A Retrospective Study of Current Management Procedures of Splenic Injury – An Experience in A Tertiary Health Care Set Up

Abinasha Mohapatra[1], Kishan Bhoi[2]

ABSTRACT

Introduction: The spleen is the most frequently injured solid organ following blunt abdominal trauma, accounting for upto 50% of all abdominal solid organ injury in some report, causing mortality as high as 20%. The aim of this retrospective study was to compare various advantages, disadvantages and outcome of different modes of management with the standard literature.

Material and methods: This retrospective study done after admission of 100 patients with abdominal injury where 28 patients were diagnosed as isolated splenic injury from December 2012 to November 2014.

Results: Blunt trauma (25 cases) is the most common mechanism of splenic injury followed by penetrating trauma (3 cases). Penetrating injuries, though less common, were more often repaired (60%) compared to blunt trauma(24%).

Conclusion: Splenic salvage has become the goal of treatment in splenic injury. Non-operative management can be done successfully in centres where close monitoring is possible, facilities for emergency surgical intervention and follow up are good. Splenectomy should be reserved for patients who are haemodynamically unstable, with polytrauma, severe peritoneal contamination from concominant bowel injury, severe grade of splenic injury and traumatized pathological spleen.

Keywords: Blunt Trauma Abdomen, Non-Operative Management, Operative management, Spleen.

INTRODUCTION

As the spleen receives 5% of the total cardiac output, large laceration of the organ results in large hemoperitoneum and shock which can be fatal i.e. mortality for splenic injury was as high as 20%. The spleen is the most frequently injured solid organ following blunt abdominal trauma, accounting for upto 50% of all abdominal solid organ injury in some report.[1]

The management of traumatised spleen is influenced by age of patient, hemodynamic stability, associated intra and extra-abdominal injuries, and presence or absence of associated pathology of the spleen.

As it was believed that spleen is not essential to life, so splenectomy even for a minor trauma was the established mode of treatment in past. But over the years the importance of spleen in cellular and humoral immunity has been clarified and complications like overwhelming post splenectomy infection, intra-abdominal sepsis, post-operative wound infection, thromboembolic sequelae, pulmonary infection, fatal coronary artery disease have led to greater efforts to preserve the spleen.

In normal and non-pathological traumatised spleen without associated organ injury and in hemodynamically stable patient, splenic preservation has become the preferred treatment modality. Advances in organ specific imaging, anatomic importance of splenic segments and evolution of newer technique of splenorrhaphy favours splenic preservation in injured spleen. The splenic preservation procedures that are in practice are non-operative management, splenorrhaphy, segmental resection or partial splenectomy and auto-transplantation of spleen.

The aim of this retrospective study was to compare various advantages, disadvantages and outcome of different modes of management with the standard literature.

MATERIAL AND METHODS

Place of study – Department of General Surgery, S.C.B. medical college and hospital, Cuttack.

Period of study – December-2012 to November-2014.

Study design – Retrospective study

Sample size – n = 28 patients admitted for splenic injury were studied

Inclusion criteria – All patients irrespective of age and sex, admitted with definite diagnosis of splenic trauma (after CECT abdomen and pelvis) were included.

Exclusion criteria

(1) Patients with other associated injuries e.g. Chest injury, Head injury, Pelvic injury, Spine injury, Bone injury etc
(2) Pregnant women
(3) Patients allergic to contrast material

Methods: On admission, all the patients were evaluated with quick detailed history and clinical examination to reach at a provisional diagnosis. All routine laboratory investigations, X-ray abdomen and Chest, USG abdomen and pelvis and diagnostic peritoneal laparotomy (DPL) were done in all

[1]Assistnt Professor, Department of General Surgery, [2]Assistant Professor, Department of General Surgery, S.C.B.Medical College, Cuttack, Odisha, India

Corresponding author: Dr. Abinasha Mohapatra, Room no.- 117, SR hostel, VIMSAR, AT/PO/PS – Burla, Dist- Sambalpur, Odisha, 768017, India

How to cite this article: Mohapatra A, Bhoi K. A retrospective study of current management procedures of splenic injury – an experience in a tertiary health care set up. International Journal of Contemporary Medical Research 2020;7(11):K14-K18.

DOI: http://dx.doi.org/10.21276/ijcmr.2020.7.11.29

cases.

CECT scan abdomen and pelvis was done to grade splenic injuries those who are haemodynamically stable, or who were managed conservatively after USG.

Management – Surgical and non-surgical (conservatively, splenorrhaphy). A definite management protocol is followed. Post-operative follow up and a long term surveillance upto two years has been done.

Auto-transplantation – Splenectomy was done in the standard fashion and placed in sterile saline. Just before abdominal closure, five splenic fragments (10/20/05 mm) were implanted into greater omental pouches, secured with silk suture.

STATISTICAL ANALYSIS

Significance is tested using Chi-square test, where appropriate.

RESULT

A retrospective study was carried out in Department of General Surgery, S.C.B. medical college, Cuttack from December-2012 to November-2014. During this period, the total number of cases studied with trauma to abdomen were 100, out of which splenic injury was diagnosed in 28 cases (28%).

Table – 1 shows out of 28 cases admitted with splenic injury, 25 cases were due to blunt trauma of abdomen (out of which 15 cases were due to road traffic accident).

Table -2 shows fall in hematocrit was seen in most cases i.e. 23 out of the 28 cases (82%).

Table – 3 shows splenectomy was done in 15 cases, auto-transplantation of spleen was done in 2 cases and non-operative management was done in 5 cases.

Table – 4 shows that there were no associated injuries were present in 15 cases. Liver and kidney being the most common organs injured (4 each).

Table – 5 shows most of the cases belongs to Grade-III (10 cases) and Grade-II (9 cases) severity. None of the cases were of Grade- V severity.

Table – 6 shows non-operative management was done in Grade-I injuries, while all Grade-III and Grade-IV were managed by splenectomy.

DISCUSSION

The age of all cases varied from 6 years to 55 years with a mean age of 26.42 years. Maximum number of cases were

Mechanism of injury	No. of cases	Percentage(%)
Blunt trauma	25	89.28
Road traffic	15	53.57
Railway accident	1	3.57
Fall from height	6	21.42
Blunt assault	3	10.71
Penetrating trauma	3	10.71
Stab wound	2	7.14
Gun shot wound	1	3.57
Total	28	100

Table–1: Distribution of cases according to mechanism of injury (non-iatrogenic)

Hb (gm%)	At time of admission	At 2 hours	At 4 hours	At 6 hours
10	15	5	5	5
7-10	10	11	10	10
<7	3	12	13	13

Table–2: Distribution of cases according to fall in hematocrit

Mech. of injury	Splenectomy	Splenorrhaphy	Non-op erative	Auto-tra nsplant
Penetrating trauma	1	2	0	0
Blunt trauma	14	6	5	2

Table-3: Mechanism versus treatment of splenic injury

Associated organ injury	No. of cases	Percentage (%)
Blunt trauma	25	89.28
Retroperitoneal hematoma	1	3.57
Liver	4	14.28
Mesentery	1	3.57
Kidney	4	14.28
Intestine	1	3.57
Rib fracture	1	3.57
No associated injury	13	46.42
Penetrating trauma	3	10.71
Stomach	0	0
Intestine	1	3.57
No associated injury	2	7.14
Total	28	100.00

Table-4: Distribution of cases according to associated injury

Grade of injury	No. of cases	Percentage(%)
I	5	17.85
II	9	32.14
III	10	35.71
IV	4	14.28
V	0	0

Table-5: Classification of Splenic injuries (By CT scan, or after laparotomy).

Grade of injury	Splenectomy	Splenorrhaphy	Non-ope rative	Auto-tra nsplant
I	0	0	5	0
II	1	8	0	0
III	10	0	0	1
IV	4	0	0	1
V	0	0	0	0

Table–6: Grade of Splenic injury versus Treatment

	Non-operative	Splenorrhaphy	Splenectomy	Auto-transplant
No, of cases	5	8	15	2
Mean age	7	23.50	34.46	32.50
Grade of injury				
I	5	0	0	0
II	0	8	1	0
III	0	0	10	1
IV	0	0	4	1
V	0	0	0	0
Type of injury				
Blunt	5	6	14	2
Penetrating	0	2	1	0
Others	0	0	13	2
Diagnosis				
CT scan accuracy 100%	Yes	Yes	Yes	
Blood tran- fusion (mean)	1.8 units	1.87 units	3.06 units	3 units
Results				
Re -exploration	0	0	0	0
Re - bleeding	0	0	0	0
Salvage rate	100%	100%	-	-
Length of hospital stay (mean)	8.2 days	10.25 days	13.33 days	13 days
Morbidity				
Wound infection	0	1	4	0
Atelectasis	0	2	4	0
Pneumonia	0	0	2	0
Systemic sepsis	0	0	2	0
Mortality	0	0	2	0
Follow up				
Blood smear at 6 wks	Normal	Normal	Normal	Normal
TPC at 6wks	Normal	Normal	Normal	Normal
Long term surveillance (upto 2years)				
OPSI	0	0	0	0
Respiratory	0	0	9	0

Table-7: Comparison between major modes of management of Splenic injuries

between the age of 21-30 years i.e. 9 (32.15%) out of 28 cases. There were 9 cases (32.12%) who belongs to pediatric age groups (< 14 years). Males comprised of 71.42%. Williams et al, 1990 also observed male predominance is 72%.[2]

Splenic injury comprised 28% of trauma to the abdomen. Most splenic injuries (89.28%) were caused by blunt trauma, out of which 53.57% being the result of road traffic accidents, 3.57% due to railway accidents, 21.42% due to fall from a height. Penetrating trauma comprised 10.71% of cases, with

7.14% due to stab wounds and 3.57% representing gun shot wounds (Table-1). Similar results had been documented by Williams et al 1990, blunt trauma being responsible in 91% of cases. Road traffic accident was the common mode of blunt injuries (54%). Armando E. et al reported, blunt trauma was responsible for 63% splenic injuries, road traffic accident being the most common mode of injury(50%).[3]

There are no associated intra-abdominal injury occurred in 15(53.56%) of the 28 patients, all of whom required operative therapy. Injury to kidney and liver occurred in 4 patients (14.28%), making these two organs most frequently damaged. (Table-4)

As per class of splenic injury, there were 5(17.85%) cases of class I injuries, 9(32.14%) cases of class II injuries, 10 (35.71%) cases of class III injuries and 4 (14.28%) cases of class IV injuries (Table-5). Reports by Armando et al show that significant associated injury occurred in 57% cases and liver was the most common organ injured.[3]

None of the class I injuries required splenectomy and were managed non-operatively, splenorrhaphy was done in majority of class II injuries 8 out of 9 (88.88%). All class III & IV splenic injuries required splenectomy, usually because of instability of vital signs (Table-6). Williams et al, 1990 had also reported that grade of injury correlates with salvage. Malangoni et al 1990 had urged for splenectomy in patients having class III splenic injuries.[4]

Clinical evaluation was helpful in 85% of cases to diagnose splenic trauma. Tenderness and rigidity in left hypochondrium/ diffuse was present in 85% of patients. Shifting dullness was present in 50% of patients. Kehr 's sign was positive in 13 cases (46.42%) of cases. Balance's sign was positive in 8 (28.57%) cases. Serial hematocrit estimation shows a fall in 23 out of 28 cases(82%). Four quadrant peritoneal tap was positive in 25(89.28%) cases. Plain X–ray film of abdomen was positive in 16(57.14%) of cases. Ultrasound of abdomen & pelvis was accurate in 19(67.85%) cases. CT scan of abdomen was done in 28 cases and was accurate in all of them (100%)(Table-7). Shackfold et al(1989) and Korobkin et al(1978) had reported similar results.[5,6]

Analysis of 28 patients revealed that 15 patients (53.57%) undergone splenectomy, 8 patients (28.57%) undergone splenorrhaphy, 2 patients (7.14%) undergone auto-transplantation, and 5 patients (17.85%) were managed non-operatively. All patients who were managed conservatively belongs to pediatric age group. Study made by Upadhaya et al, Wiig et al, William et al strongly supports the role of non-operative management in pediatric age group.[7,8] Penetrating injuries, though less common, were more often repaired (60%) compared to blunt trauma(24%). Similar reports from Barett et al. (1983) supported that penetrating trauma were more often salvageable.[9]

Any patients with systolic blood pressure less than 90mmHg were defind as unstable regardless of the response to fluid resuscitation. Only 20% of patients undergoing splenectomy were hemodynamically stable, in contrast to splenorrhaphy and non-operative management group where all patients were hemodynamically stable. Williams et al (1990), had reported 14% of patients undergoing splenectomy were hemodynamically stable, compared with 64% of the group treated non-operatively which goes in favour of present study. The blood transfusion requirements also follow similar trend, splenectomy group needing more units of blood for transfusion(3-4 units) than non-operative management and splenorrhaphy group(1-2 units) (p value < 0.05).

CT scan had been done in all patients who had been decided to be managed non-operatively i.e. in 5 cases (17.85%). CT scan was accurate (100%) in determination all such cases. Grade I injury was present in all cases. All were hemodynamically stable and blood transfusion was less (mean=1.8 units) (p value < 0.05). Re-exploration rate was zero. There was no rebleeding/delayed rupture (p value < 0.05). There was no mortality due to non-operative management, comparable to Elmore et al.[10] Mean hospital stay was 8.2 days, compared to 7 days by Aromenged et al (1989).[11]

Eight cases(28.57%) having Grage II injury, were managed by suture repair with omentum (splenorrhaphy)(Table-8), which are comparable to Williams et al(30%), Mucha et al(21.5%).[12] Patients were hemodynamically stable. Blood transfusions requirement were 1.87 units. Failure rate was zero and none of them required re-exploration. Duration of hospitalization in our study was 7-15 days (mean=10 days) and mortality rate was zero, which is comparable to Williams et al(1990). Two patients developed Left lower lobe atelectasis and one for wound infection.

Splenectomy was done in 15(54%) cases, which were comparable to Shackford et al 1990 (40-60%) and Williams et al(48%). 12% cases were hemodynamically unstable. Mean blood transfusion were 3 units. Grade of splenic injury were Grade II (7%), Grade III (67%), Grade IV (26%). This was comparable to William et al(1990). Re-exploration rate was zero. Post- operative complications were atelectasis(26.6%), pneumonia(13.3%), wound infections(26.6%). Two mortality cases were in splenectomy group which comparable to Leppanimic et al (1990) i.e. 0 -11.[13] No cases died beyond 2 weeks due to use of broad spectrum antibiotics and pneumococcal vaccine, since the risk was life long.

Auto-transplantation were done in 2 cases(7.14%). One case had grade III injury and other had grade IV, associated organ injury were present in both cases.

A comparison between non-operative management and splenorrhaphy shows that, in paediatric age group with CT scan based Grade-I splenic injury without associated polytrauma, results of non-operative management was excellent. This was also supported by Upadhyaya et al, William et al(1990). Fear of non-operative management were delayed rupture, re-bleeding, and increased morbidity if it fails.

A comparison between splenorrhaphy and splenectomy shows that in splenorrhaphy in young and adult males, with haemodynamic stability, with Grade II injury the result were excellent. In penetrating trauma, splenic salvage was better than blunt trauma. Blood transfusion requirement and

hospital stay was also less. Re-exploration and re-bleeding were also minimal with complete salvage of spleen. Post-operative complication rate were minimal and mortality rate was zero.

In splenectomy, Grade of injury was always severe and blunt trauma was the commonest cause. Polytrauma was frequently associated. Blood transfusion requirement and duration of hospital stay was more. Post-operative morbidity and mortality was high. Increased incidence of respiratory infections and risk for long term sepsis were there.

Auto-transplantation was done in 2 cases and study shows that it probably reduces the risk of sepsis, but does not abolish it.

CONCLUSION

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 centres where close monitoring is possible, facilities for emergency surgical intervention and follow up are good. Splenic injury due to blunt abdominal trauma who are haemodynamically stable, are suitable for this. Splenic salvage is considered only when condition of patient (i.e. haemodynamic stability, associated injuries)and condition of spleen (i.e. Grade of splenic injury) is favourable. Splenic conservation can be attemped by doing splenorrhaphy, partial splenectomy, or splenic transplantation, all of which preserve the splenic function. Splenectomy should be reserved for patients who are haemodynamically unstable, with polytrauma, severe peritoneal contamination from concominant bowel injury, severe grade og splenic injury and traumatised pathological spleen.

REFERENCES

1. Sosada K, Wiewiora M, Piecuch J. Literature review of non-operative management of patients with blunt splenic injury: Impact of splenic artery embolization. Wideochir Inne Maloinwazyjne. 2014;9:309-14.
2. Williams MD, Young DH, Schiller WR. Trend towards non-operative management of splenic injuries. American journal of surgery. 1990. 160,588.
3. Armando E, Guiliano MD, Robert C et al. Is splenic salvage safe in the traumatised patient. Archives of Surgery. 1981; 166: 651-656.
4. Malangoni et al. Evaluation of splenic injury by CT and its impact on treatment. Annals of Surgery. 1990; 211:592.
5. Shackford SR et al. Evaluation of splenorrhaphy. A grading system for splenic trauma. Journal of Trauma and Injury, 1989; 21: 538.
6. Korobkin M. et al. Computed tomography of subcapsular splenic hematoma. Europian Jouranal of Radiolody, 1978, 129, 441.
7. Upadhya P, Simpson JS. Splenic trauma in children. Surgery, Gynaecology and Obstetrics. 1968; 126: 781.
8. Wiig IN et al. Splenic injury study group – Splenic Injury: A prospective multicentric study on non-operative and operative treatment. British Journal of Surgery, 1987; 4: 310.
9. Berret J, Sheaff C, Abuabara S. et al. Splenic preservation in adults after blunt and penetrating trauma. American Journal of Surgery, 1983; 145: 313.
10. Elmore JR, Clark DE. Et al. Selective non-operative management of blunt splenic trauma in adult. Archives of Surgery. 1989;124, 581.
11. Armengeol M, Oller B, Salva et al. Non-operative management of splenic trauma in adults. British Journal of Surgery, 1989, 76: 422.
12. Mucha P. et al. Selective management of blunt splenic trauma. Journal of Trauma and Injury. 1986, 26, 970.
13. Leppanimic et al, The management of splenic trauma in trauma system. Archives of Surgery, 1990; 125;840.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 21-10-2020; **Accepted:** 28-10-2020; **Published:** 30-11-2020