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ROLE OF MDCT SCANNER IN EVALUATION OF SOLID ORGAN INJURIES IN SIGNIFICANT BLUNT ABDOMINAL TRAUMA

Radiodiagnosis

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ABSTRACT

Introduction: Trauma is a leading cause of death and approximately 10% of these can be attributed to abdominal trauma. Identification of intra abdominal solid organ injuries is often challenging and often clinical findings can be inconclusive. In such cases multi detector computed tomography (MDCT) is an excellent modality to assess the solid organ injuries.
Aims: Identify the solid organ injuries in blunt abdominal trauma. Further characterize the injuries on basis of their severity. Correlate the findings of CECT scan with intra-operative or follow-up findings.
Study design: Descriptive study carried out in Dept of Radio-diagnosis of a tertiary hospital over a period of 2 years consisting of 100 patients of blunt trauma abdomen with positive ultrasound reports. All patients underwent a non contrast and contrast CT scan of the abdomen. The findings of CT scan were documented and compared with the intraoperative or follow up findings.
Results: Solid organ injuries were identified in 81% of the cases of blunt trauma. Out of these maximum cases were of liver followed by spleen. The overall sensitivity and specificity in this study with respect to CT findings guiding patient management was 76.9 % and 100%
Conclusion: Excellent agreement was found in the CT findings and surgical findings in solid organ injuries following trauma.

KEYWORDS

MDCT, solid organ injury, blunt trauma, abdomen

Introduction:
Trauma is one of the leading cause of death. 10% of these fatalities are attributable to abdominal injury. Blunt injury occurs most frequently with road vehicle accident[1]. Many of these patients have multisystem injuries resulting from high velocity mechanisms. Identification of serious intra-abdominal pathology is often challenging. When assessing the status of an abdominal trauma patient upon arrival to the emergency department, clinical history and physical examination are often unreliable and even misleading. Clinical diagnosis can be challenging due to the lack of specific physical findings in many patients.

Swift recognition of injuries with prompt and appropriate treatment to reduce mortality and morbidity is the goal of modern trauma care and hence accurate diagnosis is essential. CT scanners are now available in most trauma centers, and with the advent of helical scanners, scan time has been significantly reduced. As a result, CT has become an accepted part of the traumatologist's armamentarium[2].

The importance of MDCT in the diagnosis of the solid organ injuries in significant abdominal trauma lies in its accuracy of identifying injuries that require early exploration and provide assessment of the injury which helps deciding the management. CT as the sole modality also enables the simultaneous evaluation of other injuries related to trauma (Ex. Pelvic fracture, vertebral fracture, lung base injury etc)[3].This study is an effort to assess the role of MDCT in the evaluation of patient with blunt abdominal trauma and helping decide further course of management.

Aim and Objectives:
1. Evaluate the mode of injury in cases of Blunt abdominal trauma.
2. Classify the injuries in blunt abdominal trauma based on involvement of solid organs.
3. Further characterize the injuries on basis of their severity.
4. Correlate the findings of CECT scan with intra-operative or follow-up findings.

Material and Methods:
Type of study: This is descriptive study.
Place of study: CT scan section of Department of Radiodiagnosis.
Duration of Study: The study was from Dec. 2013 to Dec. 2015.

Sample size: 100 patients were selected which presented with symptoms and signs of blunt abdominal trauma lesions with positive findings on FAST ultrasound imaging.

Inclusion Criteria: Clinical suspicion of intra-abdominal injury. Haemodynamically stable patient. Multi-trauma patient. A positive ultrasonography study.

Exclusion criteria: All haemodynamically unstable patients and with obvious peritoneal signs and progressive abdominal distention were taken up for surgery immediately and were excluded from the study.

Machine used: MX-16, MDCT scanner by Philips. Medrad power pressure injector for contrast agent.

Observations and Results:
Table 1: Classification based on mode of Injury

Mode of injury	Male	Female	Percentage (%)
MVA/RTA	57(74%)	11(47.82%)	68(68%)
Assault	6(7.79%)	4(17.39%)	10(10%)
Fall from height	13(16.88%)	9(39.1%)	22(22%)
Total	76(100%)	24(100%)	100 (100%)

Table 2: Distribution based on CT findings

	No. cases	Percentage
Solid Organ Injuries with hemoperitoneum	75	75%
Solid Organ Injuries without hemoperitoneum	6	6%
Isolated Hemoperitoneum	19	19%
Total	100	100

Table 3: Distribution based on involvement of solid organs

Abdominal viscera involved	No. Cases	Percentage (%)
Liver	38	34.54%
Gall bladder	1	0.90%
Biliary system	0	0.00%
Spleen	31	28.18%
Pancreas	11	10%
Adrenal gland	2	2%
Kidneys	19	17.30%
Bowels/Mesentery	4	3.60%
Urinary bladder	6	5.48%
Total	112	100.00%

Table 4: Further characterization of solid organ injuries

Grade	Liver	Spleen	Renal	Pancreas	Adrenal
I	7	3	4	3	0
II	11	10	6	3	2
III	15	14	7	5	0

IV	5	2	1	0	0
V	0	2	1	0	0
VI	0	0	0	0	0
Total	38	31	19	11	2

Table 5: Outcome of CT based management guidelines (Conservative vs Surgery) of blunt abdominal trauma patients in this study

	Operative management		Conservative management		Total
Positive	True positive	10	False negative	0	10
Negative	False positive	3	True negative	87	90
Total		13		87	

Discussion:

In this study there were total 112 visceral injuries identified in 100 patients. Out of these only 6% (6 cases) of visceral injuries were not associated with haemoperitoneum. Thus, a majority of patients 94 % (94 cases) with visceral injury had associated haemoperitoneum.

Out of 100 patients with positive intra-abdominal injury, 10 patients (10%) were taken up for surgery. All the CT findings of hemoperitoneum and/or solid organ injury were confirmed in the 10 cases taken up for surgery, an additional 3 cases of bowel injuries was diagnosed and one case of renal injury upgraded from grade III to IV following laparotomy. CT was 100% sensitive in detecting haemoperitoneum.

In our study, the most commonly injured organ was liver 38% (38 cases). Kala, S. K et al[4] in their study found liver was most commonly injured organ (42 cases 38.18%) in blunt abdominal trauma. VW Wing et al [5] in their study, 63 positive scan found 13 liver laceration, 12 splenic laceration, 2 bowel injury, 8 renal injury and 1 pancreatic injury.

In our study, splenic injuries found in 31% (31 cases). Majority of them, 45.16% (14 out of 31) were grade III injuries. We agree with Becker CD et al [6] who in their study found that, CT findings in splenic trauma cannot be used to determine reliably which patients require surgery and which patients can be treated conservatively.

Renal injuries were the third most commonly injured organ in this study (19%, 19cases). Out of them 36.84% (7 out of 19) were grade II injuries. There was one case of grade V injury for which nephrectomy was done based on CT findings. All findings of CT were confirmed on laparotomy.

There were 11 cases (11%) of pancreatic injury in our study. Majority of them (5 cases) were grade III injuries. All patients were managed conservatively. No grade IV and V injury were found. Gupta et al [7] in their study found that CT scan was 68 % (19 of 28) accurate in diagnosing pancreatic injury.

Hence, in the overall CT analysis of visceral injuries in this study, OIS grading in isolation, appeared to predict the management protocols in most patients, except in cases of bowel injuries (CT sensitivity for bowel injuries was only 57.1% in this study).

The overall sensitivity and specificity in this study with respect to CT findings guiding patient management was 76.9 % and 100% respectively. The positive predictive value was 100%, negative predictive value 96.6% and accuracy of this study was 97%. The reduced overall sensitivity was entirely due to the reduced sensitivity of CT in detecting bowel injuries. CT was highly accurate with respect to other visceral injuries in this study, with 100% sensitivity in detecting hemoperitoneum. MM Kumar et al [3] had an overall sensitivity, specificity and positive predictive value (for trauma detection by CT) of 93%, 100% and 100% respectively.

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