

Original Research Article

Clinical review of splenic trauma in central India: a prospective observational study

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ABSTRACT

Background: Spleen is one of the most commonly injured intra-abdominal solid organs. If undiagnosed in earlier stage patient may even present with shock. Even though management depend on grade on splenic injury, primary goal remains stabilizing the patient. The operative interventions are done by open or laparoscopic technique which may be splenorrhaphy or splenectomy.

Methods: A prospective observational study on 52 patients with splenic injury was performed. The study period was 27 months. Patients with clinical and radiological signs of splenic trauma were categorised and operative/ non-operative treatment was given as per protocol. The surgical and nonsurgical outcomes were evaluated during inpatient stay and follow-up was kept.

Results: Fifty-Two patients were analysed comprising 36 male and 16 females. Most common mode of injury was road traffic accident followed by falls. Grade III injury was commonest, while rib fracture was commonest associated injury. Pneumonia was a frequent complication postoperatively.

Conclusions: Splenic injury is a real threat after blunt abdominal trauma in young population. Vaccination and equalae of OPSI (Overwhelming post splenectomy infection) must be kept always in mind after splenectomy. Splenic trauma diagnosed early and treated immediately can save the patient's life.

Keywords: Splenic injury, Road traffic accidents, Splenectomy, Splenorrhaphy, OPSI

INTRODUCTION

Polytraumas are commonly associated with abdominal injuries. They are potentially life threatening where early diagnosis and treatment is the primary goal. Spleen is one of the most commonly injured intra-abdominal solid organs. The spleen lies in the left hypogastrium, where its hilum sits in the angle between stomach and kidney and is in contact with tail of pancreas. Trauma to spleen occurs most commonly due to its precarious location and unsupported splenic pedicle.^{1,2}

Splenic trauma presents with mild abdominal pain, distension or guarding over abdomen. If undiagnosed in

earlier stage patient may even present with shock. Diagnostic investigation may include complete blood count, USG abdomen, CT scan. Depending on CT findings, splenic trauma can be graded in 5 categories.

Even though management depend on grade on splenic injury, primary goal remains stabilizing the patient. The operative interventions are done by open or Laparoscopic technique which may be splenorrhaphy or splenectomy. Recently angio-embolisation is also tried to preserve splenic function.³ Early diagnosis and treatment can always save patient's life hence it needs to be dealt on priority basis before dealing with other injuries.^{4,5}

The aim of this study is to evaluate the cases of splenic trauma along with modalities of its management. We also want to study various causes, clinical features, management approach and complications of splenic trauma.

METHODS

To analyse the splenic trauma outcomes, a prospective observational study was conducted on patients presented with features of splenic trauma at tertiary care centre located in central India. The material for the study of surgical management of splenic trauma was taken from patients admitted to various surgical wards. The duration of the study was from July 2018 to October 2020. During the study period of 27 months, 52 cases of splenic trauma were studied under age groups ranging from 12 years to 70 years.

All cases, history, clinical examination, radiological examination and intra-operative findings were charted in a detailed case record format. The inclusion criteria consisted of all cases of abdominal trauma with evidence of splenic injury of any grade. Patients with immunocompromised status, pregnancy and not willing for participation in the study were excluded from the study. The surgical and nonsurgical outcomes were evaluated during inpatient stay and follow-up was kept.

The sample size for this study was determined after analysing hospital database for splenic trauma. An estimated sample size of 50 patients was calculated using the statistical formula. All the data was collected and tabulated. Descriptive statistics presented in tabular format with mean, standard deviation, percentage. For analytical statistical calculations continuous variables were presented as Mean standard deviation. Continuous variables were compared using Unpaired-T tests and two tailed p values were calculated. Categorical variables were expressed in actual numbers and percentages and were compared using Fisher exact test and the two tailed p value was calculated. The $p < 0.05$ was considered as statistical significance. Statistical analysis was done using free trial version of graph pad prism 6® for windows version 6.07 (trial) during the 30-days demo interval.

RESULTS

In the present study done for evaluation of splenic trauma patients, 52 patients were analysed over the period of 27 months. The results are shown as below:

The maximum number of patients were from the age group of 21-30 years of age (40%). The youngest patient was a boy aged 5 years, while the oldest individual was 62-year-old. On analysing the data, there was a clear male predominance in the study. There were 36 (69.2%) male patients while females comprised 16 (30.7%) cases. The male: female ratio was 2.25:1 (Table 1).

Table 1: Age distribution.

Age (years)	Number of cases	Percentage (%)
5-20	8	15.38
21-30	21	40.38
31-40	15	28.84
>41	8	15.38
Total	52	100

The different modes of injury in our study population are shown in Table 2 below. The commonest etiology of splenic trauma in our study was road traffic accidents. It comprised almost a third of case 18 patients (34%). Just lagging behind was fall from height 13 (25%). Remaining cases were due to railway accidents, other blunt trauma to abdomen etc.

Table 2: Mode of injury.

Mode of injury	Number of cases	Percentage (%)
Assault	2	3.8
Blunt assault	2	3.8
Blunt trauma	6	11
Fall from height	13	25
Railway accident	8	15
Road traffic accident	18	34
Stab by knife	2	3.8
Stab injury	1	1.9
Total	52	100

During evaluation of suspected splenic trauma patients, CT scan was done to grade splenic injury. In our analysis of 52 cases, mortality was seen in 7 cases (13.4%). Of those 7 cases, 5 (71.4%) had grade III injury, while 2 cases (28.6%) had grade IV splenic injury. The remaining 45 cases (86.5%) recovered well whose grades of splenic injuries is shown in Table 3 below.

Table 3: Various grades of splenic injuries in recovered/mortal patients.

Grades	Death (7) (13.46%)		Recovered (45) (86.53%)	
	Count	%	Count	%
Grade I	0	-	4	8.9
Grade II	0	-	11	24.4
Grade III	5	71.4	20	44.4
Grade IV	2	28.6	10	22.2
Grade V	0	-	0	-
Total	7	100	45	100

Cases of splenic injury were mostly because of road traffic accidents. This type of high velocity injuries is often associated with coexisting other organ injuries. The description of such associated injuries is shown in Table 4 below.

Table 4: Coexisting injuries along with splenic injuries in recovered patients.

Associated injury	Count
Femur	2
Humerus	1
Ribs	6
Tibia	1
Grade II liver trauma	2
Grade III liver trauma	2
Head injury	5
Ileal perforation	5
Jejunal perforation	1
Jejunal tear	1
None	25

The various modalities of management for splenic injuries are categorised as operative and non-operative. In our study, only 5 cases (9.6%) patients were managed conservatively, whereas 47 cases (90%) were managed by some operative intervention (Table 5).

Table 5: Different modalities of management for splenic injuries.

Variables	Count	Percentage (%)
Non-operative/ conservative	5	9.6
Operative	47	90.38
Splenectomy	36	69.2
Splenectomy + blood transfusion	8	15.3
Splenorrhaphy	3	5.7
Total	52	100

The complications often occur post surgically. In our study the commonest complication was pneumonia in 7 cases (13.4%), while surgical site infection and wound gaping was observed in 5 cases each (9.6%). Twenty-eight cases (53%) of individuals had no complication (Table 6).

Table 6: Complications after management of splenic injuries.

Complications	Cases	Percentage (%)
Coagulopathy	1	1.9
Fistula formation	1	1.9
Patient died 1 day after surgery	1	1.9
Patient died 2 days after surgery	2	3.8
Pleural effusion	1	1.9
Pneumonia	7	13.4
Septic shock	1	1.9
Superficial wound infection	5	9.6
Wound gape	5	9.6
None	28	53.8

DISCUSSION

This study included the identification of the cause of the trauma and grading splenic injury thereby deciding the further management which was conservative or operative upon the type of injury. It was done in a group of patients who had history of abdominal trauma by modes like road traffic accidents, falls, assaults etc. We assessed the history based on the criterion compromising the history of patients or relatives' presentation of signs and symptoms, findings during the operative procedures.

The analysis of 52 cases of splenic injury; majority were due to road traffic accidents and others were due to fall from heights. Blunt trauma is the second commonest mode of abdominal trauma and spleen is the most commonly injured organ after blunt trauma. The overall mortality rate from splenic injury was reported as 13% or high in many series and this mortality rate is secondary to associated injuries.⁶⁻⁸

Patients with active splenic hemorrhage were more likely to undergo splenectomy than patients with contained injuries.⁹ Also, Intravenous contrast-enhanced CT has been shown to be accurate in the evaluation of splenic injuries resulting from blunt trauma.^{10,11} Grades of splenic injury are vital to know (Table 7).

Table 7: Grades of splenic trauma on dual arterial/portal venous phase imaging by CT scan.

Grades	Lesions
I	Subcapsular hematoma <10% of surface area
	Parenchymal laceration <1 cm depth
	Capsular tear
II	Subcapsular hematoma 10-50% of surface area
	Intraparenchymal hematoma <5 cm
	Parenchymal laceration 1-3 cm in depth
III	Subcapsular hematoma >50% of surface area
	Ruptured subcapsular or intraparenchymal hematoma ≥5 cm
	Parenchymal laceration >3 cm in depth
IV	Any injury in the presence of a splenic vascular injury* or active bleeding confined within splenic capsule
	Parenchymal laceration involving segmental or hilar vessels producing >25% devascularisation
	Shattered spleen
V	Any injury in the presence of splenic vascular injury with active bleeding extending beyond the spleen into the peritoneum

There is a general trend toward nonsurgical management of abdominal traumatic injuries as well as the confidence our surgeons have in our ability to accurately stage splenic injuries, including evidence of active bleeding, and to exclude with confidence other visceral injuries that would necessitate surgery.^{12,13} Others also reported in that

grade III splenic injury was the most frequent that corroborated our findings.^{14,15}

In our series we had performed total splenectomy in 84% patients. Other similar study also concluded that the need for splenectomy was most significantly correlated with higher grades of splenic injury.^{16,17} A study was conducted on children and adolescents were admitted to acute care hospitals in Pennsylvania, with a diagnosis of blunt injury to the spleen, where the researchers reported 23.2% of children with blunt splenic injury in their study were treated operatively. Of the 752 patients who were treated operatively, 56 (7.4%) were characterized as having had a partial splenectomy, 208 (27.7%) as a repair/plastic operation of the spleen, 484 (64.4%) as a total splenectomy and 4 (0.5%) as other operations on the spleen.¹⁸ In our study, postoperative complications were observed in around 46% cases. Post-operative complication was comparatively less than other studies.^{19,20} The success rates in treating blunt splenic injury in children had been reported to be over 90% in other studies.^{21,22}

In a Nigerian study, 23 cases were managed for splenic injuries that consisted of 21 males and 2 females within the age range of 16-60 years, whereas in our study there were 36 males and 16 females in our age group. The risk factors were blunt injury in 21 cases and penetrating in two cases with motor vehicle accident being the commonest which was corroborated by our study (34%). The mean injury arrival time was 25.2±26.5 hours. Fifteen patients underwent surgical intervention while eight cases were managed conservatively. Splenectomy was the most frequently performed procedure as seen in our study. Challenges identified in the management of patients with splenic injuries in Nigeria include delayed presentation, underutilization of CT, unavailability of interventional radiology, inadequate ICUs, limited vaccination, discharge against medical advice and poor follow-up.²³

In the hemodynamically stable patients with splenic injury, nonsurgical management has become the customary care in children and adolescents. But the opinion is divergent on outcome and prognosis. Researchers noted significant difference in time required for healing among all grades when followed up for injury healing on nonsurgical management on children and adolescents with splenic injuries grade 1-3. There was a clear relationship between the severity of blunt splenic injury and adolescents and the time course.^{24,25}

In a recent extensive review, Iribhogbe et al summarised that non-operative management of blunt splenic injuries has become the norm in the developed countries.²⁷ In the absence of RCTs, conservative management has shown itself superior to laparotomy, through practice, in terms of mortality rates, blood transfused and splenic preservation. The management protocols used abdominal CT scanning to diagnose the degree of splenic injury and

to rule out associated abdominal injuries requiring surgery. However, the sole indication of need for surgery was clinical-hemodynamic instability. Further, the reasons for surgical intervention in the non-operative group varied within the surgical panel responsible for the decisions that included both clinical and CT criteria.²⁶

It was shown that the major age group which underwent splenic trauma includes people from 21 to 40 years of age which was similar to the study done by Mario et al.²⁷ In this, the age group from 21 to 30 years showed major subset of accounting up to 40% of the patients. It was also noticed that the males were significantly more predisposed to splenic trauma involving a major chunk of about 69%. As in this region they were involved in the working class and hence were predisposed to the accidents which was also seen by Mario et al.²⁷

In our study the patients who survived were hemodynamically stable in the majority of cases (64%) and the subset in which patients died, majority were unstable (85%). The most common coexisting injury was found to be fracture of ribs (13%), followed by head injury (8.5%) and ileal perforation (8.5%) but in almost half of the cases no coexisting injury was found (53%). Also, few patients had Polytraumas with multiple organs injured which needed urgent management. In the most of cases splenectomy was done as an operative procedure (70%) and Splenorrhaphy was done in (6%), while around 10% patients were managed using conservative measures.

In our study, maximum number of patients were found to be of grade III, followed by grade IV injury. These grades are found to be similar in study by Mario et al.²⁷ The spectrum of complications revealed pneumonia as the most common in the patients amounting to 14% followed by surgical site infection and wound gaping. These findings are also similar to the study by Mario et al. In the given study 7 patients died amounting to 13.46% of total sample size and among them majority had grade III or higher injury with coexisting injuries and were highly unstable on clinical presentation which was similar to Mario et al.²⁷ The exploratory laparotomy was done and was found to be the best investigation as well as treatment modality for the patients with hemodynamically unstable splenic trauma. Sequelae of OPSI must be kept always in mind after splenectomy which can be managed by educating the patient about early hospitalisation and prompt treatment.

CONCLUSION

Splenic injury is a real threat after blunt abdominal trauma in young population. Immediate hospitalisation, investigation and operative intervention saves the patient however death may occur in higher grade injury probably due to unstable condition when they present. Splenic trauma diagnosed early and treated immediately can save the patient's life.

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