

An Evaluation of Splenic Trauma and Its Management at Tertiary Care Institute

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Abstract:

Introduction: Trauma is the leading cause of death in people under the age of 45 years and is among the top three leading causes of death in all age groups.

Aim: To investigate the epidemiology, diagnosis, and management of splenic trauma patients in a tertiary care hospital.

Methodology: The prospective and observational study was conducted in the Department of Surgery at R.N.T. Medical College, Udaipur, and Rajasthan. The study was planned during the period of February 2023 to July 2024 with the approval of the institutional ethical committee.

Result: The study found that the majority of patients with splenic injuries were young, primarily due to road traffic accidents (73.6%), with significant morbidity and mortality linked to delayed hospital admissions, while pain was the most common symptom; overall mortality was 5.2%, with two high-grade cases dying within a week despite intensive care.

Conclusion: Splenic injuries primarily affect young individuals due to trauma, with timely transport and tailored management crucial for improving outcomes, as non-operative approaches are effective for lower grades while higher grades often necessitate surgery.

Keywords: Splenic Trauma, Road Traffic Accidents, Trauma.

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Introduction

Trauma remains the leading cause of death in individuals under 45, with abdominal trauma [1] accounting for approximately 15% of emergency department cases. The spleen is the most frequently injured organ in blunt abdominal trauma [2], often resulting from motor vehicle collisions, falls, sports activities, or assaults. While penetrating splenic injuries are less common, they usually occur due to assaults, with knife injuries being less likely to penetrate the spleen due to its anatomical position [3]. Patients may present with symptoms such as abdominal pain, distension, or guarding, and can deteriorate to hemorrhagic shock if injuries go undiagnosed.

Diagnostic evaluations include blood tests and imaging studies, such as X-rays and CT scans, which help classify splenic injuries according to the AAST splenic injury scale. Management of splenic injuries hinges on injury grade and patient stabilization, with critical cases often necessitating immediate surgical intervention, while advances in bleeding management allow for more conservative

approaches even in severe cases. A multidisciplinary approach is essential, emphasizing the importance of assessing both anatomical injuries and physiological effects, and initial trauma management should adhere to the ABCs of resuscitation, focusing on hemorrhage evaluation in blunt trauma patients. It is important to assess whether the patient is in early shock and provide prompt resuscitation. Beware that there is a possibility of concomitant hollow viscus injury in patients with solid organ injury [4,5].

The operative interventions are done by open or Laparoscopic technique which may be splenorrhaphy or splenectomy. Recently angio-embolization has also tried to preserve splenic function [6]. Early diagnosis and treatment can always save a patient's life hence it needs to be dealt with on a priority basis before dealing with other injuries [7]. The management of splenic injury has changed considerably in recent years after a better understanding of role of spleen in maintaining immunity status of the body. Splenic salvage has become the goal of

treatment in splenic injury. Non-operative management can be done successfully in centers where close monitoring is possible, and facilities for emergency surgical intervention and follow-up are good. Splenic injuries due to blunt abdominal trauma who are hemodynamically stable, are suitable for this [8].

Splenic salvage is considered only when the condition of the patient (i.e. hemodynamic stability, associated injuries) and condition of the spleen (i.e. Grade of splenic injury) is favorable [9]. Splenic conservation can be attempted by doing splenorrhaphy, partial splenectomy, or splenic transplantation, all of which preserve the splenic function. Splenectomy should be reserved for patients who are hemodynamically unstable, with polytrauma, severe peritoneal contamination from concomitant bowel injury, severe grade of splenic injury, and traumatized pathological spleen [10].

Aim

To investigate the epidemiology, diagnosis, and management of splenic trauma patients in a tertiary care hospital.

Methodology

The prospective and observational study was conducted in the Department of Surgery at R.N.T. Medical College, Udaipur, and Rajasthan. The study was planned during the period of February 2023 to July 2024 with the approval of the institutional ethical committee.

This study will include all cases of abdominal trauma with documented evidence of splenic injury admitted to a tertiary care institute. It will encompass splenic trauma cases across pediatric and adult age groups, involving both genders. Cases will be excluded if they involve spontaneous rupture of the spleen due to other pathological conditions or if the splenic injury is iatrogenic in nature.

Result

Table 1: Age Distribution (n =38)

Age groups [Years]	No. of cases	%
< 20 yrs.	6	15.7
21 to 30 yrs.	11	28.9
31 to 40 yrs.	5	13.1
41 to 50 yrs.	7	18.4
51 to 60 yrs.	4	10.5
>61 yrs.	5	13.1

The majority of patients (28.9%) are in the age group of 21-30 years. The maximum number of patients falls into the age group below 50 years (76%). The mean age of the study group is 37 years.

Table 2: Cause & Incidence (n=38)

Mechanism of injury	No.	%
Road Traffic Accident	28	73.6
Fall From Height	7	18.4
Stab Injury	2	5.2
Physical Assault (Blunt weapon/ blow)	1	2.6

The maximum number of splenic injuries caused by road traffic accidents (73.6%). 18% of cases involves falls from height, and 7% of cases result from assault from which 2% was from a blunt weapon/blow and 5% from a stab injury.

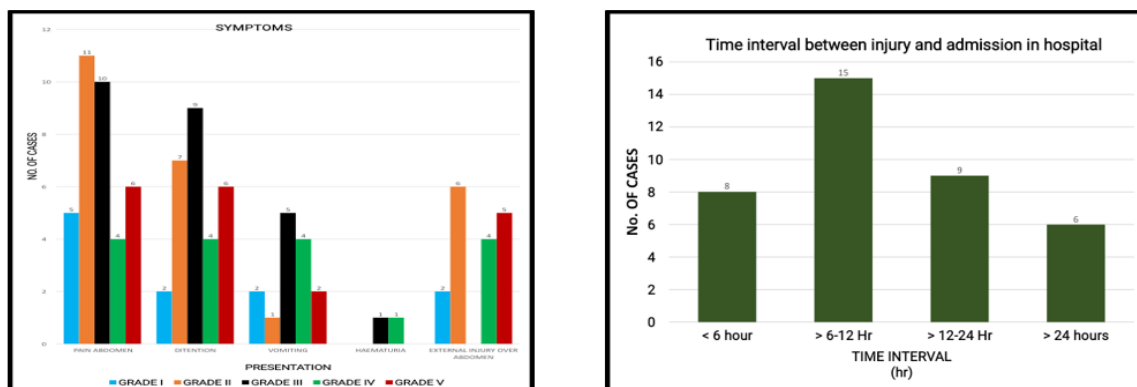


Figure 1: Symptoms of patients with splenic injury and time interval between injury and admission at the time of admission to hospital

A significant proportion of patients with splenic injury experienced delays in reaching the hospital, with 21.05% arriving within 6 hours, while 100% reported pain as the primary complaint, followed by abdominal distension (73.6%), external injury (68.4%), vomiting (36.8%), and hematuria (5.2%).

Table 3: Laboratory and biochemical examination

Investigation	No.	%
Haemoglobin (<10gm %)	21	55.2
P C V (<35%)	18	47.3
T L C (>10000 cumm)	17	44.7
Blood urea (>45mg/dl)	5	13.1
Sr. Creatinine (>1.6mg/dl)	3	7.8
RBC in urine	2	5.2

55.2% of patients have hemoglobin < 10 gm%, 47.3% have PCV < 35%, 44.7% of patients have TLC greater than 10,000 cumm, 13.1% of patients have blood urea greater than 45mg/dl and 7.8% patients have serum creatinine greater than 1.6 mg/dl. 5.2% of patients have RBCs in urine.

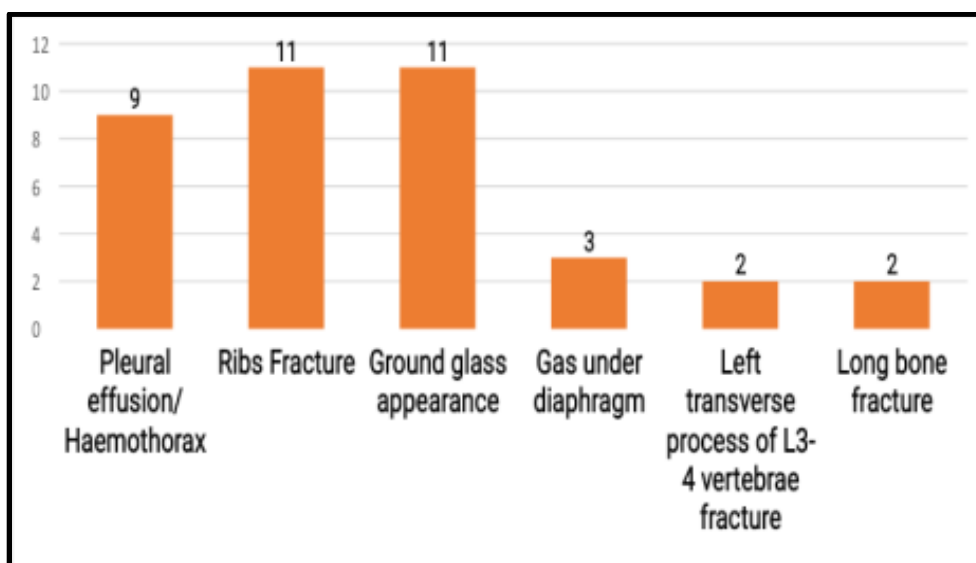


Figure 2: Roentgenography Finding

23.6 % of cases have pleural effusion / Haemothorax, 28.9% of patients have fractures in ribs, 28.9% of patients have ground glass appearance in flat plate abdomen, 7.89% of patients have gas under

diaphragm on flat plate abdominal X-ray examination. 5.26% of patients have left transverse process of L3-L4 vertebrae fracture and 5.26% of patients have long bone fracture.

Table 4: Severity of injury with hemoperitoneum (CT scan)

Hemoperitoneum	Grade I (n=7)	Grade II (n=11)	Grade III (n=10)	Grade IV (n=4)	Grade V(n=6)	Total	%
Mild	6	9	3	0	0	18	47.4%
Moderate	0	2	6	1	1	10	26.3%
Massive	1*	0	1	3	5	10	26.3%

47.4% of cases have mild hemoperitoneum, 26.3% cases have moderate hemoperitoneum and 26.3% cases have massive hemoperitoneum. 1* patient of grade I splenic injury is associated with grade IV liver laceration and has massive hemoperitoneum.

Table 5: Treatment of patients according to CT scan splenic injury grade

Splenic injury grade	Non-operative management (NOM)	Surgical
Grade I	7	0
Grade II	11	0
Grade III	10	0
Grade IV	1*	3
Grade V	2	4
Total	31	7

All grade I and II splenic injuries were successfully managed non-operatively, while 10 grade III cases were also treated non-operatively; however, surgical intervention was required for most grade IV (3 of 4) and grade V (4 of 6) injuries, with a p-value of 0.000075, noting that one stable grade IV patient was managed non-operatively, while two unstable grade V patients with polytrauma died during initial resuscitation.

Table 6: Postoperative complications in splenic injury patients (n = 7)

Complication	No.	%
Wound infection	1	14.28
Wound dehiscence	0	0
Respiratory complication	1	14.28
Urinary tract infection	1	14.28
Intra-abdominal collection	0	0

Postoperative complications are wound infection in 1(14.28%) case followed by respiratory complication in 1(14.28%) case, and urinary tract infection in 14.28% of cases. No Mortality cases after post-operative.

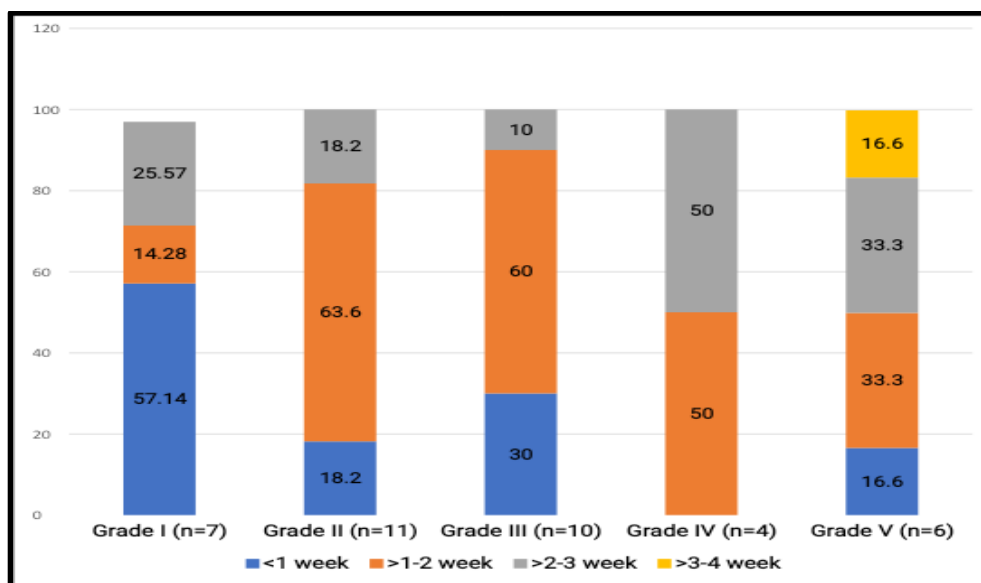


Figure 3: Hospital stays of splenic injury patients

In terms of hospital stays, grade I patients had 57.14% staying less than a week, while grade II had 63.6% staying 1-2 weeks; grade III saw 60% staying 1-2 weeks, grade IV had equal distributions of 50% for 1-2 and 2-3 weeks, and grade V had varied stays, with one patient from grade III and one from grade V dying within the first week.

Discussion

In our study, the majority of patients (28.9%) were in the age group 21-30 years. The maximum number of patients were in age ranging from 11 – 50 years (76%). The mean age of the study group was 37 yrs. The comparable incidence reported by S. Munitheja et al. (2019) [11] reported that the mean age of presentation was 29.5 years.

The most common mode of injury was Road Traffic Accident in our study (73.6%) cases, which is comparable to reports, S. Munitheja et al (2019)[11] 70%, Abinasha et al (2020) [12] 53.57%, Ashish et al (2018) [13] 62%, Abhijit et al (2023) [14] 44%, Muhammad Osman et al (2023) [15] 53.2%. In our study, the other mode of injury

in 3 cases (7.6%) was assault, and 7(18.4%) cases of fall from height. Avinash Rode et al (2021) [16] reported 13.4% of cases of assault and 25% of cases of falls from height.

The study identified road traffic accidents as the primary cause of blunt abdominal trauma in 73.6% of the 38 patients, attributed to high traffic volume, especially from two-wheelers, along with poor road maintenance and traffic regulations. Among the patients, 94.7% sustained blunt injuries, while only 5.2% had penetrating injuries, with one case involving a sharp weapon causing splenic and bowel injury and another causing isolated splenic injury from a sharp object. In other studies, Avinash et al (2021) [16] reported 94.2% blunt injuries and 5.76% penetrating injuries. In our study 8(21.05%) patients reached the hospital within 6 hours, 15(39.4%) within 6-12 hour, 9(23.6%) in hours, and 6(15.7%) after 24 hours, morbidity and mortality increased when patients reached late in hospital.

Early admission within the first 6 hours after blunt trauma significantly improves patient outcomes, reducing morbidity and mortality; delays in reach-

ing the hospital are often due to inadequate transportation, poor ambulance services, and lack of awareness about the severity of injuries, highlighting the importance of timely medical intervention as a critical prognostic factor. In the present series, the most common complaint was pain in the abdomen (100%), followed by distension of the abdomen (73.6%), Kehr's sign positive in 31.5% of cases, external injury over the abdomen in 68.4% of cases, vomiting in 36.8% cases.

A similar result was reported in S. Munitheja et al. (2019) [11] pain abdomen 90%, vomiting 20%. Abhijit et al (2023) [14] also reported pain abdomen at 90% abdomen distension at 4%, and vomiting at 2%. In our study hemoglobin was less than 10gm% in 21 cases (55.2%) while packed cell volume (<35%) was low in 18 cases (47.3%). Leucocytosis (TLC >10000) was seen in 17 cases (44.7%). Blood urea was raised in 5 patients (13.1%) while serum creatinine was raised (>1.6mg/dl) in 3 patients (7.8%). RBCs present in urine in 2 patients (5.2%). Garima (2015) reported hemoglobin of less than 10gm % in 18.75% of patients and raised WBC counts in 22.3% of patients.

Roentgenography investigations have a useful role in the diagnosis of abdominal trauma with associated injuries. A plain x-ray of the abdomen, including upright, left lateral decubitus and x-ray chest PA view when required may provide useful information.

In our study, 47.4% of cases have mild hemoperitoneum, 26.3% of cases have moderate hemoperitoneum and 26.3% cases have severe hemoperitoneum. Pinjala Nikhila et al. (2016) [17] reported hemoperitoneum, mild in 52.5% of cases, moderate in 35%, and severe in 12% of cases. Complications are wound infection in 1(14.28%) case followed by respiratory complication in 1(14.28%) case, and urinary tract infection in 14.28% of cases. No Mortality cases after post-operative.

In the study, hospital stays varied by injury grade, with 57.14% of grade I patients staying 1-2 weeks and notable cases in grades II to V also having extended stays; overall mortality was 5.2%, with two patients—one grade III and one grade V—dying within the first week. Both deceased patients had high-grade splenic injuries with massive hemoperitoneum and hemodynamic instability, despite aggressive fluid resuscitation and close ICU monitoring prior to surgical intervention.

Conclusion

Splenic injuries predominantly affect young population, typically from road traffic accidents or assaults, with common symptoms including abdominal pain and distension. Most patients are hemodynamically unstable, and CECT is vital for injury grading.

Non-operative management is effective for grades I, II, and III, while grades IV and V usually require splenectomy. Timely hospital transport and intensive management can significantly reduce morbidity and mortality, highlighting the importance of rapid intervention and appropriate treatment based on injury severity.

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