

ASSESSMENT OF MANAGEMENT STRATEGIES FOR CT-CONFIRMED SOLID ORGAN INJURIES IN BLUNT ABDOMINAL TRAUMA

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Abstract

**Abstract**

**Objective:**

To assess the management strategies and outcomes of computed tomography (CT) scan-confirmed solid organ injuries in patients presenting with blunt abdominal trauma.

**Methods:**

This descriptive cross-sectional study was conducted in the Department of General Surgery at a tertiary care hospital in Karachi. A total of 384 patients presenting with blunt abdominal trauma and having CT scan-confirmed solid organ injuries were included. Patients with penetrating abdominal trauma or without CT confirmation of solid organ injury were excluded. Data regarding demographic characteristics, mechanism of injury, type of injured organ, and management strategies were recorded using a structured proforma. Management strategies were categorized as non-operative or operative depending on the hemodynamic status and severity of injury. Patients were monitored for clinical progress, complications, and outcomes during hospital stay. Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Quantitative variables were expressed as mean  $\pm$  standard deviation, while qualitative variables were presented as frequencies and percentages.

**Results:**

Among 384 patients, the majority were male (72.4%) with a mean age of  $34.2 \pm 12.6$  years. The most common mechanism of injury was road traffic accidents (56.8%), followed by falls from height (25.0%) and assault (10.9%). The liver (40.1%) and spleen (33.3%) were the most frequently injured organs, followed by kidney injuries (19.8%). Non-operative management was successfully applied in 78.6% of patients, while 21.4% required operative intervention. Complications occurred in 9.9% of cases, and the overall mortality rate was 1.6%.

**Conclusion:**

CT scan plays an important role in the diagnosis and evaluation of solid organ injuries in blunt abdominal trauma. Non-operative management is effective in hemodynamically stable patients, while surgical intervention remains necessary in unstable cases.

## INTRODUCTION

Blunt abdominal trauma (BAT) is a significant cause of morbidity and mortality worldwide and commonly results from road traffic accidents, falls from height, and interpersonal violence. It is frequently encountered in emergency departments and poses a diagnostic and therapeutic challenge for trauma surgeons. Early identification and prompt management of intra-abdominal injuries are crucial in reducing complications and improving patient outcomes.<sup>1</sup>

Solid organ injuries involving the liver, spleen, and kidneys are among the most common consequences of blunt abdominal trauma. These injuries may range from minor contusions to severe parenchymal disruption with life-threatening hemorrhage. The American Association for the Surgery of Trauma (AAST) grading system is widely used to classify the severity of solid organ injuries and guide treatment decisions.<sup>2</sup> With advances in imaging technology, contrast-enhanced computed tomography (CT) has become the gold standard for evaluating hemodynamically stable patients with blunt abdominal trauma. CT imaging provides accurate information regarding the presence, location, and severity of organ injuries and helps in identifying active bleeding and associated intra-abdominal injuries.<sup>3</sup> Over the past few decades, the management of solid organ injuries has shifted from routine surgical intervention to non-operative management (NOM) in hemodynamically stable patients. NOM has been shown to reduce unnecessary laparotomies, decrease complications, and improve overall outcomes when appropriate monitoring and supportive care are available.<sup>4</sup> Despite advances in trauma care, surgical intervention remains necessary in patients presenting with hemodynamic instability, ongoing hemorrhage, or high-grade organ injuries. Minimally invasive procedures such as angioembolization have also emerged as important adjuncts in the management of selected cases.<sup>5</sup> Several recent studies have reported high success rates of non-operative management in patients with CT-confirmed solid organ injuries. However, the optimal management approach may vary

depending on patient condition, injury severity, and available healthcare resources.<sup>6</sup>

In developing countries, including Pakistan, trauma remains a major public health problem due to increasing road traffic accidents and limited trauma care facilities. Evaluating patterns of injury and management strategies is therefore essential to improve patient outcomes and guide clinical practice.<sup>7</sup>

## Methods

This descriptive cross-sectional study was conducted in the Department of General Surgery at a tertiary care hospital in Karachi. The study included 384 patients presenting with blunt abdominal trauma who had CT scan-confirmed solid organ injuries. Patients with penetrating abdominal trauma or without CT confirmation of solid organ injury were excluded from the study.

Data regarding age, gender, mechanism of injury, type of injured organ, and management strategy were collected using a structured proforma. The injured organs identified on CT scan included the liver, spleen, and kidneys. Management strategies were categorized into non-operative management and operative management, depending on the hemodynamic status of the patient and severity of injury. All patients were monitored during hospital stay for clinical progress, complications, and treatment outcomes. Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Quantitative variables were presented as mean  $\pm$  standard deviation, while qualitative variables were expressed as frequencies and percentages.

## Results

A total of 384 patients with CT-confirmed solid organ injuries due to blunt abdominal trauma were included in the study. The mean age of patients was  $34.2 \pm 12.6$  years. The majority of patients were male (72.4%). The most common mechanism of injury was road traffic accidents (56.8%), followed by falls (25.0%) and assault (10.9%).

The liver (40.1%) was the most frequently injured organ, followed by the spleen (33.3%) and kidney (19.8%). Non-operative management was

successfully applied in the majority of patients (78.6%), while 21.4% required operative

intervention. The overall complication rate was 9.9%, and the mortality rate was 1.6%.

**Table 1: Demographic Characteristics of Patients (n = 384)**

Variable	Frequency (n)	Percentage (%)
<b>Gender</b>		
Male	278	72.4
Female	106	27.6
<b>Age Group (years)</b>		
18-30	146	38.0
31-45	128	33.3
46-60	72	18.8
>60	38	9.9

**Table 2: Mechanism of Injury (n = 384)**

Mechanism	Frequency (n)	Percentage (%)
Road traffic accident	218	56.8
Fall from height	96	25.0
Assault	42	10.9
Others	28	7.3

**Table 3: Distribution of Injured Organs (n = 384)**

Injured Organ	Frequency (n)	Percentage (%)
Liver	154	40.1
Spleen	128	33.3
Kidney	76	19.8
Multiple organs	26	6.8

**Table 4: Management Strategies (n = 384)**

Management	Frequency (n)	Percentage (%)
Non-operative management	302	78.6
Operative management	82	21.4

**Discussion**

Blunt abdominal trauma is a major cause of morbidity and mortality worldwide, particularly among young adults involved in road traffic accidents and falls. In the present study, the majority of patients were young males, which is consistent with previous studies reporting a higher incidence of trauma among males due to increased exposure to outdoor activities and high-risk behaviors.<sup>8</sup>In our study, road traffic accidents were the most common mechanism of injury (56.8%), followed by falls from height and assault. Similar findings have been reported in several recent studies where road traffic accidents remain

the leading cause of blunt abdominal trauma in developing countries.<sup>9</sup> These findings highlight the need for improved road safety measures and trauma prevention strategies.

The liver and spleen were the most frequently injured organs in this study. The liver was involved in 40.1% of cases, followed by the spleen in 33.3% of patients. These results are comparable to other studies that have reported the liver and spleen as the most commonly affected organs in blunt abdominal trauma due to their size and vascular nature.<sup>10</sup>Computed tomography (CT) plays a crucial role in the evaluation of patients with blunt abdominal trauma. It allows accurate

identification and grading of solid organ injuries and helps guide appropriate management strategies. Several recent studies have confirmed that CT imaging significantly improves diagnostic accuracy and assists clinicians in selecting patients suitable for conservative management.<sup>11</sup> In recent years, non-operative management (NOM) has become the preferred approach for hemodynamically stable patients with solid organ injuries. In the present study, NOM was successfully implemented in 78.6% of patients, which is consistent with other studies reporting success rates ranging from 70% to 90%.<sup>12</sup> NOM reduces unnecessary surgical interventions, lowers complication rates, and shortens hospital stay when appropriate monitoring is available.<sup>13</sup> However, operative management remains essential in patients presenting with hemodynamic instability or high-grade organ injuries. In our study, 21.4% of patients required surgical intervention. Similar findings have been reported in recent trauma studies, where surgery is reserved for patients with ongoing hemorrhage, failure of conservative management, or associated intra-abdominal injuries.<sup>14</sup> The overall complication rate in this study was 9.9%, with wound infection being the most common complication. These findings are comparable with other studies reporting complication rates between 8% and 15% in patients with blunt abdominal trauma.<sup>15</sup> Early diagnosis, proper monitoring, and timely intervention play a key role in minimizing complications. The mortality rate observed in this study was 1.6%, which is relatively low and may reflect improvements in trauma care and early use of CT imaging for accurate diagnosis. Similar mortality rates have been reported in other recent trauma studies evaluating the outcomes of patients with blunt abdominal injuries.<sup>16</sup> Recent advances in trauma care, including angiographic embolization and minimally invasive techniques, have further improved the management of solid organ injuries and reduced the need for surgical intervention in selected patients.<sup>17</sup> Overall, the findings of this study support the growing evidence that non-operative management is safe and effective in hemodynamically stable patients with CT-confirmed solid organ injuries,

provided that close monitoring and timely surgical intervention are available when required.

## Limitations

This study has several limitations. First, it was conducted at a single tertiary care hospital, which may limit the generalizability of the findings to other healthcare settings. Second, the study design was descriptive and cross-sectional, which limits the ability to establish causal relationships between management strategies and outcomes. Third, the study relied on hospital-based data, and long-term follow-up of patients after discharge was not included. Additionally, factors such as associated injuries, comorbidities, and variations in treatment protocols could have influenced patient outcomes. Future multicenter studies with larger populations and long-term follow-up are recommended to further evaluate the effectiveness of different management strategies for solid organ injuries in blunt abdominal trauma.

## Conclusion

CT scan plays a crucial role in the diagnosis and evaluation of solid organ injuries in patients with blunt abdominal trauma. The findings of this study demonstrate that non-operative management is safe and effective in the majority of hemodynamically stable patients, while surgical intervention remains necessary for patients with hemodynamic instability or severe injuries. Early diagnosis, appropriate patient selection, and close clinical monitoring are essential to achieve favorable outcomes and reduce complications.

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