ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

Original research article

Effects of splenectomy on survival in patients with concomitant head and splenic injury

[1]Dr. Vishwanath Sidram, [2]Dr. Dinesh Jaluka, [3]Dr. Chandra Kumar PC, [4]Dr.Vishwajith K

[1]Professor and HOD, Department of Neurosurgery, VIMS, Bellary, Karnataka, India

[2]Associate Professor, Department of Neurosurgery, RG Kar Medical College and Hospital, Kolkata, West Bengal, India

[3]Associate Professor, Department of General Surgery, VIMS, Bellary, Karnataka, India

[4] Senior Resident, Department of General Surgery, VIMS, Bellary, Karnataka, India

Corresponding Author:
Dr. Vishwajith K

Abstract

After an initial traumatic brain injury, it was hypothesized that systemic inflammation contributes to secondary brain injury. Our study aims to observe the effect of splenectomy on mortality in patients with concomitant splenic injury and head injury. A retrospective study which involved 243 cases, out of which 119 patients had splenectomy for grade 4,5 splenic injury or hemodynamic instability.

We observed that the mortality was 67% in moderate head injury patients and 72.7% in severe head injury patients who underwent splenectomy. We conclude that the mortality in patients with concomitant splenic injury and head injury patients increases with increase in severity of head injury.

Keywords: Traumatic brain injury, splenic injury, splenectomy.

Introduction

The most frequently injured intra-abdominal organ from blunt trauma is spleen [1]. Splenectomy was the treatment of choice for splenic injuries for most of the twentieth century [2]. Reports detailed the significance and seriousness of asplenic sepsis, in hemodynamically stable patients, non-operative management (NOM) became more attractive for blunt splenic injuries [3, 4]. The frequency of operative complications associated with splenectomy was the other impetus for this shift [5]. Non operative management experiences in children and adults have been successfully reported by numerous investigators since then [6-11].

If the patients had isolated low-grade splenic injuries and were neurologically intact they were selected for NOM in initial days. For concomitant traumatic brain injury (TBI) and higher grades of splenic injury, more recent reports have broadened the selection criteria [12-16]. All blunt splenic injuries (n = 22 887) entered into the US National Trauma Data Bank from 1997 to 2003 were analysed by Watson and colleagues [13]. The frequency of attempted NOM for severe splenic injuries increased from 20.9% in 1997 to 43.4% in 2003 as per their report. 30% of these patients with severe splenic injuries also had accompanying severe TBI (Glasgow Coma Scale [GCS] score < 9).

In patients with severe TBI there are several reasons to suspect that NOM can be worse. The complications of NOM may be detrimental to brain injury. Hypotension is one such major complication [12]. Hypotension can ensue from the resulting hemorrhage whenever NOM fails. A single episode of hypotension will double the mortality in patients with severe TBI compared with stable patients [17-19]. Increased exposure to allogenic blood products; Is another potential complication of NOM [12], an increase in requirements of blood transfusion also indicates that NOM has failed. Due to both short-term causes, such as sepsis, major transfusion reactions, multiple organ failure, and long-term causes, such as transfusion-related infections (HIV, hepatitis B and C), in trauma patients blood transfusions are associated with increased risk of mortality [20-23].

The optimal management strategy for splenic injuries in patients with severe brain injury remains controversial. The patient level data on demographics, injury pattern, comorbidities and in hospital management including surgical interventions eg. splenectomy, as well as outcomes from the injury until hospital discharge were collected retrospectively by the authors. We present our experience of the systematic analysis of the course of TBI patients with or without splenectomy in our institute over a period of 5 years.

Aims and Objectives

To look for effect of splenectomy on survival in patients with mild/moderate and severe concomitant head injury.

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

Materials and Methods

A retrospective study of 5 years was conducted in a tertiary care hospital.

Inclusion criteria

a) All patients within the age group of 15 to 75 years with CT proven head injury and isolated splenic injury.

Exclusion criteria

a) Patients with polytrauma - concomitant chest/ other abdominal solid organs/ pelvic injury.
b) Patients on oral anticoagulants/anti platelet therapy.
c) Patients with Chronic Systemic Illness.
d) Patients not willing for surgery/unfit for surgery.

As soon as the patient presented to the hospital, Resuscitation was done according to ATLS guidelines, after completion of primary survey, other concomitant organ injuries are ruled out. After initial stabilization, CT brain and Whole body CT scan was done. And only those patients with head injury associated with spleen injury were included.

Grade 4, 5 splenic injury and hemodynamically unstable cases were taken up for splenectomy irrespective of grade of head injury.

Total of 243 patients were included in the study out of which 119(48.97%) underwent splenectomy, 14 patients underwent exclusive head injury operations, 10 patients had concomitant surgeries and the remaining 110 were treated conservatively.

Results

Table 1: Grading of head injury

Mild head injury	Moderate head injury	Severe head injury
148	67	28

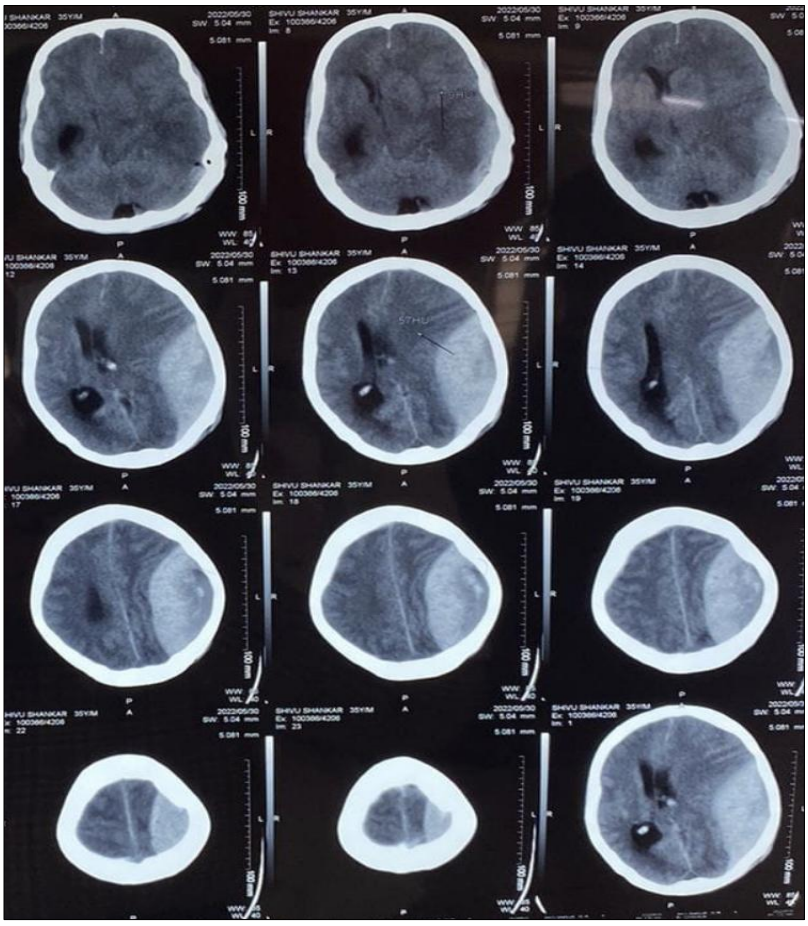


Table 2: Grading of Splenic Injury

Grade 1	58
Grade 2	71
Grade 3	49

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

Grade 4	46
Grade 5	19

Table 3: Splenectomy in various grades of head injury

Grade of head injury	Conservative	Operative
Mild	80	68
Moderate	25	42
Severe	19	09

Both conservative and post-operative patients were monitored in Neuro ICU setup, with necessary blood investigators and appropriate symptomatic treatment.
14 patients underwent concomitant operations of both splenectomy and some form of head injury operation.
10 patients underwent only head injury surgeries who had conserved spleen.
Total of 24 patients underwent some form of head injury surgeries.

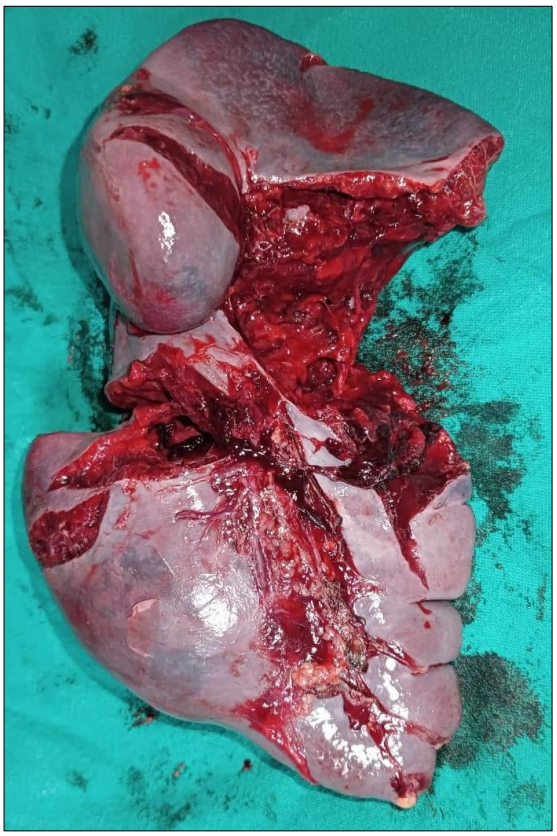
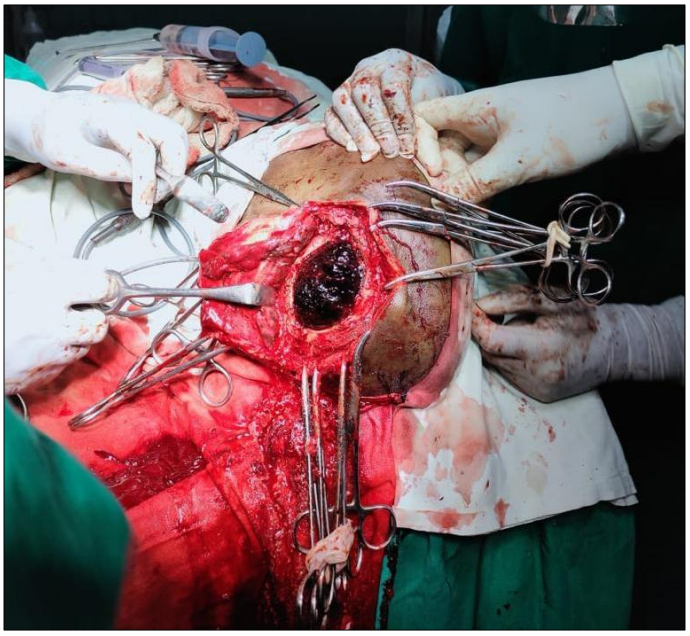


Table 4: Various Head injury operations

CT findings	Number of patients	Surgeries performed
EDH	7	Craniotomy and evacuation
SDH	11	Burr hole evacuation
ICH	5	Craniotomy and Decompression
Traumatic SAH with IVH	1	Extra ventricular drainage

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023



34 patients out of 110 conserved spleen patients underwent angioembolisation.
Out of 243 patients, 78 patients succumbed and the rest 165 survived the incident.

Table 5: Survival v/s Death in patients

	Survived	Succumbed
Conservative patients	81	29
Operated patients	52	49

68.5% of patients who were managed conservatively survived, whereas only 52.1% of operated patients survived.

Table 6: Death amongst various grades of head injury

	Death amongst operated patients	Death among patients with conservative management
Mild head injury	16	14
Moderate head injury	25	12
Severe head injury	8	03

In moderate head injury 37 patients died and amongst them 25 (67%) of patients had underwent splenectomy. In severe head injury, 11 patients died of which 8 (72.7%) had underwent splenectomy.

Discussion

The leading cause of death and disability in young adults is Traumatic Brain Injury [24]. Ongoing ischemia leads to secondary brain injury and contributes to the overall mortality of TBI. The basis of the modern medical management of TBI is avoiding hypotension and maintaining cerebral perfusion [25].

In blunt trauma patients, splenic injuries often accompany TBI. In hemodynamically stable patients, there is substantial literature that supports NOM for isolated, blunt splenic injuries. The mortality from asplenic sepsis and from operative complications increase the relative survival benefit of NOM over immediate splenectomy.

The failure rate of non-operative management of splenic injuries can be reduced by Angioembolisation. With the inclusion of angioembolization in the protocol for NOM the probability of failure rates of NOM were reduced to below 10% for grade V injuries, according to recent reports [26]. Immediate splenectomy would never result in a better survival benefit than NOM, as the 2 strategies are equivalent only, irrespective of the grade of the splenic injury in this type of situation. All stable patients with blunt splenic injury and severe TBI should undergo a trial of NOM at institutions where the failure rate of NOM is below 20% irrespective of the grade of the splenic injury, henceforth.

Institutions that demonstrate high operative mortality from trauma splenectomies immediate splenectomy, would not be appropriate. Likewise, because of inadequate resuscitation by anesthesia or because of poor selection, patients undergoing immediate splenectomy were frequently noted to be hypotensive intraoperatively, immediate splenectomy would no longer be the appropriate initial strategy. The survival advantage of performing immediate splenectomies in severe TBI patients with high grade splenic injuries would decrease, if surgeons were not aggressive in reducing the mortality of asplenic

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

sepsis (i.e., appropriate vaccinations and/or prophylactic antibiotic use),

Conclusion

1. Splenectomy was found to be harmful in patients with moderate and severe head injury through multiple mechanisms as evident in our study.
2. Our observation showed that mortality increases in splenectomized patients, with the increase in severity of head injury.
3. Head injury was found to be the major contributing factor for mortality through various immune mechanisms in splenectomized patients which correlates with other animal studies.
4. Due to minimal study population (243) we can't conclude on survival benefits of conservative management in patients with concomitant TBI.

References

1. Esposito TJ, Gamelli RL. Injury to the spleen. In: Mattox KL, Feliciano DL, Moore EE, editors. Trauma. 4th Edition. New York: McGraw-Hill. 2000. [Google Scholar]
2. Pachter HL, Guth AA, Hofstetter SR, *et al*. Changing patterns in the management of splenic trauma: the impact of non-operative management. Ann Surg. 1998;227:708-17. [PMC free article] [PubMed] [Google Scholar]
3. O'Neal BJ, McDonald JC. The risk of sepsis in the asplenic adult. Ann Surg. 1981;194:775-8. [PMC free article] [PubMed] [Google Scholar]
4. King H, Schumacker HB., Jr Splenic studies: I. Susceptibility to infection after splenectomy performed in infancy. Ann Surg. 1952;136:239-42. [PMC free article] [PubMed] [Google Scholar]
5. Ellison EC, Fabri PJ. Complications of splenectomy. Surg Clin North Am. 1983;63:1313-30. [PubMed] [Google Scholar]
6. Koury HI, Peschiera JL, Welling RE. Non-operative management of blunt splenic trauma: a 10-year experience. Injury. 1991;22:349-52. [PubMed] [Google Scholar]
7. Feliciano PD, Mullins RJ, Trunkey DD, *et al*. A decision analysis of traumatic splenic injuries. J Trauma. 1992;33:340-7. [PubMed] [Google Scholar]
8. Velanovich V. Blunt splenic injuries in adults: a decision analysis comparing options for treatment. Eur J Surg. 1995;161:463-70. [PubMed] [Google Scholar]
9. Coburn MC, Pfeifer J, DeLuca FG. Nonoperative management of splenic and hepatic trauma in the multiply injured pediatric and adolescent patient. Arch Surg. 1995;130:332-8. [PubMed] [Google Scholar]
10. Brasel KJ, DeLisle CM, Olson CJ, *et al*. Splenic injury: trends in evolution and management. J Trauma. 1998;44:283-6. [PubMed] [Google Scholar]
11. Hunt JP, Lentz CW, Cairns BA, *et al*. Management and outcome of splenic injury: the results of a five-year statewide population based study. Am Surg. 1996;62:911-7. [PubMed] [Google Scholar]
12. Peitzman AB, Heil B, Rivera L, *et al*. Blunt splenic injury in adults: Multi-institutional study of the Eastern Association for the Surgery of Trauma. J Trauma. 2000;49:177-87. [PubMed] [Google Scholar]
13. Watson GA, Rosengart MR, Zenati MS, *et al*. Non-operative management of severe blunt splenic injury: Are we getting better? J Trauma. 2006;61:1113-8. [PubMed] [Google Scholar]
14. Shapiro MB, Nance ML, Schiller HJ, *et al*. Nonoperative management of solid abdominal organ injuries from blunt trauma: impact of neurologic impairment. Am Surg. 2001;67:793-6. [PubMed] [Google Scholar]
15. Archer LP, Rogers FB, Shackford SR. Selective nonoperative management of liver and spleen injuries in neurologically impaired adult patients. Arch Surg. 1996;131:309–15. [PubMed] [Google Scholar]
16. Keller MS, Sartorelli KH, Vane DW. Associated head injury should not prevent nonoperative management of spleen or liver injury in children. J Trauma. 1996;41:471-5. [PubMed] [Google Scholar]
17. Committee on Trauma American College of Surgeons. Advanced Trauma Life Support Course for Physicians. 7th edition. Chicago: 1997. [Google Scholar]
18. Chesnut RM, Marshall LF, Klauber MR, *et al*. The role of secondary brain injury in determining outcome from severe head injury. J Trauma. 1993;34:216-22. [PubMed] [Google Scholar]
19. Vassar MJ, Rischer RP, O'Brien PE, *et al*. A multi-center trial for resuscitation of injured patients with 7.5% sodium chloride: the effect of added dextran 70. Arch Surg. 1993;128:1003-11. [PubMed] [Google Scholar]
20. Pietropaoli JA, Rogers FB, Shackford SR, *et al*. The deleterious effects of intraoperative hypotension on outcome in patients with severe head injuries. J Trauma. 1992;33:403-7. [PubMed] [Google Scholar]
21. Moore FA, Moore EE, Sauaia A. Blood transfusion: an independent risk factor for post-injury multiple organ failure. Arch Surg. 1997;132:620-4. [PubMed] [Google Scholar]

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 06, 2023

22. Robinson WP, III, Ahn J, Stiffler A, *et al*. Blood tranfusion is an independent predictor of increased mortality in non-operatively managed blunt hepatic and splenic injuries. J Trauma. 2005;58:437-44. [PubMed] [Google Scholar]
23. Callum JL, Pinkerton PH. Blood transfusions, blood alternatives and transfusion reactions. 2nd edition. Toronto: Sunnybrook and Women's College Health Sciences Centre; 2005. Bloody easy 2. [Google Scholar]
24. Duron JJ, Silva NJ, du Montcel ST, *et al*. Adhesive postoperative small bowel obstruction: incidence and risk factors of recurrence after surgical treatment: a multicenter prospective study. Ann Surg. 2006;244:750–7. [PMC free article] [PubMed] [Google Scholar]
25. Sangiovanni A, Prati GM, Fasani P, *et al*. The natural history of compensated cirrhosis due to hepatitis C virus: a 17-year cohort study of 214 patients. Hepatology. 2006;43:1303-10. [PubMed] [Google Scholar]
26. Bhullar IS, Frykberg ER, Siragusa D, *et al*. Selective angiographic embolization of blunt splenic traumatic injuries in adults decreases failure rate of nonoperative management. J Trauma Acute Care Surg. 2012;72:1127-34. [PubMed] [Google Scholar]