



COMPARISON OF COMPUTED TOMOGRAPHY WITH DIAGNOSTIC PERITONEAL LAVAGE FOR DIAGNOSIS OF SOLID ORGAN DAMAGE IN PATIENTS WITH BLUNT ABDOMINAL TRAUMA.

Abdul Ghaffar¹, Saeed Mahmood², Muhammad Kareem Ullah³, Saqib U. Khan⁴, Ambreen Akram⁵, Umar Niazi⁶, Afsar Ali Bhatti⁷

1. FCPS
Senior Registrar
Department of Surgical Unit II
Lahore General Hospital, Lahore.
2. FCPS
Associate Professor
Department of Surgery
Lahore General Hospital, Lahore.
3. FCPS
Associate Professor
Department of Surgery
Lahore General Hospital, Lahore.
4. MCPS, MRCS
Senior Registrar
Pak Red Crescent Medical & Dental
College, Lahore
5. MBBS
Medical Officer
6. MBBS
Registrar
PGMI/AMC/LGH
7. FCPS
Head
Department of Surgical Unit II,
Lahore General Hospital, Lahore.

Correspondence Address:

Dr. Abdul Ghaffar
Department of Surgical Unit II,
Lahore General Hospital, Lahore.
abdulje@yahoo.com

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INTRODUCTION

Blunt abdominal trauma (BAT) may result in intra-abdominal injury in as high as 12–15% cases.¹ In a study it was found that out of seventy patients 66 patients of BAT were found to have solid organ injury (94.3%).² Prompt diagnosis of abdominal injury is an important step in the treatment process to prevent morbidity or mortality in BAT cases. Early determination of cases in need of emergency laparotomy is crucial for life saving, especially for those with unstable hemodynamics. But the avoidance of unnecessary surgeries with its invasiveness and complications should be considered.³

Diagnosing gastrointestinal trauma is difficult based on emergency rooms physical examination

ABSTRACT... Abdominal trauma can be mysterious to some practitioners. If patients are evaluated for being stable or unstable, then abdominal trauma can be easily managed. Using a combination of physical examination, eFAST Scan, DPL and CT scans, patients can be quickly and efficiently evaluated. To determine the positive predictive value (PPV) of computed tomography and diagnostic peritoneal lavage for diagnosis of solid organ damage in patients with blunt abdominal trauma (BAT) taking surgical findings as gold standard. **Study Design:** Cross sectional study. **Setting:** Department of Surgery at Lahore General Hospital, Lahore. **Period:** Six months i.e. from 21.5.2016 to 20.11.2016. **Materials and Methods:** CT scan was performed with oral and intravenous contrast. DPL was done with sample assessment. Only those cases were included with positive findings in CT Scan or DPL. These patients underwent laparotomy under general anesthesia by a one standard surgical team. Results of surgical findings were compared between groups with CT scan and DPL. All the information was collected on predesigned proforma. **Results:** The mean age of the patients was 44.48 ± 14.83 years. There were 66 (55%) males and 54 (45%) females in our study. In this study PPV for CT-scan group was 90.1% while PPV for group with DPL was 51.3%. **Conclusion:** PPV for CT Scan group was higher than that of DPL group for diagnosing solid organ damage in patients with BAT. Hence, evidence shows that CT Scan should be used as an initial investigation of choice in haemo-dynamically stable patients with BAT.

Key words: Blunt Abdominal Trauma, Computed Tomography, Diagnostic Peritoneal Lavage, Positive predictive value, Solid Organ Damage, .

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and necessitates using other imaging modality such as CT scan.⁴ Now a days, diagnostic peritoneal lavage (DPL) is performed infrequently, as it has been largely replaced by CT scan.⁵ In a study, the positive predictive value (PPV) of DPL was 91.7%, which was found to be less than that of CT scan, i.e. 100%.⁶ Another study has showed the PPV of CT was 82% for diagnosis of solid organ injury in BAT patients.⁷ In another study, PPV of DPL was 94%.⁸

Rationale of this study is to compare the positive predictive value of CT versus DPL for diagnosis of solid organ damage in patients with BAT. DPL has been observed to replace CT scan. CT scan has more PPV as compared to DPL⁶ but contradiction has also been reported which showed less PPV

of CT as compared to DPL. No local evidence has been found which can prove that which modality is more favorable. DPL helps to diagnosis solid organ injury in BAT patients, though it requires expertise and sterilized technique. It is a feasible method particularly in areas where facility of CT scan is not available. CT scan also requires technical expertise and not accessible in all regions. So we wanted to conduct this study to find which modality is more feasible keeping in view applicability in all local regions.

OBJECTIVE

To determine the positive predictive value of computed tomography and diagnostic peritoneal lavage for diagnosis of solid organ damage in patients with blunt abdominal trauma taking surgical findings as gold standard.

MATERIALS & METHODS

Study Design

Cross sectional study.

Setting

Unit III, Department of Surgery, Lahore General Hospital, Lahore.

Duration of Study

Six months, i.e. from 21.5.2016 to 20.11.2016.

Sample Size

Sample size of 120 cases was calculated with 95% confidence level, 5% margin of error and taking expected percentage of PPV, i.e. 91.7% of DPL taking surgical findings as gold standard.

Sampling Technique

Non probability, consecutive sampling.

DEFINITIONS

Blunt Trauma Abdomen is defined as internal abdominal injuries without having breach in abdominal wall with involvement of internal solid and hollow abdominal organs. It usually happens due to road traffic accidents, assault or fall from height. These findings are assessed on clinical basis (abdominal tenderness, guarding, rigidity etc) and positive findings on CT or DPL. Positive

diagnostic peritoneal lavage for the purpose of this study is defined as if introduction of catheter in the peritoneal cavity reveals frank blood (>10ml), biliary contamination or lavage aliquot on analysis showed >100,000 RBC/mm³, >500 WBCs or Amylase level >250U/l. Positive findings on CT Scan abdomen and pelvis is defined as findings of solid organ damage, viscus perforation or presence of significant amount of free fluid (>200ml). Solid organ injury is defined as injury of intra abdominal solid organs like liver, spleen, pancreas, kidneys, adrenal glands etc.

SAMPLE SELECTION

Inclusion Criteria

All haemo-dynamically stable patients, between age 20 to 70 years from either gender; presenting with BAT and consenting to be included in the study.

Exclusion Criteria

Patients with penetrating trauma, isolated hollow viscus injuries, frank peritonitis or patients' not giving consent to be excluded in the study.

Data Collection Procedure

After taking approval from hospital ethical committee, 120 patients fulfilling the selection criteria were included in the study presenting in emergency department. Informed consent was taken. Predesigned Performa was filled up with demographic information of patients including name, age, gender, cause of BAT was noted. CT scan of abdomen and pelvis was performed with oral and intravenous contrast. DPL was done using open method after giving 10mm incision just below the umbilicus. 18Fr Nelton catheter was used in all cases and it was placed into the peritoneal space. Peritoneal fluid samples were taken and sent to the Pathology Department for detailed assessment of RBCs, WBCs and chemistry. Only patients with positive findings on CT Scan abdomen and DPL were included in the study and underwent laparotomy under general anesthesia by a single surgical team. Results of surgical findings were compared between two groups with CT scan and DPL. On CT scan, solid organ damage, viscus perforation or presence

of significant amount of free fluid (>200ml) was considered positive. On DPL, solid organ injury was considered as positive if introduction of catheter revealed frank blood (>10ml), biliary contamination or lavage aliquot on analysis showed >100,000 RBC/mm³, >500 WBCs or Amylase level >250U/l. All the information was collected on predesigned Performa.

Statistical Analysis

Data was entered and analyzed by SPSS version 20. Mean and Standard deviation was calculated for age and BMI. Frequency and percentage was calculated of gender and presence of solid organ damage on CT and DPL. 2x2 tables were generated to calculate PPV of CT and DPL taking surgery as gold standard.

RESULTS

The mean age of the patients was 44.48±14.83 years. There were 66 (55%) males and 54 (45%) females in our study. The mean weight of the patients was 79.95±9.17 kg. The mean height of the patients in our study was 1.66±0.10 meters. The mean BMI of the patients in our study was 27.91± 4.73kg/m². There were 46 (38.3%) patients had road traffic accident, 41 (43.2%) had fall from height and in 33 (27.5%) patients had assault (Table-I).

n	120
Age (years)	44.48±14.83
Gender (M:F)	66 (55%): 54 (45%)
Weight	79.95±9.17
Height	1.66±0.10
BMI	27.91±4.73
Cause of injury	
Road traffic accident	46
Fall from height	41
Assault	33

Table-I. Baseline characteristics of patients

In patients with positive DPL findings when surgery was done only 78(65%) were found to have solid organ injury. Similarly, patients who had positive findings on CT Scan, 71(59.2%) of these patients were found to have solid organ injuries on surgery. PPV for DPL group for diagnosing solid organ damage was 51.3%. PPV

for CT for diagnosing solid organ damage was 90.1% (Table-II).

	DPL	Surgical Findings
Positive	78(65%)	75(62.5%)
Negative	42(35%)	45(37.5%)
Total	120	120
PPV	40/78	51.3%
	CT	Surgical Findings
Positive	71(59.2%)	75(62.5%)
Negative	49(40.8%)	45(37.5%)
Total	120	120
PPV	64/71	90.1%

Table-II. Results of DPL& CT surgical findings

DISCUSSION

Timely and effective management of solid organ injury in abdomen with cases of blunt abdominal trauma can reduce morbidity and mortality. Many diagnostic tests support each other in cases of blunt abdominal trauma including a physical examination, diagnostic peritoneal lavage, CT scan and FAST scan. CT scan is the most commonly used screening method for the detection and evaluation of intra-abdominal injury particularly in hemodynamically stable patients with BAT. CT scanning is a highly specific method for the diagnosis of solid organ damage.

Surgeons sometimes have to face diagnostic dilemma when blunt abdominal trauma is associated with mesenteric or bowel injury because in such cases CT scan findings may not be specific for the diagnosis.⁹ CT performance in such cases may be improved with diagnostic modality like DPL, which was introduced in 1965,¹⁰ well before the CT scan was introduced. Sensitivity for the detection of intra-abdominal bleeding by DPL is 83–98%.¹¹ In this study, positive predictive value for CT-scan was 90.1% which is significantly higher than that for DPL group which was 51.3%, for diagnosing solid organ damage in patients with BAT. A study⁶ reported PPV of DPL as 92%, which was less than that of CT scan, i.e. 99% which supports findings of our study.

In another study PPV of CT was shown to be 82% for diagnosis of solid organ injury in BAT patients⁷ which is significantly lower than findings of our

study and Al salamah study.⁶ Another study done by Parvin reported PPV for DPL which was 94%⁸, significantly higher than ours.

Nirav Patel in his study reported the PPV for CT-Scan as 100% for the diagnosis of abdominal trauma¹² which again coincides with the findings of our study as well as Al-Salamah's findings.⁶ Kane in his study reported that 16 patients out of 44 haemodynamically stable patients with blunt trauma abdomen were those in whom significant intra-abdominal or retroperitoneal injuries were missed by DPL but they were seen on CT scan. Whereas in his study the findings on CT scan resulted in significant modification to the original treatment plan in 58% of the patients.¹³

CT is inadequate for the diagnosis of mesenteric injuries and may also miss hollow visceral injuries. In patients at risk for mesenteric or hollow visceral injury, DPL seems to be better diagnostic test. A negative CT scan in such a patient cannot reliably exclude intra-abdominal injuries but CT scan has the unique ability to detect clinically unsuspected injuries.¹⁴

On the negative side DPL is an invasive procedure and provides non-specific information about which organ is involved in the injury, which may result in a significant number of negative or non-therapeutic laparotomies.¹⁵ DPL is sensitive to detect haemoperitoneum but it does have limitation when it comes to detect retroperitoneal damage. When compared with other diagnostic modalities DPL has a higher rate of non-therapeutic laparotomy, especially in cases with minor mesenteric tear and trivial mesenteric venous ooze.^{11,16}

Prompt and accurate diagnosis of intra-abdominal injury in a timely fashion is crucial in optimizing the treatment and improving outcomes for patients with BAT. However, diagnostically ambiguous cases pose major challenge for accurate diagnosis of intra-abdominal injury in the care of trauma patients. In the United States, FAST has been introduced as an adjunct for the diagnosis of intra-abdominal injury after blunt trauma for more than two decades.¹⁷

CONCLUSION

Results of this study showed that PPV of CT is higher than that of DPL for diagnosing solid organ damage in BAT patients. So, it can be used as an initial investigation of choice in hemodynamically stable patients with BAT.

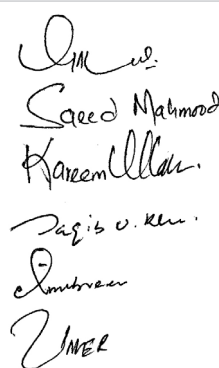
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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Abdul Ghaffar	Writer	
2	Saeed Mahmood	Writer	
3	M. Kareem Ullah	Writer	
4	Saqib U. Khan	Editor / Biostatition.	
5	Ambreen Akram	Co-helper for biostatics.	
6	Umar Niazi	Co-helper for biostatics.	
7	Afsar Ali Bhatti	Head of department	