



The Role of Computed Tomography in Blunt Abdominal Trauma

Om Bahadur Karki¹

¹Department of Surgery, Manipal College of Medical Sciences, Pokhara, Nepal.

ABSTRACT

Introduction: Blunt injury trauma is regularly encountered in the emergency department. Diagnostic tools that help in optimum management of blunt abdominal trauma include; Focussed Assessment Sonography for Trauma scan, Diagnostic peritoneal lavage and Computed Tomography scan. The aim of this study is to determine the validity of CT scan as an accurate diagnostic tool and its role in management of patients with blunt abdominal trauma.

Methods: A prospective analysis of 80 patients of blunt abdomen trauma who were admitted in Manipal Teaching Hospital, Pokhara, Nepal within a span of 15 months was done. Demographic data, mechanism of trauma, management and outcomes were studied. Organ injuries were graded using the Organ Injury Scale guidelines.

Results: Most of the patients in our study were in the age group of 21-40 years with an M: F ratio of 2.3:1. Road traffic accident (47.5%) was the most common mechanism of injury. Spleen (27.5%) was the commonest organ injured. CT scan was superior to FAST scan and had sensitivity of 97.3% specificity 75% positive predictive value 98.6%. FAST scan had sensitivity of 78.9%, specificity 50%, positive predictive value 96% with p-value of 0.0034. 81% of patients were conservatively managed.

Conclusion: In conjunction with close clinical monitoring, CT scan is reliable in the evaluation and management of blunt abdominal trauma patients. Our study also shows CT as a superior diagnostic modality compared to FAST scan.

Keywords: blunt abdominal trauma; CT scan; FAST scan; road traffic accident.

INTRODUCTION

Trauma is the leading cause of death in persons under 45 years of age, with 10% of these fatalities attributable to abdominal injuries.¹ Missed intra-abdominal injuries continue to cause preventable deaths.² Blunt Abdominal Trauma usually results following road traffic accidents, assaults, recreational accidents, or falls.³ Clinical findings are compounded by factors like fractures of ribs, vertebrae and pelvis or other associated injuries.⁴ Major change in the paradigm of the management of blunt abdominal trauma is the introduction of non-operative management coinciding with the availability

of Computed Tomography (CT) scans, hence the role of imaging becomes even more paramount for the safe practice of such surgical restraint.^{5,6}

CT scans, unlike direct peritoneal lavage (DPL) or Focused Assessment with Sonography for Trauma (FAST), have the capability to determine the source of

Correspondence: Dr. Om Bahadur Karki, Lecturer, Department of Surgery, Manipal, College of Medical Sciences, Pokhara, Nepal. Email: karkiom10@gmail.com, Phone: +977-9846080576.

haemorrhage, defining the severity of solid organ injury, retroperitoneal injuries and genitourinary system.^{3,7} It is contraindicated in patients with clear indication of laparotomy and in haemodynamically unstable patients.⁸

The objective of the study was to assess the efficacy of CT scan as an accurate diagnostic tool in patients with blunt abdominal trauma and to suggest guidelines based on the above result

METHODS

This hospital based prospective study was conducted over a period of 15 months (December, 2014 to February, 2016) in the department of Surgery, Manipal Teaching Hospital, Pokhara, Nepal. Ethical clearance was obtained from the Institutional Research Committee prior to the study and informed consent taken from patient or their guardian. Eighty patients of all ages and sex presenting with blunt injury abdomen were included in the study. Indications for admission were either the detection of a significant abdominal injury requiring treatment or a suspicion of such an injury and need for further investigation or follow-up. Patients were resuscitated and preliminary FAST scan examination performed, patients selected fit for abdominal CT were then scanned. Patients who had at least one of these scans interpreted as positive, were included in the study. CT scan of abdomen and pelvis was done in patients with clinical suspicion of intra-abdominal injury, polytrauma patients and with a positive ultrasonography study.

Contrast enhanced CT was performed with 50 ml of intravenous iodinated contrast, 5-10 mm thick slices were taken from domes of diaphragm to the pubic symphysis with additional thin slice sections taken where ever required. Early and five minutes delay were taken in cases of renal injuries. Oral contrast was avoided since blunt injury abdomen patients were potential candidates for emergency surgery and hence general anesthesia. Diagnostic peritoneal lavage was not performed in any of the patients. The exclusion criteria was as follows:

1. Penetrating abdominal injury
2. Patients with normal FAST scan and CT scans
3. Blunt injury abdomen patients where CT scan was not done
4. Contraindication for CECT imaging like hypersensitivity to contrast media, increased serum creatinine, pregnancy.
5. Patients who refused admission
6. Patients who were referred to other centre for further management.

Individual organ injuries were graded according to the OIS system. FAST scan and CT scan reports were compared with operative findings in operated cases and in those cases where CT was positive and surgery deferred, clinical follow up was the yardstick.

Data were entered in Microsoft excel and statistical analysis done using SPSS-16.

RESULTS

Eighty patients with blunt injury abdomen were prospectively studied, 56 (70%) were male and 24(30%) female. Their ages ranged from 3 to 68 years (mean 30.86 ± 19.70 years). Road traffic accident was the commonest mode of injury and it was the cause of abdominal trauma in 38(47.5%) patients. In 32(40%) patients, the injury was caused due to fall from height. Spleen (27.5%) was the commonest organ to be injured followed up by liver (20%), Kidney (11.2%), mesentery (8.75%) and bowel (7.5%)(Figure 1). Chest injuries including rib fractures, pneumo/hemothorax, lung contusion besides fracture of pelvis and spine were other injuries commonly associated with abdomen trauma scan in our study. These injuries were detected by CT scan rather than FAST scan.

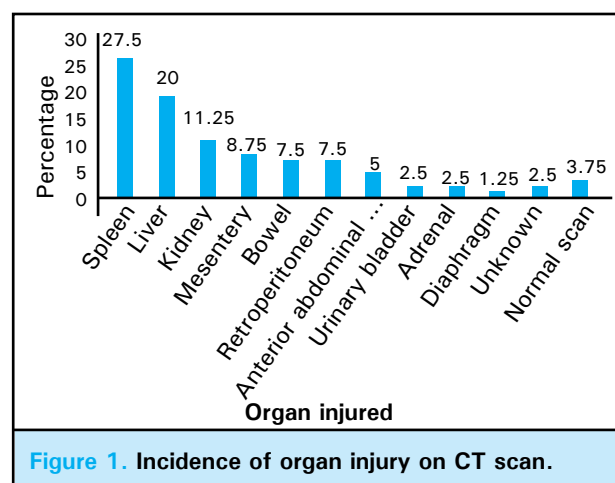


Figure 1. Incidence of organ injury on CT scan.

Out of 47 patients of solid organ injury diagnosed and graded by CT-OIS grading, only five underwent surgery, others could be managed conservatively. Those who underwent surgery were of CT-OIS grade IV or higher. (Table 1). The sensitivity and specificity of CT scan and FAST were as follows. (Table 2 and Table 3). Table 2 shows the Sensitivity of 97.3%, Specificity of 75%, Positive predictive value of 98.6%, Negative predictive value of 60%. Similarly Table 3 shows Sensitivity of 78.9%, Specificity of 50%, Positive predictive value of 96% and Negative predictive value of 11%.

Table 1. CT-OIS grading and management in patients with solid organ injury (n = 47).

OIS grade	Total number of patients	No. of Conservatively managed patients	No. of operated patients
I	2	2	
II	10	10	
III	19	19	
IV	15	11	4
V	1		1

Table 2. Sensitivity and specificity of CT scan in blunt injury abdomen.

	Patients with positive finding	Patients without positive findings	
CECT abdomen positive	74	1	75
CECT abdomen negative	2	3	5
	76	4	

Table 3. Sensitivity and specificity of USG in blunt injury abdomen.

	Patients with positive finding	Patients without positive findings	
FAST scan positive	60	2	62
FAST scan negative	16	2	18
	76	4	

In the present study, CT scan had detected additional injuries in 18.7% patients (15 out of 80), which were missed by FAST. The significance between CECT and FAST in detection of intra-abdominal injury in our series is shown in table 6. P-value of 0.0034 was observed, so the test was significant. (Table 4) Mortality rate in our study was 5%.

Table 4. Comparison of CT scan with FAST scan in blunt injury abdomen.

	Patients without significant finding	Patients with positive findings
CECT abdomen and pelvis	5	75
FAST scan	18	62

DISCUSSION

The mean age of patients was 30.86 years. No age group is exempted from traumatic injury of abdomen, but that it is more common in the second to fourth decade of life because this age represent working population. A similar incidence was reported by Vadodariya et al.³ and Mohapatra et al.⁹ Majority of our patients were male (Male: female = 2.3:1). The incidence of abdominal trauma in male population is higher because in our country males lead more active life and have more outdoor activities. Road traffic accident is the commonest mode of injury in blunt injury abdomen. This is consistent with the studies of Kumar et al.,¹ Radwan et al.,⁴ and Mohapatra et al.⁸ Other causes are fall injuries, physical assault. We also had some cases of blunt injury abdomen due to earthquake related injuries as Nepal suffered from 7.8 magnitude earthquake in the month of April, 2015. Spleen was the most common organ to be injured followed up by liver, kidney, mesentery, bowel etc. Studies in India by Vadodariya et al.,³ in Jordan by Hamidi et al.² also showed spleen as the commonest organ to be injured in blunt injury abdomen. Chest injuries, fracture of pelvis and spine were the maximum associated injuries.

FAST scan was the preliminary investigation and was followed by CT scan in our patients. CT scan had a sensitivity of 97%, specificity of 75% and a positive predictive value of 98.60 while FAST had sensitivity of 78.9%, specificity of 50% and a positive predictive value of 96%. CT scan had detected additional injuries in 18.7% patients, which were missed by USG. Chi square: 8.581 P value = 0.0034 (<0.05) So the test is highly significant and it indicates that CT scan is better investigation as compared to USG abdomen in cases of blunt abdominal trauma. Studies by Hamidi et al.,² Mallik K et al.⁷ also demonstrates the superiority of CT over FAST. CT scan is helpful in detecting other associated injuries like fracture of spine and pelvis. Many retroperitoneal injuries go unnoticed with DPL and FAST examinations. Poor results of FAST scan may be due to overlying bowel shadow, surgical emphysema, empty bladder and lack of skilled radiologist at emergency hours. FAST can be a valuable initial investigation; however, FAST can miss crucial injuries and may lead to inappropriate management in some patients. Five patients incorrectly diagnosed by CT scan were of bowel injury or mesentery injury. Atri et al showed that sensitivity of the three observers in diagnoses of surgically important bowel or mesenteric injury by CT scan ranged from 87%-95%.¹⁰

The possibility of surgical management increases with higher OIS grading of solid organ injury, however OIS grading in isolation appears inadequate for predicting

management protocol. Hence correct management of blunt abdominal trauma should be based on clinical examination, hemodynamic stability of patient in conjunction to radiological investigations.

Limitations of the study was small sample size and FAST scan being performed by residents rather than consultants.

CONCLUSION

This study shows that CT scan is a superior diagnostic modality in the diagnosis and management

of blunt abdominal trauma. USG can be a valuable initial investigation. OIS grading, quantification of hemoperitoneum, clinical stability of patient and anatomical site of organ injury predict the management protocols in the majority of the patients.

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