ORIGINAL RESEARCH PAPER

Radiology

KEY WORDS:

ROLE OF CT SCAN IN MANAGEMENT OF BLUNT ABDOMINAL TRAUMA

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INTRODUCTION

After sustaining wide impact trauma, patients who are not in need of an emergency operation should undergo through radiologic evaluation during immediate post trauma period , Though quite impressive in variety and accomplishment, the standard diagnostic armamentarium at our disposal frequently has not satisfied a triad of requirements : (1) a clear understandable presentation of the third dimension (2) a way to quantify findings ; and (3) a way to accomplish all these in the shortest time possible(1).

Introduction of the multislice computed tomography has revolutionised the management of these trauma patients. Recent reports from major trauma centres indicate that CT is increasingly performed on patients with active internal bleeding while resuscitation and active haemorrhage continues (2) .It is believed that this practice can detect the origin of bleeding and consequently decrease the time needed to identify and control it , either surgically or angiographically.

MATERIALS AND METHODS

This study was conducted on one hundred patients with definitive history of blunt abdominal trauma. All patients were clinically examined first in the casualty or Trauma department. The patients were first investigated with abdominal ultrasonography. Modified focused abdominal sonographic test (FAST) was performed on each such patients and no more than 3 minutes was spent for the whole procedures. The patient showed free fluid or had definitive injury on ultrasonography and were hemodynamically stable were included in the study. Hemodynamic stability of the patient was assessed by the attending surgeons.

The patients who had free fluid and were hemodynamically unstable were considered directly for laparotomy. All patients selected for the study underwent computed tomographic examination with either Siemens Somotom ARC Scanner or Siemens Somotom Emotion 6.

Intravenous contrast (Non Ionic) was used for all patients. However oral contrast was used only for limited number of patients in whom bowel injury was strongly suspected clinically and there was no major risk of aspiration.

Both plain and post contrast scan was performed from both domes of diaphragm to the level of pubic symphysis taking 5-10 mm contiguous axial sections. Finer sections 3mm -4mm were repeated after completion of the scan through region or organ of interest. Findings were recorded in proper performa based on ASST grading.

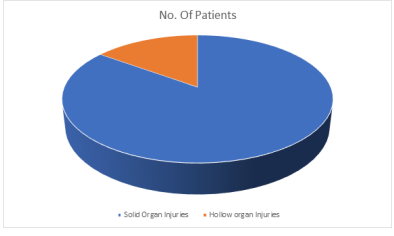
CHARACTERISATION OF INJURIES

1. Solid organ injury such as Liver and Spleen and its CT grading.
2. Retroperitoneal Injuries:

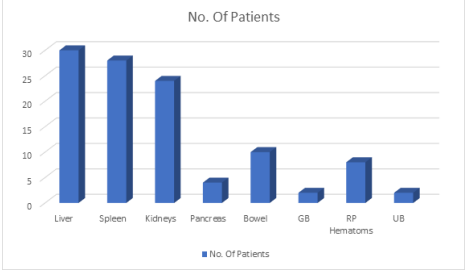
a. Kidneys – Contusion/ Laceration or any other injury with grading.
b. Injury to the Ureter
c. Retroperitoneal Hematoma
3. Hollow viscus injuries such as bowel or urinary bladder injury.
4. Abdominal wall injuries such as hematomas.
5. Quantification of free fluid.
6. Pneumoperitoneum (Images were reviewed with lung window)
7. Bony injuries e.g. Fracture ribs, vertebra, pelvis, (Images were reviewed with bone window).
8. Multiple organ injuries/polytrauma.

PIE CHART DEPICTING THE PERCENTAGE OF PATIENTS WITH SOLID AND HOLLOW ORGAN INJURIES.

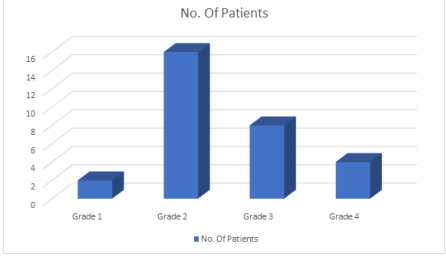
Type of organ injury (Solid/Hollow)	No. of Patienmts
Solid organ injuries	80
Hollow organ Injuries	14



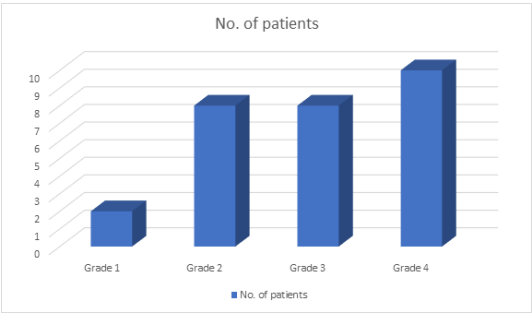
BAR DIAGRAM DEPICTING NO. OF PATIENTS WITH EACH PARTICULAR ABDOMINAL ORGAN INJURY



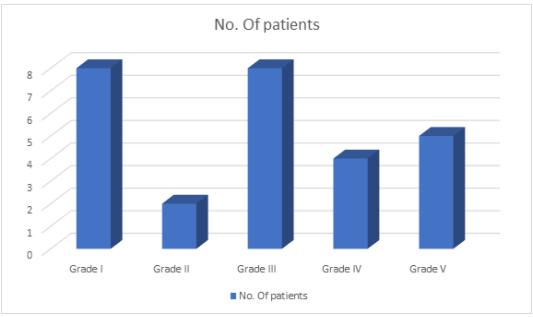
Classification of Liver Injuries as per International Grading (AAST)



CLASSIFICATION OF SPLENIC INJURIES AS PER INTERNATIONAL GRADING (ASST)



INTERNATIONAL GRADING OF RENAL INJURIES



DISCUSSION

There is high sensitivity of focused abdominal ultrasonography in the detection of significant intraabdominal injury. Jehle and collegues had reported sensitivity of 81.8% and specificity of 93.9 % in the identification of hemoperitoneum in patients with blunt abdominal trauma [8].

The study by KathirkaamnathanShanmuganathan et al[9] indicate reliance on the presence of hemoperitoneum as the sole indicator of abdominal visceral injury limits the value of FAST as a screening diagnostic modality for patients who sustain blunt abdominal trauma.

Michele brown et al[10] carrieda study in which findings from 2,693 US examinations were evaluated and were positive in 145 of 172 patients with injuries (sensitivity, 84%) and (89%) of 72 patients who ultimately underwent laparotomy with surgical repair of injuries.

Liver was the most commonly injured organ in our study followed by spleen.Foleyet al [3] reported that in review of twenty patients with blunt hepatic trauma treatednon-operatively, patients with the extensive hemoperitoneum could be managed successfully. However , on follow up CT scan , the failure of the hemoperitoneum to resorb within 7 days following the initial injury was distinctly abnormal and suggested ongoing bleeding that required either arteriography or laparotomy [3]. One of the largest published series of non-operative management include a retrospective study of the fifty two patients [4], out of which thirty four had relatively minor hepatic injuries [1-2]. However eighteen of fifty two patients had major hepatic injuries (grade 3-4). CT demonstrated evidence of hemoperitoneum in thirty-seven patients. Of note is the fact there was no major complication from non-operative management. Although the majority of hepatic laceration appeared to heal within the first few weeks after trauma, small defects though to represent small areas of biloma formation were noted to persist for months on CT[4] .

In our study twenty eight patient out of 100 cases with blunt abdominal trauma had splenic injury, 10 patients had grade 4 injury i.e. fragmented or devascularised shattered (non enhancing) spleen. Lacerations were identified in fourteen cases. The most astonishing part of our study was that out of twenty eight patients with splenic injuries , twenty four patients underwent splenectomy.Only four patients were managed conservatively. High degree of laparotomy in our study can be attributed to the fact that more patients had grade 3 or 4 injury.Comparative study by Becker [5]et al showed that CT findings alone cannot be used to determine reliably which patients require surgery and which patients can be treated conservatively. Even patients with splenic parenchymal injuries of CT grade 3 or 4 can be successfully treated conservatively if the clinical situation is appropriate, whereas delayed splenic rupture can still develop in patients with CT grades or scores. The studies by Mirvis et al[6] indicate that CT scan grading does help in selecting patients for conservative treatment. In their study, non-surgical management ultimately was successful in 73% (94) of the 78 patients who initially were selected for conservative management of their blunt splenic injuries.

Our study had 10cases of bowel /mesenteric injuries. 10% of the total positive blunt abdominal trauma cases were due to either bowel or mesenteric injury suggested in seven of the cases, while three cases were indeterminate. Five cases had extraintestinal air i.e. pneumoperitoneum. Two cases had local bowel wall thickening. Other signs like oral contrast extravasation could not be properly studied as oral contrast was not used in most of cases because of the physical state of the trauma patients. Our results matched well with study by Mirvis et al [6] which concluded that computed tomographic scanis sensitive for diagnosis of bowel rupture resulting from blunt trauma, if careful inspection and technique is used to detect often subtle findings.

24 patients suffered Renal injury in our study. Most of the patients had either Grade I or Grade III injuries (Total of sixteen patients). Few patients (two) had Grade V (i.e. Renal pedicle injury to PU) junction with extravasation of urine). Contusion of the kidney was a most common type of injury encountered (twelve patients) out of twenty four patients with renal injuries , seventeen patients were managed conservatively, seven had to undergo nephrectomy. Both patients with Grade V were operated.Our data matched well with studies by Federle et al[7] who stated that most renal traumas can be managed conservatively however catastrophic renal injuries require operative intervention.

2 cases out of the total study had urinary bladder rupture. Both cases were associated with pelvic fracture and hematuria. Both cases were extraperitoneal rupture of bladder. CT cystography was performed in both cases as bladder rupture was strongly suspected clinically.

From the above discussion, it is clear that computed tomography is the modality of choice in patients with blunt abdominal trauma. The grading of the injury based on the computed tomography images correlate well with injury which can help the surgeon in deciding the type of management whether conservative or operative.

CONCLUSIONS

Computed tomography is the modality of choice in patients with blunt abdominal trauma. CT grading of organ injury correlates well with the intraoperative findings. Hence management should be based upon clinical status and CT grading of the patients.

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