A PROSPECTIVE STUDY ON SPLENIC INJURY

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ABSTRACT

BACKGROUND

An injured spleen is a well-known entity to those involved in trauma care. The majority of individual with a splenic injury now receive nonoperative intervention and therapy. This shift from operative to nonoperative treatment over the past several decades is a tremendous success story in which clinical judgment and reason triumphed over standard surgical dogma. In emergency room, restoration of airway, breathing and circulation should be focussed on. A careful history is the most important one. Nevertheless, the severity of the splenic injury plays a dominant part in determining whether nonoperative management is appropriate or-if-not-whether splenorrhaphy or splenectomy will be the more appropriate surgical option. As a general rule, younger, healthier patients with lower grade splenic injuries and fewer associated injuries and comorbidities are usually managed nonoperatively or with splenic repair, whether unstable, actively bleeding patients with more severe splenic trauma and/or multiple associated injuries require splenectomy.

The aim of the study is to evaluate-

1. The impact of blunt or penetrating abdominal trauma on spleen.
2. Various modes of injury.
3. Various modes of clinical presentation of cases.
4. The value of various available investigations employed.
5. The various methods of treatment.
6. The morbidity and mortality.

MATERIALS AND METHODS

This study was a prospective study of 20 cases of splenic injury admitted in the triage ward of Mahatma Gandhi Memorial Government Medical College Hospital, Trichy, over a period of 2 years from December 2014 to December 2016. Once the patient is admitted, the name, age, sex and mode of injury are noted. The time interval between splenic injury and admission and time interval between admission to hospital and surgery are recorded. After resuscitating the patient, all patients were subjected to careful clinical examination.

RESULTS

The total number of patients who had sustained splenic injuries were 20. In this study of the 20 patients, 15 cases were males and 5 cases were females. After improving the general condition of the patient, laparotomy proceeded in 12 cases, in which splenectomy done in 8 cases and splenoraphy in 5 cases.

CONCLUSION

Road traffic accident is the commonest cause for splenic injury abdomen. Predominance of male over female in splenic injury abdomen with the ratio of 3:1.People in the age group of 3rdand 4th decade were commonly involved in splenic injury abdomen constituting about 55%. Based upon the grading of injuries and haemodynamic stability of the patient and other associated injuries, decision of laparotomy versus conservative management was taken. 12 patients were managed surgically, 8 underwent splenectomy and 4 underwent splenoraphy by topical haemostatic agents and sutural repair. Overall mortality due to splenic injury abdomen was 15%. Sepsis and associated injury were the major causes of death.

KEYWORDS

Splenic Injury, Splenectomy, USG, CT.

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BACKGROUND

An injured spleen is a well-known entity to those involved in trauma care. The majority of individual with a splenic injury now receive nonoperative intervention and therapy. This shift from operative to nonoperative treatment over the past several decades is a tremendous success story in which clinical judgment and reason triumphed over standard surgical dogma. In emergency room, restoration of airway, breathing and circulation should be focussed on. A careful history is the most important one. In motor vehicle accident, it is imperative to know whether rapid deceleration occurred, whether the patient weared restraint

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device and the type of restraint. On physical examination, the most frequent signs are hypotension and peritonitis. On inspection of abdomen, detailed external injuries should be noted. Abdominal distension noted. On palpation, signs of peritonitis, guarding, rigidity and rebound tenderness maybe present. In cases of significant splenic trauma, the most common findings on DPL are either the return of gross blood or the presence of more than 1,00,000/mm^3 of red blood corpuscles. The sensitivity of DPL for detecting significant intra-abdominal injury has been reported to range from 82% to 96%, whereas its specificity ranges from 87% to 99%.[1]

Moreover, DPL itself carries an incidence of complications approaching 2.5%.[2,3] FAST is completely without risk of complications and, moreover, its performance does not preclude the subsequent performance of CT scanning. The sensitivity of FAST has been reported as anywhere between 42% and 93%, whereas its specificity ranges in various reports between 90% and 98%.[4] CT scanning is the diagnostic imaging modality of choice in all haemodynamically stable patients in whom splenic injury is suspected. The sensitivity and specificity of CT scanning (approaching 100% and 98%, respectively)[5] are superior to both FAST and DPL in detecting significant intra-abdominal injury and determining the need for surgery.

Grading System for Splenic Injury

This is used to classify the severity of splenic injuries and these have important implications in guiding both operative and nonoperative management decisions.

Organ Injury Scaling Committee (OISC) of the American Association for the Surgery of Trauma[6] helps not only in stratifying the severity of splenic injuries and determining proper therapy but also in providing a standardized and reproducible nomenclature for reporting purposes. This grading system incorporates both CT findings and intraoperative assessment of the injured spleen and consists of five levels of splenic injury, as follows.

Grade(*) and Type of Injury	Injury Description
I	
Haematoma	<10% surface area, subcapsular
Laceration	<1 cm parenchymal depth, capsular tear
II	
Haematoma	Intraparenchymal, <5 cm diameter subcapsular, 10-50% surface area;
Laceration	Parenchymal depth of 1-3 cm trabecular vessel not involved
III	
Haematoma	>50% surface area (subcapsular) or expanding; ruptured parenchymal or subcapsular haematoma
Laceration	Parenchymal depth of >3cm or trabecular vessels involved
IV	
Laceration	>25% devascularisation of spleen due to laceration involving hilar vessels
V	
Laceration	Completely spleen shattered
Vascular	Spleen devascularised, hilar vascular injury

Nevertheless, the severity of the splenic injury plays a dominant part in determining whether nonoperative management is appropriate or-if-not-whether splenorrhaphy or splenectomy will be the more appropriate surgical option. As a general rule, younger, healthier patients with lower grade splenic injuries and fewer associated injuries and comorbidities are usually managed nonoperatively or with splenic repair, whether unstable, actively bleeding patients with more severe splenic trauma and/or multiple associated injuries require splenectomy.

Aims of the Study

1. To evaluate the impact of blunt or penetrating abdominal trauma on spleen.
2. To evaluate various modes of injury.
3. To evaluate various modes of clinical presentation of cases.
4. To evaluate the value of various available investigations employed.
5. To evaluate the various methods of treatment.
6. To evaluate the morbidity and mortality.

MATERIALS AND METHODS

This study was a prospective study of 20 cases of splenic injury abdomen admitted in the triage ward of Mahatma Gandhi Memorial Government Medical College Hospital, Trichy, over a period of 2 years from December 2014 to December 2016. Once the patient is admitted, the name, age, sex and mode of injury are noted. The time interval between splenic injury and admission and time interval between admission to hospital and surgery are recorded. After resuscitating the patient, all patients were subjected to careful clinical examination.

Depending on the clinical findings, decision was taken for further investigations such as four-quadrant aspiration, x-ray abdomen, ultrasound and CT abdomen. The decision for operative and nonoperative management depended upon the outcome of clinical examination and diagnostic tests. Patients selected for conservative management were placed on strict bed rest, serial clinical examination, which included hourly pulse rate, blood pressure, respiratory rate and repeated abdominal examination. In those who are operated, the operative findings and methods of management are recorded. Case are followed up till their discharge from the hospital. If patient expired, postmortem

findings are noted. Postoperative morbidity and duration of hospital stay were recorded. The above facts are recorded in a proforma prepared for this study.

RESULTS

The total number of patients who had sustained splenic injuries were 20. In this study of 20 patients, 15 cases were males and 5 cases were females. The increase in the incidence of association of males is due to acts of violence and vehicleaccidents. Peter et al found patients between 4 and 82 years with mean age 27.5 years. Akio and Toshibumi between 6 and 80 years with mean age of 33 years.[7,8] Karen J Brasel et al found patient between 6 and 84 years with mean age of 31.4 years.[9]

Age Distribution

Age Group (Years)	Numbers	%
13-20	2	10%
21-30	6	30%
31-40	5	25%
41-50	4	20%
51-60	2	10%
>60	1	5%
Total	**20**	

Table 1. Shows the Age Group Involved in this Study

Sex Incidence

Gender	Number of Patients	%
Male	15	75%
Female	5	25%
Total	**20**	**100%**

Table 2. Sex Incidence

The report of Stork showed the incidence of splenic injury in males and females as 69.69% and 30.3%, respectively.[10] Elmo et al found incidence between males and females as 84.98% and 15.01%.[11]

Ratio of Operative to Nonoperative Management

Type	Number of Patients	%
Operated	12	60%
Conservative	8	40%

Table 3. Operative vs. Nonoperative

Mode of Injury

Mode of Injury	Number of Cases	%
RTA	11	55%
Fall from height	5	25%
Fall of heavy object on abdomen, inc. wall collapse	3	15%
Kick by animal	1	5%

Table 4. Mode of Injury

Symptoms and Signs

The following table shows the incidence of various symptoms and signs with which the 20 patients studied. White shell reported that pain constantly dominated the symptomatology of splenic laceration. Shock was either due to hypovolaemia or reflex due to severe pain or apprehension. Tripathi reported shock in 37% of patients.[12] Darvis reported hypovolaemic shock in 12% of patients out of his 437 patients of blunt injury.[13] Jervis et al observed rigidity was a reliable finding in splenic trauma patients.[14]

Symptoms % Signs	Number of Patients
Abdominal pain	15
Abdominal distension	12
Guarding and rigidity	12
Abdominal tenderness	14
Pallor	10
Pulse >100/min.	12
BP <90 mmHg systolic	11
Absent bowel sounds	8

Table 5. Symptoms and Signs

Time of Presentation

Time Interval	Number of Cases	%
0-4 hours	9	45%
4-8 hours	4	20%
8-12 hours	3	15%
12-24 hours	2	10%
>24 hours	2	10%

Table 6. Time of Presentation

Associated Injuries

Other Injuries	Number of Patients	%
Head injuries	1	5%
Thoracic injuries	2	10%
Orthopaedic injuries	1	5%
Other abdominal organ injuries	3	15%
Combination	2	10.5%

Table 7. Injury to Other Organs

Operative- Splenectomy vs. Splenorrhaphy

Operative	Total Number of Cases
Splenectomy	8
Splenorrhaphy	5

Table 8. Operative Management

Investigations

Plain X-Ray Abdomen

Plain x-ray abdomen was done in all 20 cases. Gas under the diaphragm was found in only about 2 cases. 2 bowel perforations were detected at laparotomy. The following table shows the abnormal findings detected in x-ray erect abdomen.

Feature	Number of Patients
Gas under the diaphragm	2
Ground-glass appearance	2
Dilated loops	3

Table 9. X-Ray Abdomen Findings

Four Quadrant Aspiration

The number of patients who underwent four quadrant aspiration were 15.

Result	Number of Patients	Percentage
Positive	6	40
Negative	9	60
Total	15	100

Table 10. Four Quadrant Aspiration Results

The following table, analysis the results of four quadrant aspiration and splenic injury at laparotomy.

Four Quadrant Aspiration	Organ Injury At Laparotomy		Total
	Present	Absent	
Positive	4	2	6
Negative	5	4	9
Total	**9**	**6**	**15**

Table 11. Four Quadrant Aspiration vs. Laparotomy Findings

Four Quadrant Aspiration had a Sensitivity of 44.4% and a Specificity of 66.6%.

Ultrasound Examination

A total of 20 patients were subjected for ultrasound examination. Free fluid was seen in 8 cases. Splenic parenchymal injury without free fluid 5 cases.

CT Scan of Abdomen with Contrast

A total of 10 patients underwent CT scan abdomen in the study. CT scan abdomen was very helpful in grading the injury and managing the haemodynamically stable patients conservatively. Grade 1 and 2 injuries can be managed nonoperatively. Stassen and co-worker scitated that IV contrast enhanced CT scan is the diagnostic modality of choice for evaluating blunt splenic trauma.[15]

Postoperative Complication

The following table shows the postoperative complications in patients who underwent exploratory laparotomy.

Complication	Number of Patients
Wound dehiscence and infection	3
OPSI	1
Respiratory complication	4

Table 12. Postoperative Complications

Morbidity and Mortality

The mean range varied from 5 days to 46 days. The followings table shows duration of hospital stay of patients with blunt abdominal trauma including those who died.

Duration (Days)	Number of Patients	Percentage
1-9	4	20%
10-19	10	50%
20-29	4	20%
30-39	2	10%

Table 13. Duration of Hospital Stay

Mortality

Three patients with splenic injury abdomen died in the present study. 2 patients belonged to operative group and died in the postoperative period due to infection and remaining one to associated head injury. Therefore, the mortality rate in the present study is 15%.

DISCUSSION

Road traffic accident forms the single most important cause for splenic injury abdomen in our study. This assumes all the more significance because people involved in RTA are in their most active and productive phase of life. Injury is the commonest cause of death among people aged 1-34 years in the western world. Prevention is better than cure. A 10% increase in speed translates into 40% rise in case of fatality risk for the occupants of motor vehicle. Use of seatbelts reduces the risk of death or serious injury for front occupants by 45%. Helmets reduce the risk of fatal head injury by about one-third and reduce the risk of facial injury by two thirds among persons who ride two wheelers. Avoiding alcohol before driving is an important preventive step.

In the Management of Polytrauma Patients, the Steps in the ATLS Philosophy Should be followed

a. Primary survey with simultaneous resuscitation of the patient.
b. Secondary survey to proceed and identify all other injuries.
c. Tertiary survey and definitive care of the injuries.

The Steps in the Primary Survey are-

1. Airway with stabilisation of cervical spine.
2. Breathing and oxygen supplementation.
3. Circulation and haemorrhage control.
4. Disability evaluation.
5. Exposure and complete examination.

In this study of 20 patients who were admitted in triage ward met with deceleration type motor vehicle accident, a driver with a driver's side impact type motor vehicle accident or any patient with a direct blow to the left lower ribs or left upper quadrant of the abdomen. Based upon the clinical conditions and supportive investigations like plain x-ray abdomen, four quadrant aspiration, ultrasound abdomen, CT scan, haemodynamically unstable patients resuscitated.

After improving the general condition of the patient, laparotomy proceeded in 12 cases in which splenectomy done in 8 cases as there was massive haemoperitoneum in 6 cases, rest 2 cases (general condition didn't improve in spite of resuscitation).

The Following Indication for Laparotomy were Included in Our Study

1. Progressive shock not improved with resuscitative measures.
2. Shattered or avulsed spleen.
3. Multiple associated intra-abdominal injuries.

4. Haemoperitoneum.
5. Rupture of an obviously diseased spleen.

Open splenectomy done in all above-mentioned cases and drainage tube kept in left flank, which was usually removed by third or fourth day. In the remaining 4 cases, splenorrhaphy was done where two cases were managed by topical haemostatic agents such as Surgicel (oxidised regenerated cellulose) where there was no associated injuries. Rest of two cases were managed by sutural repair with 3-0 chromic catgut. Chromic suture is easy to handle, slides through the spleen without friction and needles large enough to make even deep stitches. It should be noted, however, that a variety of other absorbable or permanent suture materials have been successfully used during splenorrhaphy. The correct amount of tension to apply when tying chromic sutures across asplenic laceration is similar to that used when hepatic sutures are tied; i.e. no further tension should be applied once the chromic suture starts cutting through the rather friable capsule of the adult spleen. To avoid tearing through splenic tissue, viable pedicle of omentum can be readily mobilised from the adjacent stomach or colon. Use of Teflon pledgets found safe, but that was not done in this study of patients.

Among 12 patients who underwent surgery, either splenectomy or splenorrhaphy, four patients developed respiratory complications in the form of left lower lobe pleural effusion and atelectasis (minimal). They were managed conservatively with chest physiotherapy and antibiotics. Three patients developed wound infection, serous and seropurulent discharge came, wound swab was sent for culture and sensitivity, and based upon the reports, antibiotics were given and twice daily dressing done and gradually it settled down. Two patients died of infection (? overwhelming postsplenectomy infection) in the postoperative period in whom there were no septic focus, patient developed fever with chills, blood culture was inconclusive and were treated with higher antibiotics. Inspite of that, patient suddenly collapsed and we lost that patient by 10^{th} postoperative day. Mostly, patients were discharged by 10 to 15 days. Only in patients who have associated injuries, discharge was delayed. 8 cases managed conservatively as the grading of injury was less severe and followed up with repeat ultrasound and contrast CT done to assess the resolving status. Conservative management included bed rest, IV antibiotics, analgesics and vitals monitoring. Usually, patients were discharged after repeat ultrasound and advised to avoid heavy work atleast for 1 month.

CONCLUSION

- Road traffic accident is the commonest cause for splenic injury abdomen.
- Predominance of male over female in splenic injury abdomen with the ratio of 3:1.
- People in the age group of 3^{rd} and 4^{th} decade were commonly involved in splenic injury abdomen constituting about 55%.
- Based upon the grading of injuries and haemodynamic stability of the patient and other associated injuries, decision of laparotomy versus conservative management decision was taken.
- 12 patients were managed surgically, 8 underwent splenectomy and 4 underwent splenorrhaphy by topical haemostatic agents and sutural repair.
- Overall mortality due to splenic injury abdomen was 15%.
- Sepsis and associated injury were the major causes of death.

REFERENCES

[1] Nagy KK, Roberts RR, Joseph KT, et al. Experience with over 2500 diagnostic peritoneal lavages. Injury 2000;31(7):479-482.
[2] Gonzalesz RP, Ickler J, Gachassin P, et al. Complementary roles of DPL and CT in evaluation of blunt abdominal trauma. J Trauma 2001;51(6):1134-1136.
[3] Falcone RE, Thomas B, Hrutkay L, et al. Safety and efficacy of DPL performed by supervised surgical and emergency medicine residents. Eur J Med 1997;4(3):150-155.
[4] Rozycki GS, Ballard RB, Feliciano DV, et al. Surgeon performed ultrasound for the assessment of truncal injuries: lessons learned from 1540 patients. Ann Surg 1998;228(4):557-567.
[5] Wing VW, Federle MP, Morris JA, et al. The clinical impact of CT for blunt abdominal trauma. AJR Am J Roentgenol 1985;145(6):1191-1194.
[6] Moore EE, Cogbill TH, Jurkovich GJ, et al. Organ injury scaling: spleen and liver (1994 revision). J Trauma 1995;38(3):323-324.
[7] Mucha P, Daly RC, Farnell MB. Selective management of blunt splenic trauma. J Trauma 1986;26(11):970-972.
[8] Kimura A, Otsuka T. Emergency center ultrasonography in the evaluation of hemoperitoneum: a prospective study. J Trauma 1991;31(1):20-23.
[9] Brasel KJ. Evaluation of necessity of clinical observation of high energy trauma patients without significant injury after standardized emergency room stabilization. J Trauma 1998;44:273-282.
[10] Storck AH. Penetrating wounds of abdomen, an analysis of 46 personal cases. Ann Surg 1940;111:775-819.
[11] Cerise E J, Scully JH. Blunt trauma to small intestine. J Trauma 1970;10(1):46-50.
[12] Tripathi MD, Srivastava RD. Blunt trauma abdomen with special reference to early detection of visceral injuries. Int J Surg1991;53(5):179-184.
[13] Davis JJ, Cohn I, Nance FC. Diagnosis and management of blunt abdominal trauma. Ann surg 1976;183(6):672-678.

[14] Jarvis FJ, Byers WL, Platt EV, et al. Experience in the management of the abdominal wounds of warfare. SurGynObst1946;82:174-193.

[15] Rozycki GS, Ochsner MG, Feliciano DV, et al. Early detection of hemoperitoneum by ultrasound examination of the right upper quadrant: a multicentric study. J Trauma 1998;45(5):878-883.