

# Outcome of Splenic Injuries in Adult Trauma Population

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## ABSTRACT

**Aim:** To highlight the mode of injury and various factors affecting the outcome of splenic injuries in adult trauma population in developing countries.

**Study design:** A prospective study comprised of 40 patients.

**Setting:** West Surgical Ward, Mayo Hospital, Lahore.

**Duration:** October 2011 to September 2013.

**Methods:** All the patients above 12 years of age either referred from the periphery or directly admitted in the emergency department with the diagnosis of splenic injury alone or associated with other organ injuries were included in the study.

**Results:** Male to female ratio was 7:1 with the mean age of 28 years in the study. Mode of injury in 22(55%) patients was blunt trauma abdomen. Most patients sustained grade III (32.5%) and grade IV (25%) splenic injuries. Majority of the patients (60%) underwent splenectomy, being the most frequently performed procedure for splenic pathologies including trauma. Postoperative complications observed in the study were respiratory tract infection in 5(12.5%) and wound infection in 4(10%) patients. Mortality rate was 10%.

**Conclusion:** In developing countries, although the blunt abdominal trauma is the leading cause of splenic injuries but the incidence of penetrating injuries to the spleen is also on rise day by day in the civil society. Increasing awareness about the risk of overwhelming postsplenectomy sepsis and postoperative complications are major incentives for splenic salvage and nonoperative management.

**Keywords:** Splenic injury, associated organ injuries, splenic salvage, splenectomy.

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## INTRODUCTION

The spleen is nestled in the left posterior upper quadrant in intimate contact with the diaphragm, stomach, pancreas, kidney and colon. The great ancient Roman physician Galen described the spleen as "plenum mysterii organum" or "the organ full of mystery" and he struggled to elucidate its function as to remove the evil humor "black bile" produced by the liver<sup>1</sup>. As the understanding of physiology and anatomy improved, it is now considered that the spleen is a friable, highly vascular organ holding 25% of the body's lymphoid tissue and has both hematological and immunological functions<sup>2</sup>.

Despite being protected under bony cage, the spleen remains amongst the vulnerable organs sustaining injury from amongst the abdominal trauma cases in all age groups and a missed splenic injury is the most common cause of preventable deaths in trauma patients<sup>3</sup>. Globally, splenic injuries account for 25% of all solid abdominal organ injuries and the mortality rate associated with splenic trauma is reported to be in between 7-18%<sup>4</sup>.

In the past century, the management of splenic injuries has continued to evolve from a focus almost entirely as splenectomy to splenic salvage and nonoperative management in isolated blunt trauma to

the spleen due to its role in the immunity and the danger of overwhelming sepsis in asplenic patient<sup>5-7</sup>.

## PATIENTS AND METHODS

The prospective study was conducted in West Surgical Ward, Mayo Hospital, Lahore for a period of two years. All the patients above 12 years of age either referred from the periphery or directly admitted in Accident and Emergency Department, Mayo Hospital, Lahore with the diagnosis of splenic injury alone or associated with other organ injuries were included in the study. The diagnosis of splenic injury was made on the basis of history, physical examination, abdominal tenderness, guarding, distension, imprint sign or penetrating wound in the left lower chest. During primary survey, hematological investigations (hemoglobin, total leukocyte and platelet count, blood grouping) and biochemical investigations (blood sugar, urea, creatinine and electrolytes) were advised in all patients while x-ray chest and abdomen were advised in stable patients only. Diagnostic peritoneal lavage was performed in 5 patients. The average time interval in between the infliction of injury and arrival in the emergency department was 4 hours. Sophisticated imaging modalities like CT scan and angiogram were not available in the emergency department. All the patients were given antibiotics and analgesia cover preoperatively and postoperatively. After preparation, once the abdomen was opened, a quick appraisal of

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bleeding sites was made. Injury severity of the spleen was defined according to Moore EE et al<sup>8</sup>. The preservation of spleen was not pursued in patients with protracted hypotension, coagulopathy, high grade splenic injury or devascularization of spleen and severe associated organ injuries. Drainage with external tube was provided in most of the patients. All the patients were keenly observed in the ward for earlier detection and prompt management of postoperative complications. Vaccination against encapsulated microorganisms was advised in those patients who underwent splenectomy. Hospital stay varied from 4-17 days with the mean of 8 days. The data was analyzed by SPSS 10.

## RESULTS

The study included 40 patients with isolated splenic injury or associated with other organ injuries. In the series 35(87.5%) patients were male and 5(12.5%) female with the age ranged from 14-65 years with the mean age of 28 years. At the time of admission in the emergency department 16(40%) patients were stable and 24(60%) were in the state of shock. Blunt trauma abdomen was the mode of injury in 22(55%) patients as in table 1.

Table 1: Cause/mechanism of splenic injury

Mode of injury	n	%age
Blunt trauma	22	55
Firearm injury	13	32.5
Stab injury	5	12.5

At exploratory laparotomy, after securing haemostasis, injury severity encountered was graded as in table 2.

Table 2: Severity of splenic injury

Grade	n	%age
I	4	10
II	8	20
III	13	32.5
IV	10	25
V	5	12.5

In the study, associated organ injuries were found in 26(65%) patients. Stomach, liver, diaphragm, small gut, large gut, pancreas, kidney, chest, brain and extremities were among the associated organs injured as in table 3.

Table 3: Associated organ injuries

No. of organs injured	n	%age
Isolated spleen	14	35
One organ	7	17.5
Two organs	10	25
Multiple organs	9	22.5

All the associated organ injuries were managed according to their own priority and protocols. During surgery, the decision to preserve the spleen or splenectomy was based primarily on the severity of splenic injury, intraoperative stability of the patient, coagulopathy and the severity of associated organ injuries as in table 4.

Table 4: Operative techniques for splenic injury

Operative procedure	n	%age
None	3	7.5
Simple/horizontal mattress sutures	10	25
Segmental resection	3	7.5
Splenectomy	24	60

All the patients were observed keenly in the ward for the earlier detection and prompt management of postoperative complications as in table 5.

Table 5: Postoperative complications with management

Complication	n	Management
Respiratory tract infection	5(12.5%)	Conservative
Wound infection	4(10%)	Opened and aseptic dressings
Subphrenic abscess	2(5%)	Conservative

Mortality in the series was 10% (4 deaths). One patient expired on the operative day because of exsanguination and coagulopathy and 2<sup>nd</sup> patient with associated head injury died on 3<sup>rd</sup> postoperative day. The other two patients expired on 7<sup>th</sup> and 9<sup>th</sup> postoperative day respectively because of adult respiratory distress syndrome and multiple organ failure. All of these patients were admitted in the state of shock and along with resuscitation underwent splenectomy and management of their associated organ injuries.

## DISCUSSION

In developing countries, injuries in general and splenic injury in particular are increasing due to an increase in urbanization, motorization, civil violence, wars and criminal activities<sup>9</sup>.

Trauma surgeons have learned much about spleen from their pediatric colleagues. The spleen is particularly vulnerable to trauma of left lower thorax. Associated organ injuries can be an undue source of excessive morbidity and mortality and can readily be ruled out by immediate laparotomy. The credo that states "all unstable trauma patients are in hemorrhagic shock until proven otherwise" serves the trauma surgeons well. In this area of shock, the blood is either in the chest, abdomen or on the floor. The risk for postsplenectomy infectious complications and the appreciation of the spleen's immunologic

importance have provided an impetus to attempt splenic salvage after trauma<sup>10</sup>.

Trauma is a disease of productive age with marked male preponderance. In the series, 87.5% patients were male and 12.5% female with the mean age of 28 years which is in comparison with the study conducted by Renzulli P et al<sup>11</sup> where 70.9% were men with the mean age of 38.2 years.

The cause and pattern of splenic injuries vary worldwide from continent to continent. In the study, the mode of splenic injury was blunt abdominal trauma in 55% and penetrating injuries in 45% patients which is in near resemblance with the study carried out by Mufti TS et al<sup>12</sup> where they managed 57.9% patients with blunt trauma abdomen causing splenic injury.

The splenic injuries are commonly associated with other organ injuries, being one of the most important factors influencing the outcome in splenic trauma. In the series, 32.5% patients sustained grade III and 25% grade IV splenic injuries while 65% patients had associated organ injuries which is in comparison with the study conducted by Chalya PL, et al<sup>13</sup> where 39% patients had grade III and 38.1% grade IV splenic injuries with associated organ injuries in 40.7% patients.

Indeed, the intact spleen deserves respect but the damaged spleen warrants even greater reverence. In the study, splenectomy was performed in 60% patients and splenic salvage procedures in 40% which is comparable with the study carried out by Khan AZ, et al<sup>14</sup> where splenectomy was done in 66% patients.

Splenic injuries constitute a continuing diagnostic and therapeutic challenge to the trauma or general surgeons practicing in developing countries. Postoperative complications observed in the series were 27.5% and mortality rate 10% which is similar with the study conducted by Cadeddu M et al<sup>15</sup> where the mortality rate was 9.3% in their operative group.

## CONCLUSION

Although trauma resulting from road traffic accidents remains the most common cause of splenic injuries but the incidence of penetrating injuries to the spleen is also on rise in civil society day by day in developing countries. Elderly age, poor prehospital care, exsanguination, severity of splenic injury, coagulopathy, severity of associated organ injuries, adult respiratory distress syndrome and multiple organ failure are the major factors directly affecting the outcome of spleen injuries in adult trauma population.

Preventive measures to reduce the incidence of road traffic accidents, licensed weapons, commandment of law and order and prevention of

overcrowding in urban areas will definitely reduce the incidence of trauma. The availability of trained medical emergency team at periphery with better transportation facilities, free availability of blood, experienced trauma surgeons and provision of modern diagnostic imaging tools like CT scan and angiogram in the emergency departments will definitely reduce the rate of both morbidity as well as mortality and will also help in splenic salvage and nonoperative management of splenic injuries in adult trauma population in developing countries.

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