuse above the adrenals and become attached to the diaphragm. Inferiorty, the renal fascia extends into the pelvis where they thin out so that the anterior and posterior pararenal spaces become continuous in the iliac fossa. The fascia consists of dense connective tissue, which blends with the connective tissue enveloping the aorta, the IVC and the roots of the SMA. The perirenal space contains kidneys, adrenals, blood vessels and fat.
3. The posterior pararenal space lies between the posterior renal and lateroconal ligament anteriorly and the transversalis fascia posteriorly. Its media border is formed by the psoas major and quadratus lumborum muscles. Laterally, it communicates with the properitoneal fat compartment.

AIMS AND OBJECTIVES
To elaborate further the aims and objectives of this study are,
1. To analyse the efficiency of abdominal ultrasound to identify the injuries to abdominal organs in cases of blunt abdominal trauma.
2. To determine the organ injury scale and its correlation with the final outcome during patient management.

MATERIALS AND METHODS
All the 100 cases that are referred for ultrasound with history of blunt abdominal trauma. All patients had blunt abdominal trauma and some patients also had other injuries in forms of head, thoracic or extremity injuries. The patients will be submitted to a thorough clinical examination and routine investigations including radiological examination. Ultrasonography will be carried out using a 3.5 MHz high frequency transducer of a Hewlett Packard Image Point HX Machine and on occasions where the situation demanded a 7.5 MHz high frequency transducer was used to scan superficial parts and paediatric patients. No attempt will be made to compare sonography with other imaging modalities like CT or MRI. The ultrasonography findings will be correlated with surgical findings wherever necessary and in the rest the ultrasonography findings were confirmed on subsequent scans or by favourable clinical outcome.

Inclusion Criteria
All individuals irrespective of age and sex referred for ultrasonography with history of blunt abdominal trauma.

Exclusion Criteria
Patients who refused admission or who were discharged from the casualty were not included in the study.

RESULTS
Study Design
A prospective radiological study consisting of 100 patients is undertaken to identify the injuries in abdominal injury in case of blunt abdominal trauma to determine the organ injury scale and its correlation with final outcome during the patient management.

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 10</td>
<td>10</td>
<td>10.0</td>
</tr>
<tr>
<td>11 - 20</td>
<td>22</td>
<td>22.0</td>
</tr>
<tr>
<td>21 - 30</td>
<td>32</td>
<td>32.0</td>
</tr>
<tr>
<td>31 - 40</td>
<td>24</td>
<td>24.0</td>
</tr>
<tr>
<td>41 - 50</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td>50 - 60</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 1. Age Distribution of Patients Studied

Figure 1. Age Distribution of Patients Studied
### Table 2. Sex Distribution of Patients Studied

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>94</td>
<td>94.0</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 3. Mechanisms of Injury

<table>
<thead>
<tr>
<th>Mechanisms of Injury</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTA</td>
<td>66</td>
<td>66.0</td>
</tr>
<tr>
<td>Fall</td>
<td>28</td>
<td>28.0</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 4. Clinical Findings of the Patients Studied

<table>
<thead>
<tr>
<th>Clinical Findings</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generalised tenderness</td>
<td>68</td>
<td>68.0</td>
</tr>
<tr>
<td>Hypochondrium tenderness</td>
<td>35</td>
<td>35.0</td>
</tr>
<tr>
<td>Guarding</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>Lumbar tenderness</td>
<td>16</td>
<td>16.0</td>
</tr>
<tr>
<td>Soft (Per abdomen)</td>
<td>14</td>
<td>14.0</td>
</tr>
<tr>
<td>Diffuse tenderness</td>
<td>11</td>
<td>11.0</td>
</tr>
<tr>
<td>Distension</td>
<td>10</td>
<td>10.0</td>
</tr>
<tr>
<td>Epigastric tenderness</td>
<td>9</td>
<td>9.0</td>
</tr>
<tr>
<td>Iliac fossa tenderness</td>
<td>8</td>
<td>8.0</td>
</tr>
<tr>
<td>Umbilical tenderness</td>
<td>7</td>
<td>7.0</td>
</tr>
</tbody>
</table>

### Table 5. Organ Involvement

<table>
<thead>
<tr>
<th>Organ Involvement</th>
<th>Number (n = 100)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>34</td>
<td>34.0</td>
</tr>
<tr>
<td>Spleen</td>
<td>26</td>
<td>26.0</td>
</tr>
<tr>
<td>Kidney</td>
<td>12</td>
<td>12.0</td>
</tr>
<tr>
<td>GIT</td>
<td>10</td>
<td>10.0</td>
</tr>
<tr>
<td>Retroperitoneum</td>
<td>10</td>
<td>10.0</td>
</tr>
<tr>
<td>Urinary Bladder</td>
<td>4</td>
<td>4.0</td>
</tr>
<tr>
<td>Abdominal wall</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>Pancreas</td>
<td>2</td>
<td>2.0</td>
</tr>
</tbody>
</table>

### Table 6. Comparison of USG Abdomen with Intraoperative Findings

<table>
<thead>
<tr>
<th>Organ Involvement</th>
<th>USG Findings</th>
<th>Actual Number</th>
<th>Abnormalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Liver</td>
<td>30</td>
<td>34</td>
<td>Contusion, Laceration, Laceration</td>
</tr>
<tr>
<td>2. Spleen</td>
<td>24</td>
<td>26</td>
<td>Contusion, Laceration, Shattered Spleen</td>
</tr>
<tr>
<td>3. Kidney</td>
<td>12</td>
<td>12</td>
<td>Contusion, Laceration</td>
</tr>
<tr>
<td>4. GIT</td>
<td>0</td>
<td>10</td>
<td>Tear, Perforation, Contusion</td>
</tr>
<tr>
<td>5. Retroperitoneum</td>
<td>6</td>
<td>10</td>
<td>Haematoma</td>
</tr>
<tr>
<td>6. Urinary Bladder</td>
<td>6</td>
<td>4</td>
<td>Tear</td>
</tr>
<tr>
<td>7. Abdominal Wall</td>
<td>2</td>
<td>2</td>
<td>Haematoma</td>
</tr>
<tr>
<td>8. Pancreas</td>
<td>2</td>
<td>2</td>
<td>Pancreatitis, Pseudocyst Formation</td>
</tr>
</tbody>
</table>

---

**Figure 2. Sex Distribution of Patients Studied**

**Figure 3. Mechanisms of Injury**

**Figure 4. Clinical Findings of the Patients Studied**

**Figure 5. Organ Involvement**
4 cases were missed in liver injuries (Sensitivity of 88.2%). However, it did not adversely affect the final outcome since they were operated for spleen injuries.

2 cases were missed in splenic injuries (Sensitivity 92.3%). However, it did not affect the final outcome, since they were operated for liver injuries.

Bowel lesions were not visualised on ultrasound. However, massive haemoperitoneum following injury was indication for surgery.

Overall sensitivity of USG abdomen was 80.0%.

### Table 7. Analysis of 52 Cases that Underwent Surgery

<table>
<thead>
<tr>
<th>Organ Involvement</th>
<th>Number of Cases on USG</th>
<th>Number of Cases on Surgery</th>
<th>Change of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Liver</td>
<td>24</td>
<td>28</td>
<td>Grade 3 to Grade 4 (two cases)</td>
</tr>
<tr>
<td>2. Spleen</td>
<td>20</td>
<td>22</td>
<td>Grade 2 to Shattered Spleen (six cases)</td>
</tr>
<tr>
<td>3. GIT</td>
<td>0</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>4. Retroperitoneum</td>
<td>6</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>5. Kidney</td>
<td>6</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>6. Urinary Bladder</td>
<td>4</td>
<td>4</td>
<td>-</td>
</tr>
</tbody>
</table>

4 false negatives were seen in cases of liver injuries.
2 false negatives were seen in cases of splenic injuries.

### Table 8. Outcome

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number (n = 100)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactory</td>
<td>74</td>
<td>74.0</td>
</tr>
<tr>
<td>Recovered</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>Discharged</td>
<td>22</td>
<td>22.0</td>
</tr>
<tr>
<td>Expired</td>
<td>2</td>
<td>2.0</td>
</tr>
</tbody>
</table>

4 images of the cases are shown: 
- Image 1. Liver Laceration (Arrow Head) with Haematoma (Arrow)
- Image 2. Laceration – Right Lobe of Liver
- Image 3. Collection in the Morrison’s Pouch
- Image 4. Splenic Laceration

### Figure 6. Outcome

- Satisfactory: 74%
- Recovered: 2%
- Discharged: 22%
- Expired: 2%
DISCUSSION

Single or multiple organs are affected due to blunt abdominal trauma. Abdominal tenderness, distension, absent bowel sounds, haematuria, low haematocrit, pelvic or lower rib fractures are signs and symptoms identified.

Ultrasonography is 1st imaging modality for screening patients with blunt abdominal trauma. It can demonstrate variety of post-traumatic abdominal organ pathologies like haematoma, contusion, laceration and haemoperitoneum.

The first case report of ultrasound in a patient with blunt abdominal trauma was published in 1971 by Kristensen et al, Germany.10

The frequency of intra-abdominal injuries continues to increase worldwide.11-15

LIVER

Grading of liver injuries (OIS).16

Grade I Subcapsular haematoma (small). Small laceration < 1 cm in depth.

Grade II Subcapsular haematoma > 5 cm, but < 10 cm or an intraparenchymal haematoma < 10 cm laceration 1 - 3 cm in depth.

Grade III Subcapsular haematoma > 10 cm or intraparenchymal > 10 cm. Laceration > 3 cm in depth.

Grade IV Parenchymal laceration involving 25 to 75% of the lobe or 1 - 3 Couinaud’s segment within a lobe.

Grade V Parenchymal disruption involving > 75% of the hepatic lobe or > 3 Couinaud’s segments within a lobe. Vascular involvement of hepatic veins or retrohepatic IVC. Hepatic avulsion.

Case 23 and 73 - Patients with sonographic Grade 3 injury treated conservatively, as the patients were not willing for the surgery. However, patients recovered completely.

Case 2 and 52 - Sonographic Grade 3 laceration of posterolateral aspect of right lobe of liver, depth of the laceration could not be made out, but operative findings were that of more severe injury with a laceration (Grade 4) extending from segment 8 through segment 5 with devitalised segment 6 and segment 7 because of avascularity in that area.
Jebmh.com

Case No. 25 and 75 - Sonographic diagnosis was splenic laceration and gross haemoperitoneum, patient undergone surgery.

Grading of liver trauma by sonographic assessment correlated with the surgical outcome.

In our study, liver trauma of Grade 3 or more are treated by operative management and trauma of Grade 2 and less are treated conservatively.

88.2% sensitivity was observed for liver injuries and there were no false positives.

**Spleen**

Grading of splenic injuries,19

I. Splenic laceration or linear parenchymal defect 1 Point.

II. Splenic fracture/thick irregular defects 2 Point.

III. Shattered spleen 3 Point.

Points with scores of 2.5 or less could be treated conservatively.

Points with scores 2.5 or more require surgery.

Case No. 9 and 59 - Splenic laceration were noted on ultrasound as Grade 2 injuries and were observed to be shattered spleens (Grade 3) at operation.

Case 21 and 71 - Splenic injury were not diagnosed in this series, where 1 cm splenic laceration was noted during surgery. The gross haemoperitoneum, which was noted was attributed to Grade 4 liver lacerations in these patients. This did not, however, affect the final outcome.

Case 34 and 84 - False positive diagnosis of splenic laceration was made. Haemoperitoneum was noted in this patient due to the associated liver injury and subsequent scans did not reveal the splenic injury.

Splenic trauma by sonographic assessment was correlated with clinical outcome. Patients with a point score of four and more are managed by surgery and patients with a score of 3 and less are treated conservatively.

92.3% sensitivity was observed for splenic injuries.

**Genitourinary Injuries**

Total renal injuries were identified in 12 patients; 8 cases of renal laceration were confirmed.

1. Case No. 3, 44, 47, 53, 94 and 97 - Confirmed at surgery, which were undertaken for associated liver/splenic laceration.

2. Case No. 40 and 80 - Demonstrated extravasation of contrast into the perinephric space and clots in the ureter and bladder were identified as filling defects, which were confirmed by IVU.

However, renal injuries were not handled on surgery. Urinary bladder injuries are not identified on ultrasound and should look for free peritoneal fluid (urine) or extraperitoneal perivesical fluid collections.

In cases 27 and 77 - Inability to distend the bladder despite saline infusion via a catheter was the method employed to diagnose bladder rupture.

**Pancreatic Injuries**

Pancreatic-organ injury scale

- Grade I: Haematoma with minor contusion without duct injury. Superficial laceration without duct injury.
- Grade II: Haematoma with major contusion without duct injury. Major laceration without duct injury and without tissue loss.
- Grade III: Distal laceration or parenchymal injury with duct injury.
- Grade IV: Proximal transaction or parenchymal injury involving ampulla.
- Grade V: Massive disruption of the pancreatic head.

Pancreatic injuries were noted in 2 of our patients. It was due to midline compression injury.

Serum amylase was raised in our patients. Following trauma both patients had an increased size of pancreas and the pancreas was hypoechoic in echotexture suggestive of pancreatitis secondary to trauma.

One patient had pancreatic pseudocyst formation secondary to the trauma.

**Gastrointestinal Tract**

Injury of the bowel and mesentery was not identified directly by the ultrasound scan, but identification of free intraperitoneal fluid with no evidence of solid visceral injury indicated a bowel injury in four of our patients. This was confirmed by a conventional radiography, which demonstrated free intraperitoneal air. Surgery revealed jejunal and colonic tears.

Two cases of mesentery and omental injury were noted. These patients were noted to have free intraperitoneal fluid. The tears were not identified by ultrasound.

Two cases of abdominal wall collection were observed.

Two cases with gross haemoperitoneum and splenic injuries had omental haematoma during laparotomy.

In cases 42 and 92 - Abdominal wall (parietal) haematomas were identified with a 7.5 MHz probe. No intervention was done and serial scans showed gradual resorption of the haematoma.

The retroperitoneal haematoma following trauma are diagnosed in 6 of the 10 cases. This is probably because of the obscuration of the retroperitoneal regions by overlying distended bowel loops of an unprepared abdomen, and meteorism associated with anxiety and pain abdomen in patients with blunt abdominal trauma; 80% sensitivity was observed in identifying solid visceral injury.

**CONCLUSION**

100 cases of blunt abdominal trauma patients were studied sonographically and the following conclusions were made.

1. 66% of blunt abdominal trauma patients admitted to the hospital were of road traffic accidents.

2. Age group of patients were ranging from 1 - 60 years, mean age being 28 years.

3. Male:Female ratio was 94:6, males are more affected than females.
Liver and spleen are more commonly affected organs, accounting for 34% and 26% respectively.

Kidneys (12%), GIT (10%), retroperitoneum (10%) and pancreas (2%) are next commonly affected organs.

80% of patients presented with haemoperitoneum.

88.2% sensitivity was seen in cases of liver injuries.

92.3% sensitivity was seen in case of splenic injuries.

Ultrasonography not able to visualise bowel lesions. However, massive haemoperitoneum following injury was indication for surgery.

Identifying solid visceral injury was 80% overall sensitivity.

Ultrasonography can be considered as the initial imaging modality in evaluation of blunt abdominal trauma patients. It is non-invasive, readily available and requires minimal preparation time. Portable ultrasonography is useful in haemodynamically unstable patients at bedside.

Emergency ultrasonography can be concluded as the initial diagnostic modality for blunt abdominal trauma patients.

ACKNOWLEDGEMENTS

We sincerely thank all patients who participated in this study.

REFERENCES