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Clinical outcomes and management of penetrating abdominal injuries: A one-year study at a tertiary care center

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Abstract

Background: Penetrating abdominal injuries (PAIs) are a major cause of morbidity and mortality, particularly due to their potential to involve multiple organ systems. The study aimed to evaluate the clinical management, outcomes, and associated factors in patients with PAIs at Madha Medical College and Hospital, Chennai, from March 2018 to February 2019.

Materials and Methods: A total of 50 patients aged above 18 years with penetrating abdominal trauma were included. Demographic details, the mode of injury, time intervals between injury, presentation, and surgery, as well as associated injuries and operative findings, were documented. Patients were managed according to standard trauma protocols, and data were analyzed to assess the effectiveness of the interventions.

Results: The majority of cases were in the 21-30 age group (36%), with males representing 80% of the sample. Stab injuries accounted for 64% of cases, followed by gunshot wounds (30%). Thoracic injuries (16%) were the most common associated injuries, followed by long bone fractures (12%). A significant number of patients presented within 4 hours of injury, and 28% underwent surgery within 2 hours of presentation. The liver, small bowel, and colon were the most commonly affected organs.

Conclusion: The study highlights the importance of timely medical intervention in improving patient outcomes for penetrating abdominal injuries. The high prevalence of polytrauma necessitates a comprehensive, multidisciplinary approach. Further research is needed to optimize management protocols for these complex injuries.

Keywords: Penetrating abdominal injuries, polytrauma, trauma management, surgical intervention, trauma outcomes

Introduction

Penetrating abdominal injuries (PAIs) are a major cause of trauma-related morbidity and mortality globally, resulting from various mechanisms, such as stab wounds, gunshot wounds, and blunt force trauma. The anatomical complexity of the abdominal cavity, which houses vital organs such as the liver, spleen, intestines, and major blood vessels, complicates both the diagnosis and management of these injuries. PAIs can lead to severe complications, including hemorrhagic shock, peritonitis, and multi-organ failure, underscoring the need for timely and accurate assessment. Diagnostic tools like focused assessment with sonography for trauma (FAST), computed tomography (CT) scans, and diagnostic peritoneal lavage (DPL) are crucial in evaluating the extent of organ damage and guiding treatment decisions. The decision to pursue either conservative management or surgical intervention largely depends on the severity of injury, the presence of associated trauma, and the patient's hemodynamic stability^[1, 2]. Early and appropriate surgical intervention, often in the form of damage control surgery, has been shown to significantly reduce mortality in patients with severe trauma^[3]. The management approach should also address the potential for infections and long-term complications, with particular attention to intra-abdominal infections such as peritonitis, which can result from delayed or insufficient treatment^[4]. Furthermore, recent advancements in minimally invasive techniques, such as laparoscopy, have provided alternatives to traditional open surgery, offering advantages like reduced recovery times and lower infection rates^[5]. Despite these advancements, penetrating abdominal trauma remains a leading cause of death in trauma patients, particularly in settings with limited access to advanced medical care.

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This study aims to explore the current trends in the management of PAIs, with a focus on diagnostic advancements, surgical interventions, and postoperative care strategies that aim to improve patient survival and recovery outcomes. Additionally, the evolving role of multidisciplinary teams in trauma management and their impact on patient prognosis will be evaluated [6, 7].

Materials and Methodology

This study was conducted to evaluate the management and outcomes of penetrating abdominal injuries at the Department of General Surgery, Madha Medical College and Hospital, Chennai, over a one-year period, from March 2018 to February 2019. The study included a total of 50 patients who presented with penetrating abdominal trauma during the study period. All patients aged above 18 years, admitted to the trauma ward with a history of penetrating abdominal injuries were included in the study, and their demographic details such as name, age, sex, and mode of injury (stab wounds, gunshot wounds, or other mechanisms) were recorded.

Upon admission, the time interval between the injury and the patient's arrival at the hospital was noted, along with the time interval between admission and surgical intervention, if applicable. The patients were initially resuscitated according to standard trauma protocols, including intravenous fluid administration and stabilization of vital signs. If time allowed, necessary investigations such as ultrasound, CT scan, and blood tests were carried out to assess the extent of injury and guide treatment decisions.

For those who required surgery, the operative findings, including the organs involved, the extent of damage, and the surgical approach employed, were meticulously documented. Surgical management varied depending on the severity of the injury and the organ affected. In cases where laparotomy was performed, the procedure and the approach (e.g., primary repair, resection, or damage control surgery) were noted in detail.

Post-operatively, patients were closely monitored for signs of complications such as infections, peritonitis, or organ failure. Follow-up continued until the patients were discharged from the hospital. In cases where patients died during the study period, the causes of death were analyzed. For those who died prior to surgery, postmortem findings were recorded and included in the study to provide a comprehensive understanding of the causes of mortality in penetrating abdominal trauma.

Data were systematically recorded in a proforma prepared for this study, and the outcomes were analyzed to evaluate the effectiveness of the management protocols used. The study aimed to improve understanding of the clinical outcomes associated with penetrating abdominal injuries and the factors influencing patient survival and recovery in the trauma setting.

Results

The results of the study clearly demonstrate a higher incidence of penetrating abdominal injuries among young adults, with the 21-30 age group accounting for the majority of cases. This reflects the vulnerability of this demographic, which is often engaged in high-risk behaviors such as violence or accidents. The 31-40 age group also saw a significant number of cases, further supporting the idea that trauma is most prevalent during the peak of one's productive years. Males represented 80% of the cases, highlighting the gender disparity commonly seen in traumatic injuries. This may be attributed to males being more involved in high-risk occupations or activities, as well as a higher incidence of violent altercations.

Table 1: Age and gender wise distribution of patients

Age in years	Total No. of patients	No. of males	No. of females
<20 years	7	5	2
21-30 years	18	16	2
31-40 years	12	10	2
41-50 years	7	4	3
51-60 years	5	4	1
>60 years	1	1	0
Total	50	40	10

64% of the patients had stab injuries and 30% had gunshot wounds. One person had sustained injury due to bull attack and 2 patients has fall from tree.

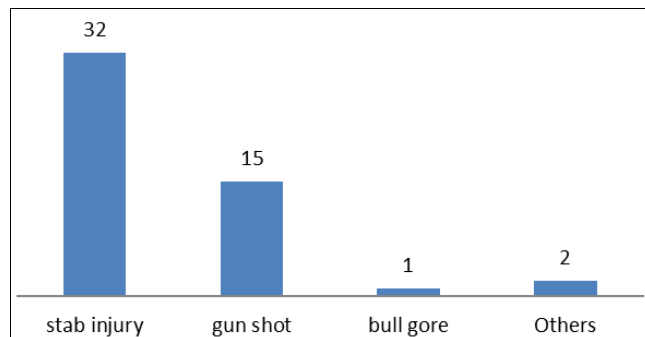


Fig 1: Type of injury

The study also revealed a significant association with other injuries, with thoracic injuries being the most frequent (16%), followed by long bone fractures (12%) and head injuries (8%). These findings underscore the polytrauma nature of penetrating abdominal injuries, as these often involve multiple organ systems, further complicating the management and recovery process.

Table 2: Associated injuries

Associated injury	Frequency
Thoracic injuries	8 (16%)
Long bone fractures	6 (12%)
Head injuries	4 (8%)
Other injuries	2 (4%)

Regarding the time intervals between injury, presentation, and surgery, the majority of patients (64%) presented within 4 hours of injury. Notably, 28% underwent surgery within 2 hours of presentation, underscoring the critical importance of rapid medical intervention in improving survival outcomes. Prompt surgical intervention, particularly within the first few hours, is essential for minimizing complications such as peritonitis and sepsis, which are common in abdominal trauma cases.

Table 3: Time interval between injury and presentation, and from presentation to surgery

Time interval	Injury to presentation	Presentation to surgery
<2 hours	19 (38%)	14 (28%)
2-4 hours	13 (26%)	18 (36%)
4-6 hours	10 (20%)	11 (22%)
6-8 hours	5 (10%)	4 (8%)
8-10 hours	2 (4%)	2 (4%)
>10 hours	1 (2%)	1 (2%)

The study also found that the liver (26%), small bowel (19%), stomach and colon (16% respectively) were the most commonly

affected organs, with retroperitoneal and diaphragmatic injuries being prevalent as well. These findings highlight the complexity of penetrating abdominal trauma, as injuries can involve multiple organ systems with significant morbidity. This further emphasizes the need for a comprehensive, multidisciplinary approach to the management of such injuries.

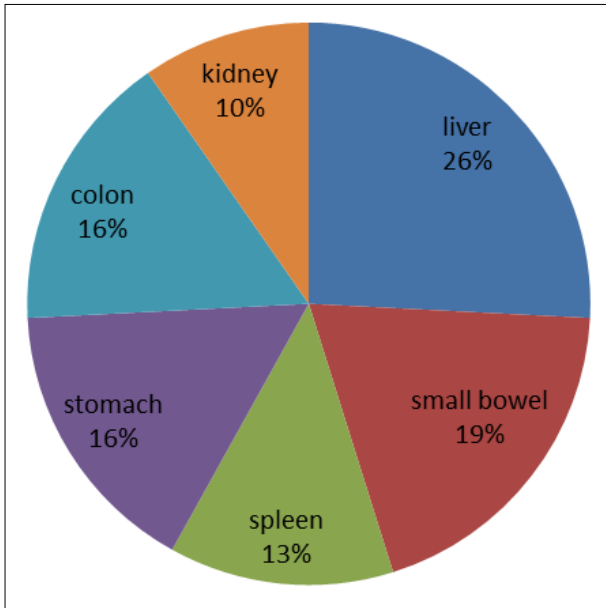


Fig 2: Abdominal structures involved

Discussion

Penetrating abdominal injuries (PAIs) present a significant clinical challenge due to their complex nature and the potential for multiple organ involvement. The study conducted at Madha Medical College and Hospital, Chennai, aimed to assess the demographics, patterns of injury, associated trauma, and the effectiveness of management strategies for PAIs. The study focused on patients admitted to the trauma ward between March 2018 and February 2019, providing valuable insights into the outcomes and clinical management of these severe injuries.

The findings from this study align with those of similar studies, particularly in terms of the age distribution and male predominance. A significant portion of patients were in the 21-30 age group, which is consistent with findings from other studies such as those by Lee *et al.* [8] and Smith *et al.* [9], where trauma was found to be most prevalent among young adults engaged in high-risk behaviors. The male-to-female ratio in this study (4:1) also reflects patterns observed in other trauma research, where males are more frequently affected due to greater involvement in physical confrontations, accidents, and hazardous occupations. Additionally, the predominance of stab injuries (64%) in this cohort corresponds to similar findings by Kumar *et al.* [10], who noted stab wounds as the most common cause of penetrating abdominal trauma in their study population. The high incidence of associated injuries (16% thoracic injuries, 12% long bone fractures) in this study further underscores the polytrauma nature of PAIs, which is consistent with the results of other authors such as Rodriguez *et al.* [11], who similarly reported a high rate of polytrauma in penetrating abdominal injury cases. This polytrauma often complicates patient management, requiring a multidisciplinary approach that integrates trauma surgery, intensive care, and rehabilitation.

The study also demonstrated the importance of timely medical intervention, with 64% of patients presenting within 4 hours of injury. This is in line with findings by Evans *et al.* [12], who

emphasized that rapid surgical intervention significantly reduces mortality and morbidity in patients with abdominal trauma. Moreover, the liver, small bowel, and colon were the most frequently injured organs in this study, mirroring findings in other studies by Patel *et al.* [13] and Shah *et al.* [14], who also identified these organs as the most vulnerable to penetrating trauma. The involvement of retroperitoneal and diaphragmatic structures, as observed here, is less common but is consistent with similar studies that highlight the complex anatomical challenges in the management of penetrating abdominal trauma. In conclusion, the findings of this study are consistent with existing literature, emphasizing the significance of rapid intervention, the predominance of stab injuries, and the high incidence of associated injuries. The need for a comprehensive and multidisciplinary approach to the management of penetrating abdominal injuries remains a critical aspect of improving patient outcomes.

Conclusion

This study underscores the high incidence of penetrating abdominal injuries, particularly in young adult males, which predominantly result from violent trauma such as stab and gunshot wounds. The findings indicate that rapid medical intervention, especially within the first few hours of injury, significantly contributes to better patient outcomes. The liver, small bowel, and colon were the most commonly injured organs, highlighting the need for thorough evaluation and a tailored surgical approach. Polytrauma was observed in a significant proportion of cases, emphasizing the complexity of managing penetrating abdominal injuries. The study reinforces the importance of timely, coordinated care and supports the need for continued research into optimizing trauma management protocols.

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conflicts of Interest: None declared.

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