



Evaluation of Penetrating Abdominal Injuries: A Prospective Study in A Tertiary Care Centre

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Abstract

Abdominal penetration injuries pose considerable difficulties for trauma care. Injuries to the abdomen may have deadly consequences. The fact that abdominal trauma affects individuals of all ages and socioeconomic backgrounds and is linked to high rates of morbidity and mortality raises serious concerns about public health. Penetrating abdominal trauma is a major reason for surgical emergency. It is essential to comprehend the etiology, degree of organ involvement, best management practices, and related outcomes in order to enhance patient care and lower adverse event rates. To study the aetiology, the extent of organ involvement in the penetrating injury and organs commonly involved and to evaluate the morbidity rate, modalities of treatment, complication and prognosis. This prospective observational study included 40 patients with penetrating abdominal injuries admitted in a tertiary care hospital of South India over a two-year period. Study participants comprised adults over the age of 18 who had abdominal penetrations. Information on demographics, injury types, results of clinical exams, diagnostic tests, surgical procedures, and complications following surgery were all documented and analyzed. The study population included a wide range of demographic traits, with middle-aged men making up the majority. The age distribution was 41.65±5.56 years. Homicide was the most frequent way of penetration that resulted in abdominal injuries, accounting for 21 (52.5%) of the patients. In the majority of the patients, 31 (77.5%), the latent interval between the onset of injury and presentation was between 1 and 5 hours. For 16(40%) of the patients, the lumbar area was the most often injured area. The majority, 10 (37%) had a laparotomy because of peritoneal penetration, 9 (33%) because of peritonitis and 8 (30%) because of evisceration. Of the patients, 14 (35%) had abnormal plain X-ray findings. In 24 cases (60%) laparotomies were done as a therapeutic measure. Depending on the type and extent of the injuries, different surgical techniques were used, among the therapies were visceral tear repair and splenectomy. Penetrating abdominal injuries need to be identified quickly, thoroughly evaluated and managed appropriately to maximize patient outcomes, Even though these injuries present difficulties, the prognosis can be improved and complications can be reduced with prompt surgical intervention and thorough postoperative care. More investigation is required to improve therapeutic and diagnostic strategies for the better handling of abdominal trauma.

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Key Words

Abdomen, complications, injury, trauma management, surgical intervention

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INTRODUCTION

Perforating abdominal injuries continue to be a major global public health concern, as they are a major cause of morbidity and mortality. These wounds cover a broad range of trauma, from superficial cuts to serious cuts that penetrate organs^[1].

The intricate anatomical structures and essential organs located within the abdominal cavity present specific problems for healthcare personnel when dealing with abdominal trauma, especially penetrating injuries^[2]. Penetrating injuries can be caused by a variety of processes, including but not limited to stab wounds, gunshot wounds and workplace accidents. The precise organs impacted as well as the speed and velocity of the penetrating item determine how severe these injuries are^[3].

The abdomen contains critical organs such as the intestines, spleen, pancreas, liver as well as major blood veins, rendering it vulnerable to severe injury if penetrated. Depending on the mechanism, force and anatomical location of the trauma, the level of organ involvement following penetrating abdominal injuries varies greatly^[4]. Stabbing and gunshot wounds are the most frequent mechanisms seen in clinical practice, while other causes such as accidents, self-harm and interpersonal violence can also result in penetrating abdominal injuries^[5].

The growing frequency of armed conflicts and urban violence in many areas emphasizes how crucial it is to solve this pressing problem. Furthermore, because of the severity of penetrating abdominal injuries, it must be managed quickly and effectively to avoid potentially fatal outcomes like sepsis, bleeding, and peritonitis^[6].

Making decisions in the context of surgical intervention is difficult and necessitates giving careful thought to a number of variables, such as the hemodynamic stability of patients, the results of the clinical examination, imaging studies and the surgical outcome. It is crucial to comprehend the etiology, degree of organ involvement, best management practices, and related rates of morbidity and mortality in order to enhance patient outcomes and reduce needless interventions^[7,8].

Avoiding unnecessary laparotomies is essential since it not just reduces the risk of perioperative complications, but also reduces overall healthcare burden along with consumption of resources. Thus, determining trustworthy patient selection criteria is crucial to directing clinical judgment and maximizing results. Negative laparotomies, which are exploratory procedures that do not find severe injuries that need to be repaired, put patients at risk as well as put a burden on the healthcare system, lengthen hospital stays and raise expenditures^[9].

Predicting patient outcomes also requires an understanding of the morbidity linked to injury to various abdominal organs. The development of an intra-abdominal abscess, colon fistulas and persistent pain are examples of complications that can seriously impair the quality of life and long-term prognosis of patients^[10].

The treatment of penetrating abdominal injuries is still difficult, even with improvements in trauma care along with diagnostic imaging technologies. Prospective studies are required to fully assess the cause, degree of organ involvement, best course of treatment and related outcome among individuals with penetrating abdominal injuries. Healthcare professionals can identify patients at high risk who need immediate surgical intervention, learn important information about damage patterns and create evidence-based protocols to improve patient care by carrying out such a study.

Aims and Objectives:

- To study the aetiology, the extent of organ involvement in the penetrating injury and organs commonly involved
- To evaluate the morbidity rate, modalities of treatment, complication and prognosis.

MATERIALS AND METHODS

Study Design: This study is a prospective observational study on 40 patients with penetrating injuries to the abdomen admitted in Sree Mookambika Institute of Medical sciences, a tertiary care hospital in south India for a period of 2 years from October 2021-September 2023.

Study Population: All patients who presented to the hospital emergency department with abdominal penetrating injuries during the study period were included. Prior to their involvement in the study, every patient or legal guardian provided their informed consent.

Inclusion Criteria: Patients over the age of 18 with a penetrating injury to the abdomen, whether suicidal, assaultive, or accidental, who were willing to provide written informed consent and to participate in the study.

Exclusion Criteria: Patients who were not willing to provide consent or participate in the study, patients with non-penetrating abdominal trauma and patients with penetrating injuries to locations other than the abdomen.

Data Collection: The study involved a total of 40 patients. Prior to participation, each patient provided written and informed consent. Name, age, gender, occupation, economic position, and level of literacy were among the demographic data that was documented. A standardized proforma was used to record information about the type of injury, the time of the incident leading to the injury, the results of the clinical examination, the results of the diagnostic investigations, the intra operative findings, the operative procedures, and any complications that occurred during the hospital stay and follow-up. Patients receive a comprehensive clinical assessment after the initial resuscitation. Additional investigations, including local wound exploration, radiographic examinations, and diagnostic peritoneal lavage (DPL), were ordered based on the clinical findings. A thorough evaluation of the results of the inquiry and clinical trials was used to determine whether to move forward with the surgical intervention. A midline laparotomy involves a thorough exploration of the abdomen, including a look at the stomach, the small intestine, large intestine as well as solid organs. This allows for the identification of pathology and the use of the organ injury scale.

Statistical Analysis: The information collected were analyzed and statistical techniques were used as needed. For data analysis, SPSS 20.0 statistical software was used. Microsoft Word and Excel are used to create tables. Frequencies and percentages were used to express categorical variables.

RESULTS AND DISCUSSIONS

A thorough examination of the study population was given in result (table 1), which covers age groups, gender distribution, penetration mode, latent duration, related injuries, injury site and local wound exploration. The age range covered by the study was 13-68 years old, with the most common age group being 41-50 years. The age distribution was 41.65 ± 5.56 years. Males were impacted at a rate of 80% compared to 20% for females. Homicide was the most common manner of penetration that resulted in abdominal injuries, accounting for 21 (52.5%) individuals. The majority of patients 31(77.5%) had a one to five-hour latent period between injury onset and presentation. The most common site of injury was lumbar region in 16(40%) patients.

The majority, 10 (37%) had a laparotomy due to peritoneal penetration, 9 (33%) for peritonitis and 8 (30%) for evisceration. Of the patients, 14 (35%) had abnormal plain X-ray findings. In 24 cases (60%) laparotomies were done as a therapeutic measure. In 8 patients (20%), omental evisceration was performed. (Table 2)

(Table 3) illustrates the distribution of operative procedures performed among the study participants.

The most prevalent postoperative consequence was wound infection, which accounted for 6 (15%) of cases, followed by small intestinal damage in 4 (10%) patients. Patients who had surgery for small bowel damage frequently experienced this. Respiratory infections were also found in four (10%) of the cases. The remaining 26 (65%) patients experienced no post-operative difficulties.

The findings of this study provided insight into the features, surgical procedures and postoperative problems related with abdominal penetrating injuries. The age range covered by the study was 13-68 years old, with the most common age group being 41-50 years old. The bulk of the patients were male, with a mean age of 41.65 ± 5.56 years. The results of the study were comparable to those of Sander^[11], where the mean age was 28.3 years and 94.7% of the participants were young men. Of the 105 patients in the study by Bansal^[12] 88.5% were men and 11.5% were women. The patients' average age was 31 ± 14.12 years.

In the current study, homicide was the primary mode of penetration. However, geographical location and sociocultural factors may cause variances in frequency and distribution. Patient outcome was significantly influenced by the latent period that exists between the time an injury occurs and its presentation. The study helps to clarify the necessity of medical action by classifying this gap into discrete time intervals.

Laparotomy was the most common therapeutic procedure, which supports the results of earlier research and emphasizes its importance in the diagnosis and treatment of abdominal injuries.

The study highlighted the wide range of therapies needed to treat injuries that penetrate the abdomen. The administration of Gell foam for liver lacerations and the splenectomy procedure were in line with accepted surgical procedures for treating particular organ damage. Omental, mesenteric and mesocolonic rip repairs highlight how careful surgical procedures are when trying to protect abdominal structures and reduce complications. The incidence of negative laparotomy underscores the difficulties in correctly identifying abdominal injuries, hence requiring more improvement of diagnostic techniques.

In the study by Gupta^[13] Out of the 65 patients that were included, 63(96.92%) patients, had pain, 20 had gastrointestinal hemorrhage, 7 had hypovolemia, 11 had vomit stained with blood, 23 had breathing noises and 9 had protruding intestine. More patients (63.07%) ranged in age from 21-40 years. Of the 65 patients, 11 had injury to the diaphragm, 6-the esophagus, 9 to the stomach, 20 to the liver, 15 to the small intestine and 4 to the spleen.

Table:1 Descriptive characteristics of the study population

S.No	Descriptive characteristics		Frequency (n = 40)	Percentage (%)
1.	Age in groups (years)	13- 20	4	10
		21-30	9	22.5
		31-40	9	22.5
		41-50	10	25
		51-60	4	10
		>60	4	10
2	Gender	Male	32	80
		Female	8	20
3.	Mode of penetration	Homicide	21	52.5
		Suicide	3	7.5
		Bull gore	4	10
		Fall on sharp objects	12	30
4.	Latent period	1-5hrs	31	77.5
		5-10hrs	7	17.5
		10-15hrs	1	2.5
		>15hrs	1	2.5
5.	Associated injuries	Head and neck	5	12.5
		Chest	3	7.5
		Extremities	8	20
		Absent	24	60
6.	Site of injury	Epigastrium	2	5
		Left hypochondrium	4	10
		Right hypochondrium	5	12.5
		Umbilical	5	12.5
		Left lumbar	10	25
		Right lumbar	6	15
		Left iliac	1	2.5
		Right iliac	5	12.5
		Hypogastrum	2	5
		Absent	5	12.5
7.	Local wound exploration	Present	35	87.5
		Absent	5	12.5

Table:2 Surgical intervention of the study population

S.No	Surgical intervention		Frequency (n = 40)	Percentage (%)
1.	Indications for laparotomy	Peritoneal penetration	10	37
		Peritonitis	9	33
		Evisceration	8	30
2.	Plain x-ray abdomen and chest	Normal	26	65
		Abnormal	14	35
3.	Role of laparotomy	Therapeutic	24	60
		Negative	3	7.5
		Conservative	13	32.5
4.	Ratio of laparotomy to conservative treatment	Operated	27	67.5
		Conservative	13	32.5
5.	Incidence of evisceration	Omentum	4	10
		Bowel with omentum	4	10
		Nothing	32	80

Table 3: Operative procedures done among the study participants

S.No	Operative procedure		Frequency (n = 40)	Percentage (%)
1.	Mesoderm	Secondary closure	12	30
		Negative	3	7.5
		Rent closure	4	10
2	Omentum	Repair	2	5
3	Mesentry	Rent closure	2	5
4	Spleen	Splenectomy	1	2.5
5	Liver	Gell foam tamponade	3	7.5
6	Colon	Serosal tear repair	2	5
7	Diaphragm	Rent closure	1	2.5
8	Duodenum	Gastrojejunostomy	1	2.5
8	Jejunum	Primary closure	2	5
		Resection and anastomosis	1	2.5
		Primary closure	3	7.5
9	Ileum	Resection and anastomosis	3	7.5
		Resection and anastomosis	3	7.5

Murari^[14] 20% of patients in their study had organ evisceration, 66.66% had omental evisceration and 13.33% had both omental and organ evisceration. Additionally, 26.66% of patients had an emergency laparotomy, 20% had an early laparotomy, 16.66% had a late laparotomy and 36.66% of patients received non-operative care.

The most frequent unfavorable result among the surgical complications was wound infection. This is

consistent with previous research showing that surgical incisions were prone to infection, especially when intestinal damage was present. Even though they were less common, respiratory infections indicate the systemic effects of abdominal trauma and surgical procedures.

According to the study by Hanna^[15] 23% of participants had damage control laparotomies (DCLs) and their mean injury severity score was 19 (15-25).

Major abdominal complications occurred at a rate of 22% (fascial dehiscence 4%, superficial infection at the surgical site 7% and intra-abdominal abscesses 19%). In comparison to patients who suffered stab wounds, patients with firearm injuries experienced greater rates of intra-abdominal abscesses (27% versus 10%, $p < 0.01$), superficial surgical site infections (11% versus 3%, $p < 0.01$), fascial dehiscence (5% versus 3%, $p = 0.03$), non-abdominal complications (54% versus 24%, $p < 0.01$) and post-discharge mortality (8% versus 6%, $p < 0.01$).

Pau^[16] found that among patients who had a laparoscopy for trauma, there was a 19% incidence of negative laparoscopy, 11% reoperation rate, 7.4% conversions and 27% overall morbidity. There was also no fatality. The range for the median stay in the critical care unit was 0-41 days and the range for the median total hospital stay was 2-78 days.

CONCLUSION

A prevalent surgical emergency was penetrating abdominal injuries, which mostly affected middle-aged males between the ages of 31 and 50. Management was determined by the duration, frequency, and magnitude of the injury. The provision of care at the scene of the trauma and the creation of modern trauma treatment facilities can shield these patients from morbidity and death. Efficient therapy necessitates a meticulous clinical assessment and suitable diagnostic research. Patients who had been eviscerated frequently need therapeutic laparotomies. Adequate resuscitation and prompt care can minimize postoperative complications and lower mortality.

Limitations: Due to its observational design and possible biases in the data collection process, the study may have limitations. The results of this study may not be applicable to populations outside of the study context. For certain cases, the follow-up data may be insufficient, which could result in follow-up bias.

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