

## COMPARATIVE STUDY OF PARACENTESIS, DIAGNOSTIC PERITONEAL LAVAGE, AND ULTRASONOGRAPHY IN THE MANAGEMENT OF PATIENTS OF BLUNT INJURY ABDOMEN – A STUDY FROM CENTRAL INDIA

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### ABSTRACT

**Objective:** Blunt abdominal trauma comprises 1–1.5% of total admissions for trauma. In India every year more than a lakh persons die due to accidents. It is in fact the automobiles traveling at a greater speed than ever before that account for an amazing frequency of admissions in civilian hospitals. These injuries present a challenge to the most astute diagnostician, mainly because of the many organs involved, complexity of the hidden and vital structures involved and also because other frequently overshadow the early symptoms associated injuries to the head and chest. The figure is increasing every year, for example, from 1965 to 1966 and an increase by 8.4% was recorded.

**Methods:** The present study consists of 70 cases of blunt abdominal trauma treated in surgical indoors of Hamidia Hospital and associated Gandhi Medical College, Bhopal within the period of 3 years. Abdominal paracentesis was done in all cases and diagnostic peritoneal lavage (DPL) done in those cases, where paracentesis was negative or doubtful. Ultrasonography was also done in almost all the cases admitted.

**Results:** In our study, the accuracy and sensitivity of DPL marginally exceeds that of ultrasonography and accuracy and sensitivity of paracentesis is relatively less.

**Conclusion:** Our study establishes that safety and accuracy of peritoneal tapping as a diagnostic aid in acute abdomen. It is particularly useful in several centers, where radiological facilities do not exist. Comparing all the above diagnostic tools, ultrasonography and DPL were considered are the most accurate, sensitive, and specific diagnostic modalities in cases of blunt injury abdomen.

**Keywords:** Blunt trauma, Diagnostic peritoneal lavage, Paracentesis, Ultrasonography.

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### INTRODUCTION

Blunt abdominal trauma can be defined as non-penetrating injury to the abdomen, where by the bruising and crushing injuries of the abdomen any intra-peritoneal organ may be ruptured, and occasionally without the association of superficial trauma. Unlike penetrating abdominal trauma, where management is largely determined clinically, the diagnosis of blunt abdominal injury by clinical examination is unreliable, particularly in patients with a decreased level of consciousness [1-4]. Confirmation of the presence or absence of injury, therefore, relies largely on the use of diagnostic adjuncts. Late diagnosis and missed injuries are associated with poor outcome. Abdomen is the third most frequently injured body region and about 25% of all abdominal trauma cases require abdominal exploration [5, 6]. Usually, abdominal injuries occur either due to blunt or penetrating trauma, and around 7–10% of all trauma-related deaths occurred due to these injuries [7, 8]. An earlier study on major blunt abdominal trauma reported an overall mortality of 42%, and massive intra-abdominal hemorrhage was identified as the frequent cause of the early mortality following multiple trauma [9]. These injuries present a challenge to the most astute diagnostician, mainly due to the many organs involved, complexity of the hidden, and vital structures involved and also because other frequently overshadow the early symptoms associated injuries to the head and chest. Consequently, the fallacies in the treatment of non-penetrating abdominal injuries are more resulting in a higher mortality. Some if operated needlessly will be unable to tolerate the added stress of unnecessary surgical trauma; others when the pathology remains unrecognized and untreated may be the tragic examples of preventable death. Mortality in blunt abdominal trauma is due to late diagnosis of visceral injuries, delay between trauma and treatment, lack of proper immediate or on the spot first aid treatment,

and associated multiple injuries. Delay in the diagnosis of patients with blunt injury abdomen is avoidable since the advent of procedure such as paracentesis, diagnostic peritoneal lavage (DPL), and USG. This study will make an attempt to demonstrate the reliability of four quadrant abdominal paracentesis, DPL, and ultrasonography in the establishment

**Table 1: Age- and sex-wise distribution of subjects**

Age in years	Male n (%)	Female n (%)
0–9	-	-
10–19	14 (20.00)	1 (1.42)
20–29	22 (31.42)	6 (8.57)
30–39	10 (14.28)	1 (1.42)
40–49	09 (12.82)	-
50 and above	06 (08.57)	1 (1.42)
Total	61 (87.12)	9 (12.83)

**Table 2: Distribution of cases according to dominant symptoms and signs**

Symptoms and signs	Number of cases	Percentage
Pain in abdomen	60	87.5
Distension of abdomen	56	80.2
Vomiting	21	30.1
Hematuria	04	5.71
Muscle guarding	61	88
Muscle rigidity	42	62.2
Tenderness	53	75.2
Obliterated liver dullness	21	30.2
Absent bowel sound	54	78.2

Table 3: Comparative evaluation of the various diagnostic procedures

Diagnostic procedure	True+ve No. of cases	True -ve No. of cases	False+ve No. of cases	False -ve No. of cases	Accuracy rate (%)	Sensitivity (%)
Paracentesis	29	15	06	20	62.85	59.18
DPL	148	15	02	03	86.84	85.17
Ultrasonography	34	1	01	07	86.20	82.92

of diagnosis of intraperitoneal organ injury in cases of blunt trauma abdomen and its management.

## METHODS

The present study consists of 70 cases of blunt abdominal trauma treated in surgical indoors of Hamidia Hospital, Bhopal Associated with Gandhi Medical College, Bhopal, within period of 3 years. All cases attending the Hamidia Hospital casualty department with suspicion of blunt abdominal injury were admitted in different surgical wards.

All cases after admission were immediately assessed clinically by the integration of the data provided by color of skin, level of consciousness, pulse, BP, depth and frequency of respiration, and temperature. Resuscitation with airway and establishment of intravenous route done with collection of blood samples for grouping and cross-matching. Those cases which failed to respond to fluid replacement were kept on vasopressor drugs, for example, dopamine infusion and Trendelenburg position maintained until the patient has achieved a stable response. Abdominal paracentesis was done in all cases and DPL done in those cases where paracentesis was negative or doubtful. Ultrasonography was also done in most of the cases admitted.

## RESULTS

In our study, the majority of the patients belong to 20–29 age group, followed by 10–19 age group and then 30–39 age group. It was more common in males as compared to females giving rise to male: female ratio of 7:1. Age- and sex-wise distribution of subjects is shown in Table 1.

In our study, pain in abdomen is the most pre-dominant symptoms found in about 87% cases and the most common abdominal signs were muscle guarding and tenderness. Distribution of cases according to dominant symptoms and signs is shown in Table 2.

In our study, the accuracy and sensitivity of DPL marginally exceeds that of ultrasonography and accuracy and sensitivity of paracentesis is relatively less. Comparative evaluation of the various diagnostic procedures is shown in Table 3.

## DISCUSSION

In this study, 70 cases were evaluated for the clinical assessment of the patients of blunt abdominal injury and to find out the best diagnostic means available for the rapid understanding of the underlying problem, with an objective to reduce the morbidity and mortality. The incidence of non-penetrating abdominal trauma in the different age group in the series has been worked out and found to be maximum in 3<sup>rd</sup> decade (41.81%). Total incidence in other groups is 21.81% in the 2<sup>nd</sup> decade, 16.36% in the 4<sup>th</sup> decade, and 10% in the 5<sup>th</sup> and 6<sup>th</sup> decade. In this study, it has been seen that the patients (33.96) between 21 and 30 years were most commonly affected from blunt abdominal trauma. Gupta *et al.*, in their study of 63 patients, had 87% patients below the age of 40 years. Deodhar *et al.*, in a study of 51 patients of blunt and penetrating abdominal trauma, also found that people in second and third decades are common victims. The highest incidence in this age group can be attributed to active lifestyle of this age group with the highest exposure to external environment, use of automobiles, working with machinery, assaults, and contact sports. Male preponderance was noted with incidence of 81.13%. Same findings have been noted by Gupta *et al.*, Deodhar *et al.*, and David *et al.* [10-12].

In our study, pain in abdomen was noted in 87% cases and muscle guarding and tenderness were the common physical findings in the present study associated with distension, rigidity, and absent bowel sounds. In a study conducted by Sisodiya and Malpani in 2020 in central India, majority of the patients presented with pain in abdomen 85 (94.4%), while 62 (69%) presented pain abdomen, along with vomiting [13]. Abdominal paracentesis was done in all the 70 cases. Positive results were obtained in 35 cases (29) true-positive and (6) false-positive. It was negative for 35 cases (15) true-negative and (20) false-negative. The test had a sensitivity of 59.18% and specificity of 71.42%. Positive predictive value in 82.85%, negative predictive value in 42.85%, accuracy of 62.85%, false-positive rate of 17.14%, and a false-negative rate of 57.14%. In a study conducted by Mansoor *et al.*, there were 13 positive taps, out of which 12 were true-positive and one was false-positive [14].

DPL was attempted in 41 cases out of 70 in the present study. Eighteen patients showed true-positive results and two cases gave false-positive result. False-negative result in the series was with three cases and true-negative in 15 cases. Out of 41 cases, in three cases, DPL was non-conclusive. Laparoscopy was done in these cases to confirm the diagnosis, and patients were managed accordingly. The sensitivity of the test is 85.71%, specificity is 88.23%, predictive positive test 90.00%, predictive negative test 83.33%, and accuracy 86.84%. In a study conducted by Sunil *et al.*, DPL was significantly better than FAST in detecting as well as not missing the bowel injuries. DPL took significantly more time than FAST to perform [15].

Ultrasonography was done in 60 cases. It was true-positive in 34 cases, false-positive in one case, true-negative in 16 cases, and false-negative in seven cases. The sensitivity of the test is 82.92%, specificity 94.11%, predictive positive test 97.14%, predictive negative test in 69.56%, and accuracy in 86.20%. In ten cases, ultrasonography was not done. In two cases, ultrasonography was not conclusive and so diagnostic laparoscopy was done to confirm the diagnosis and patients were managed accordingly. In a study conducted by Nnamonu *et al.*, sensitivity, specificity, positive, NPV, and diagnostic accuracy were 71%, 35%, 62%, 44%, and 56%, respectively. They found that ultrasonography has a high diagnostic value in the screening of patients with blunt abdominal trauma [16].

## CONCLUSION

Comparing all the above diagnostic tools, ultrasonography and DPL were considered are the most accurate, sensitive, and specific diagnostic modalities in cases of blunt injury abdomen, but, in rural centers of our country, we can still depend on paracentesis with or without lavage as the best mode of assessment.

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