Print ISSN: 2321-6379
Online ISSN: 2395-1893
DOI:10.17354/SUR/2017/123

Original Article

Change in the Trends of Management of Blunt Liver Injury

Y V Narayanaswamy, H K Rudresh, Omar Ahmed, K Deepak, Tariq Iqbal

Professor, Department of Surgery, Ramaiah Medical College, Bengaluru, Karnataka, India

Abstract

Objective: The objective of this study is to evaluate the outcome of non-operative management (NOM) in liver trauma and analyze the reason for conversion to operative management in a tertiary care hospital.

Methods: This is a study of cases admitted to a university teaching hospital between 2015 and 2017. In this period, 212 blunt trauma abdominal injuries were evaluated and 31 patients of isolated blunt hepatic trauma were admitted and evaluated clinically. All patients underwent focused assessment with sonography for trauma (FAST) scan followed by abdominal computerized tomography was done to all hemodynamically stable patients following stabilization by initial resuscitation. Only isolated liver injuries were considered in this study and staged as per the scoring criteria of the American Association for the surgery of trauma. For all patients who were hemodynamically stable, irrespective of the severity of liver injury, patients were treated with conservative or NOM and monitored in the Intensive Care Unit with adequate blood kept in reserve. The patients who needed laparotomy later were considered as a failure of NOM. The parameters predictive of conversion to operative intervention were assessed. Liver injuries due to penetrating causes were excluded. An informed consent was obtained from each patient.

Results: Blunt trauma was the mechanism of injury in all 31 patients (100%) including road traffic accidents in 27 patients (87%). The peak age was between 21 and 40 years. The male-to-female ratio was 4:1. Surgery was indicated in four patients (12.9%). The most common grade of injury encountered was Grade III injury in both NOM group (33.3%) and NOM failure group (26.6%). The indications to convert were fall in hemoglobin (Hb) (50%) and fever/peritonitis (50%). FAST scan was positive for peritoneal fluid in 100% of the NOM failure group and 76.1% of the NOM group. The mean admission blood pressures (systolic 112 mmHg and diastolic 96 mmHg) and Hb (10.5 g% vs. 9.4 g%) were lower in the NOM failure group, while the mean pulse rate was higher. The overall hospital stay was longer in the NOM failure group as compared to the NOM group (17 days vs. 9 days).

Conclusion: NOM is a safe and effective measure in the management of liver trauma. It results in lower complications, a lesser need for blood transfusions, a lower mortality rate, and a shorter hospital stay. The time interval between time of injury and arrival to the hospital is an important factor for NOM.

Key words: Blunt abdominal trauma, Liver injury, Non-operative management, Trauma severity

INTRODUCTION

The liver is one of the most commonly injured organs in abdominal trauma. This is due to its size and anatomical position. Hepatic injuries correspond to approximately 5% of admissions in emergency rooms (ER) worldwide[1] and make up 16–22% of all abdominal injuries.[2,3] Its prevalence has risen in the past three decades as a result of an absolute increase in the number of cases and also in part due to improvement in diagnostic methods.[4] The past few decades have witnessed a paradigm shift from surgical treatment to non-surgical treatment for selected patients with blunt abdominal trauma with hemodynamic stability and no signs of peritonitis.[5] The use of computed tomography (CT) for patients with blunt abdominal trauma determines the presence and severity of a liver injury and while excluding other significant lesions thereby avoiding unnecessary surgery. Besides the advantage of avoiding morbidity from a laparotomy, non-operative treatment of hepatic lesions has shown other benefits such as a reduction in the need for blood transfusions, a lower rate of abdominal

Access this article online

www.surgeryijss.com

Month of Submission : 09-2016
Month of Peer Review: 10-2017
Month of Acceptance : 11-2017
Month of Publishing : 12-2017

Corresponding Author: H K Rudresh, Department of Surgery, Ramaiah Medical College, Bengaluru, Karnataka, India.
E-mail: drrudreshhk64@gmail.com

complications, a shorter length of hospital stay, and lower mortality.[6,7]

This study aims to examine the outcomes of blunt hepatic trauma and compare and characterize the surgical and non-surgical treatments for patients admitted in a tertiary care center.

Aims and Objectives

The aim of the study was to evaluate the outcome of nonoperative management in blunt liver trauma, to analyze the reason for conversion to operative management in our institute, and to show that the treatment protocol is not only altered by severity of CT findings of liver injury but also based upon clinical findings and hemodynamic stability.

METHODS AND PATIENTS

This is a study of cases admitted to a university teaching hospital, equivalent to a Level 1 Trauma Center, located in a metropolitan city with a population of approximately 12.3 million people. From September 2015 to September 2017, 212 blunt trauma abdominal injuries were evaluated, and 31 patients of isolated blunt hepatic trauma were admitted and evaluated to represent the sample analyzed in this study. All patients underwent a focused assessment with sonography for trauma (FAST) scan and once stabilized, they were evaluated with contrast enhanced CT (CECT) abdomen and pelvis for details of liver injury and its grade. For all patients, vitals were monitored and blood parameters were investigated at serial intervals. Radiological investigations were done to monitor the status of the liver injury and its resolution. Initially, all patients were treated with non-operative management (NOM). NOM required strict bed rest, close observation, continuous monitoring of hemoglobin (Hb) and hematocrit, and periodic CT of the abdomen.

Any fall in Hb and blood pressure (BP) or an increase in peripheral resistance (PR) (signs of shock) indicated the use of appropriate measures to stabilize the patient (including blood transfusion) main emphasis was also recorded on the time gap between impact of blunt injury and time of presentation to the hospital. All patient data mechanism of injury, associated injuries, grade of liver injury, time between injury and presentation to the ER, blood products received, and total length of stay (days) in the hospital were collected.

Any fall in Hb and BP or an increase in PR (signs of shock) indicated the use of appropriate measures to stabilize the patient (including blood transfusion and fluid resuscitation).

If the patients were hemodynamically unstable after initial resuscitation or there was active bleed, they were taken up for emergency laparotomy. Those patients who were stable initially and needed laparotomy later were considered as converted cases (failure of NOM).

Statistics

Data were analyzed using SPSS for Windows version 11.5 (SPSS Inc., Chicago, IL, USA). Data are expressed as mean ± standard deviation unless otherwise stated. A value of $P < 0.05$ was considered statistically significant.

RESULTS

- Between 2015 and 2017, a total number of 30 cases were included in this study. 80% of cases were male and 20% female. The youngest patient was 18-year-old and the oldest was 70 years of age with a mean age of 30. The peak age group in the present study was 21–40 years.
- Of the 31 cases, 4 underwent conversion to operative management and 27 were successfully managed conservatively [Table 1 and Figure 1].

The most common mode of injury was road traffic accident, seen in 27 patients (87%). Age, sex, and mode of injury had no statistical significance in conversion to operative management ($P > 0.05$).

FAST scan done in both groups yielded following results as summarized in Table 2.

The reasons underlying failure of NOM were as follows:

- On average, the patients presented to the ER 6½ h after injury.
- Converted patients presented 7 h after injury on average.
- All converted patients required blood product transfusion preoperatively.
- 3 of the 4 required blood transfusion postoperatively (75%) [Table 3].

The most common grade of liver injury encountered was Grade III injury. CT grading of solid organ injury had no influence on the decision to convert to operative management [Figures 2 and 3].

An 18-year-old boy presented to our hospital with Grade V liver trauma had bile leak 4 days after admission and was treated conservatively with only placement of intraperitoneal drains. He was discharged 5 days post-procedure and the leak stopped after 22 days.

Comparison of the hemodynamic parameters of the two groups was summarized in Table 4.

Table 1: Modality of management

Parameter	Number of patients (%)
Managed conservatively	27 (87.1)
Converted to surgery	4 (12.9)
Total	31 (100)

Table 2: Intra-abdominal Fluid

FAST (Focused assessment with sonography for trauma) Scan	Converted (%)	Conserved (%)
Fluid^{+ve}	4 (100)	22 (81.48)
Fluid^{-ve}	0 (0)	5 (18.52)

An average number of days of hospital stay was 12, among NOM was 9 days and converted group was 17 days. All of the patients who required laparotomy were converted within the first 48 h of conservative management.

DISCUSSION

With the new-age trend of non-operative management, it is important to analyze guidelines for a "wait and watch" approach in cases of liver injury.[5]

Due to its fixed position, size, and anatomical position, the liver is the second most commonly injured abdominal organ after the spleen.[2] Liver injury management depends on the patients condition, grade of injury, complications as well as the availability of facilities for constant monitoring. The availability of 24 h access to an emergency operation theater and a standby on-call surgeon also plays a role in taking up the challenge of managing a case conservatively.[4-6]

NOM of liver injury has gained widespread support and was adopted for approximately 60% of cases of liver injury irrespective of the grade.[8] Currently, its application has been extended to penetrative injuries with satisfactory results.[9]

Like previous reports, in our study, the patients were mostly younger males who had suffered road-traffic accidents. Implementing NOM in hemodynamically stable patients achieved a 87.1% success and 12.9% failure rate. These results were consistent with most recent reports on NOM of liver trauma from other centers.[10-13]

At our center, liver trauma patients (with blunt injuries) are initially stabilized by resuscitation (if indicated) and then subjected to a brief examination by a FAST, and then a CECT (ideally with IV contrast) for diagnostic purposes. If unstable, otherwise they are resuscitated and stabilized in the accident and emergency department, then sent to the operation theater. The severity of injuries and presence of associated injuries are verified with the CT or intraoperatively during laparotomy.

Table 3: Determining factors for conversion from NOM

Cause	Frequency (%)	Percentage of converted cases (%)
Fall in Hb	2 (6.45)	50.0
Fever/biliary peritonitis	2 (6.45)	50.0
Not converted	27 (87.1)	-
Total	31 (100)	

Hb: Hemoglobin

Table 4: Hemoglobin levels and vitals

Hemodynamic parameters (mean)	Conserved patients	Converted patients
Hb on admission	11.9 g%	10.7 g%
Hb after 24 h	10.5 g%	9.4 g%
PR (on admission) (after 24 h)	103 bpm	116 bpm
SBP (on admission) (after 24 h)	112 mmHg	96 mmHg
DBP (on admission) (after 24 h)	74 mmHg	66 mmHg

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, Hb: Hemoglobin

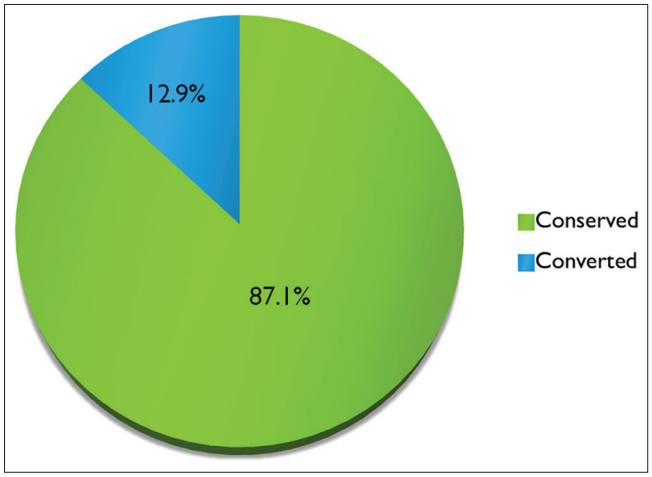

Figure 1: Conversion rate

CECT scan of the abdomen is widely used to evaluate intra-abdominal injuries in patients with stable hemodynamics; it should not be used if a patient has unstable hemodynamics since the patient's condition may deteriorate rapidly during scanning. CT scan can present the specific grade of liver injury, thereby allowing formulation of a proper management plan. A high grade (Grades III-V) represents relatively severe injury. Patients with a high grade of liver injury tend to be more unstable and require immediate operative intervention. However, NOM is becoming more applicable to these patients because of improvement in intensive critical care, better monitoring increased use of interventional radiology, and newer techniques such as angioembolization being available as alternative measures.

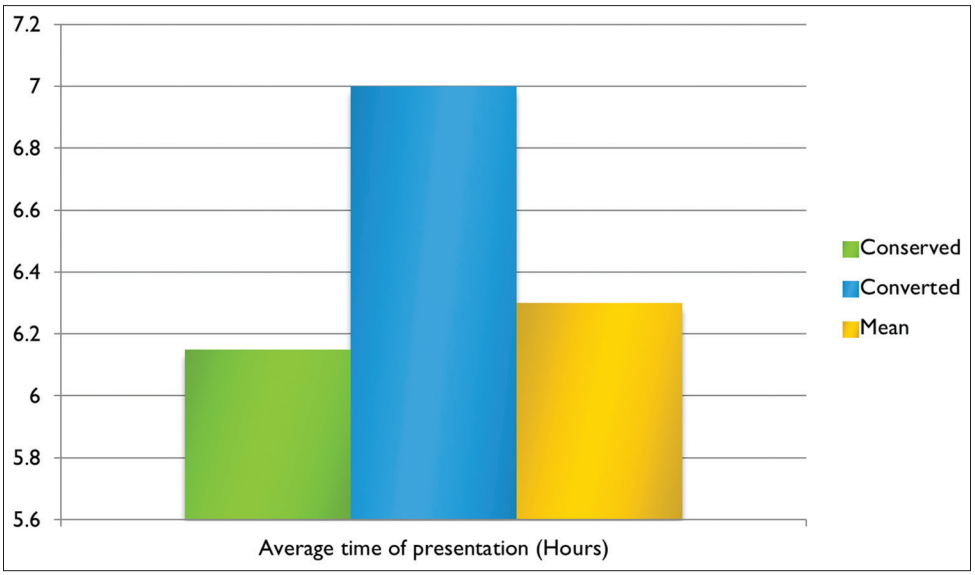

Figure 2: Time gap from impact to initial assessment

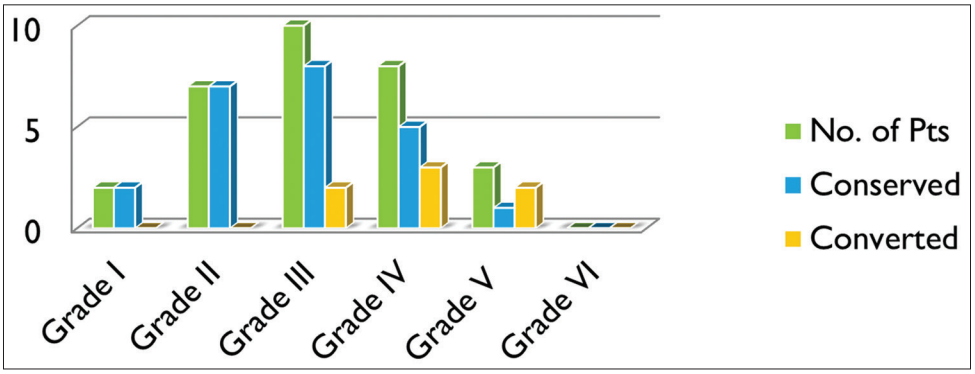

Figure 3: CT grade and modality of treatment

If NOM is adopted, reassessment CT scan should be performed within 7–10 days after the initial scan to check for any delayed complications.[10]

In this study, the overall success rate of NOM was 87.1%, which was comparable to other studies.[14] NOM was a safe and effective measure in the treatment of liver trauma, and the overall conversion rate was low with a favorable outcome.

The average duration between the onset of injury and presentation to ER was long enough to imply that bleeding would have ceased by the time of presentation.[11]

From our study, it became apparent that the grade of liver injury seen on CT scan should not be used as the only criterion to determine the need for surgical intervention. We observed that even higher grades of liver injury responded to NOM, and in spite of the initial appearance of the patient if the hemodynamic parameters such as BP, PR and Hb% are maintained within normal limits, along with the use of blood transfusions, a trial must be made to conserve the patient. Only a loss of hemodynamic stability or the development of complications determined the need for surgery as previously reported in similar studies.[1,4,10,12,15,16]

The loss of hemodynamic stability and unresponsiveness to fluid resuscitation, transfusion, or other non-operative measures should indicate a conversion to surgical management. Likewise, the volume of hemoperitoneum did not influence our decision to continue NOM as long as the patient was hemodynamically stable and the blood transfusion requirement for liver-related injuries did not exceed 4 units.[13]

NOM was excluded as an option in 12 cases as they presented with pathology warranting laparotomy (peritonitis suggestive of hollow viscus perforation). In the converted cases, 2 were due to bile leak during NOM and 2 due to expanding hematoma causing a serial Hb% drop. 5 patients required surgery for other complications (subdural hemorrhage, thoracotomy due to lung injury, unstable pelvic fracture, renal injury, and frontotemporoparietal hemorrhage).

In cases where there was a serial fall in Hb% not responding to resuscitation, there was no cutoff value for the fall in Hb below which the decision was made to convert. No case that required more than 4 units of blood to be transfused was continued with NOM. This was similar to the protocol followed in other studies.[6,9,12,17]

A major limitation of this study is that it does not represent the full spectrum of liver trauma in the city as it was conducted solely in two hospitals and thus could not adequately assess the whole spectrum of blunt liver injuries occurring in our city. The sample size of this study was only 31 patients, and further evaluation is required to give a broader scope to the study.

CONCLUSION

NOM of blunt hepatic injuries is the modality of choice in hemodynamically stable patients, irrespective of the grade of injury. Its advantages include lower hospital cost, earlier discharge, avoiding non-therapeutic laparotomy, and reduced number of transfusions and eliminate operative complications.[4,9,11,14,16] Non-operative management can be considered when reliable monitoring, serial clinical evaluations, and an operating room for urgent laparotomy are readily available. Management of liver injury has evolved and hemodynamic status, not the grade of the injury, should dictate the management.

REFERENCES

1. Kozar RA, Moore FA, Moore EE, West M, Cocanour CS, Davis J, *et al*. Western trauma association critical decisions in trauma: Nonoperative management of adult blunt hepatic trauma. J Trauma 2009;67:1144-9.
2. Leenen LP. Abdominal trauma: From operative to nonoperative management. Injury 2009;40:S62-8.
3. Slotta JE, Kollmar O, Kollmar C, Schafer T, Schilling MK. Liver injury following blunt abdominal trauma: A new mechanism-driven classification. Surg Today 2014;44:241-6.
4. Malhotra AK, Fabian TC, Croce MA, Gavin TJ, Kudsk KA, Minard G, *et al*. Blunt hepatic injury: A paradigm shift from operative to nonoperative management in the 1990s. Ann Surg 2000;231:804-13.
5. Velmahos GC, Toutouzas KG, Radin R, Chan L, Demetriades D. Nonoperative treatment of blunt injury to solid abdominal organs: A prospective study. Arch Surg 2003;138:844-51.
6. Croce MA, Fabian TC, Menke PG, Waddle-Smith L, Minard G, Kudsk KA, *et al*. Nonoperative management of blunt hepatic trauma is the treatment of choice for hemodynamically stable patients. Results of a prospective trial. Ann Surg 1995;221:744-53.
7. Asensio JA, Roldán G, Petrone P, Rojo E, Tillou A, Kuncir E, *et al*. Operative management and outcomes in 103 AAST-OIS grades IV and V complex hepatic injuries: Trauma surgeons still need to operate but angioembolization helps. J Trauma 2003;54:647-65.
8. Moore EE, Cogbill TH, Jurkovich GJ, Shackford SR, Malangoni MA, Champion HR. Organ injury scaling: Spleen and liver (1994 revision). J Trauma 1995;38:323-4.
9. Van der Vlies CH, Olthof DC, Gaakeer M, Ponsen KJ, van Delden OM, Goslings JC. Changing pattern in diagnostic strategies and the treatment of blunt injury to solid abdominal organs. Int J Emerg Med 2011;4:47.
10. Kozar RA, Moore JB, Niles SE, Holcomb JB, Moore EE, Cothren CC, *et al*. Complications of nonoperative management of high-grade hepatic injuries. J Trauma 2005;59:1066-71.
11. Scollay JM, Beard D, Smith R, McKeown D, Garden OJ, Parks R, *et al*. Eleven years of liver trauma: The Scottish experience. World J Surg 2005;29:744-9.
12. Richardson JD, Franklin GA, Lukan JK, Carrillo EH, Spain DA, Miller FB, *et al*. Evolution in the management of hepatic trauma: A 25-year perspective. Ann Surg 2000;232:324-30.
13. Ochai T, Igari K, Yagi M, Ito H, Kumagai Y, Iida M, *et al*. Treatment strategy for blunt hepatic trauma: Analysis of 183 consecutive cases. Hepatogastroenterology 2011;58:1312-5.
14. Zafar SN, Rushing A, Haut ER, Kisat MT, Villegas CV, Chi A, *et al*. Outcome of selective non-operative management of abdominal injuries from the North American national trauma database. Br J Surg 2011;99:155-65.
15. Parks N, Davis J, Forman D, Lemaster D. Observation for nonoperative management of blunt liver injuries: How long is long enough? J Trauma 2011;70:626-9.
16. Cogbill TH, Moore EE, Jurkovich GJ, Feliciano DV, Morris JA, Mucha P. Severe hepatic trauma: A multi-center experience with 1,335 liver injuries. J Trauma 1988;28:1433-8.
17. Shapiro MB, Nance ML, Schiller HJ, Hoff WS, Kauder DR, Schwab CW. Nonoperative management of solid abdominal organ injuries from blunt trauma: Impact of neurologic impairment. Am Surg 2001;67:793-6.

How to cite this article: Narayanaswamy YV, Rudresh HK, Ahmed O, Deepak K, Iqbal T. Change in the Trends of Management of Blunt Liver Injury. IJSS Journal of Surgery 2017;3(6):1-5.

Source of Support: Nil, **Conflict of Interest:** None declared.