International Surgery Journal
Mangukiya L et al. Int Surg J. 2020 Jan;7(1):58-63
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20195948

Original Research Article

Management modalities of isolated liver injury in blunt abdominal trauma

Lalji Mangukiya, Hardik Astik*

Department of Surgery, Government Medical College, Surat, Gujarat, India

Received: 03 December 2019
Revised: 18 December 2019
Accepted: 19 December 2019

***Correspondence:**
Dr. Hardik Astik,
E-mail: dr.hardik.astik@gmail.com

ABSTRACT

Background: The liver is one of the most commonly injured organ in blunt abdominal trauma. Management of liver injury due to blunt abdominal trauma has been dramatically evolved in recent years. Dramatic change from operative management to non-operative management has improved survival in these patients, becoming the standard of care for most liver injuries.
Methods: A retrospective study of the patients admitted with the diagnosis of isolated liver injury due to blunt abdominal trauma between 2013-2018. Data collected of 30 patients of isolated liver injury who either treated conservative management of operative management. Variable analyzed included demographic data, mechanism of injury, associated injury, conservative treatment, operative treatment, morbidity, mortality, and hospital stay.
Results: A total of 30 patients were analyzed of isolated liver injury due to blunt abdominal trauma, 27 patient sustained minor liver injury (grade I, II and III), whereas 3 patients had major liver injury (grade IV, V and VI). 25 cases due to road traffic accident and 5 cases were due to falls from a height. 27 patients with American Association for the surgery of trauma grade I, II, III and 2 patients with grade IV, V managed conservatively, surgical intervention required in 1 patient with grade V, mortality occurred in 1 patient out of 29 who were treated conservatively.
Conclusions: Isolated liver injury is common in the blunt abdominal trauma patient. Most of the patients with the liver injury with hemodynamically stable treated conservatively. Only a few of them require surgical management if they are hemodynamically unstable.

Keywords: Blunt abdominal trauma, Conservative management, Isolated liver injury

INTRODUCTION

The liver is a well-protected organ behind the rib cage, in spite of that protection liver is the second most common organ injured due to blunt abdominal injury.[1] The technological advancement in the automobile industry has greatly contributed to the world, but sometimes priority given to speed over safety. Motor vehicle accident (MVA) is now ranked fourth in order among the leading cause of death in person less than 30 years of age. MVA is responsible for more deaths than all other illnesses put together. They are the commonest cause of non-penetrating abdominal trauma.[2] India, where more than 70% of its population dwells in villages and where very few trauma care centers are available has one of the highest accident rates in the world. As abdominal injuries are mainly seen in young and economically productive individual it is essential to develop effective trauma care systems so that many innocent lives may be salvaged. Liver trauma occurs in ranges front 1% to 8% of patients hospitalized for trauma and in 8 to 10% of all patients with abdominal trauma. Blunt force is responsible for 70

to 80% of liver trauma.[3] Liver trauma can occur as a result of falls from a height, assault and sports injuries.[4] Blunt liver injury is usually not evident and is often missed. Rapid resuscitation is necessary to save the unstable but salvageable patient with liver trauma. During the last decades, there has been a change in treatment protocols for isolated liver injury and many studies published.[4-7] Current practice of either non-operative management (NOM) usually depends on the liver injury scale.[8] Non-operative management of liver injury first reported in 1972 and is the cornerstone in the management of liver injury in last five decades.[9-10] Initially skeptical but now NOM is standard of care with aim of obtaining a reduction in morbidity and mortality.[11,12] Surgery is also limited to limited debridement, selective vascular ligation and perihepatic packing.[13,14]

The objective is to achieve a reduction in morbidity, mortality and complication rate. In Minor Liver Injuries, it can be achieved but difficult to achieve in Major Liver Injuries with the hemodynamically unstable patient and with vascular injuries.

The aim of the study was to analyze the effectiveness and morbidity and mortality of both non-operative management as well as operative management of liver injury patients admitted to our hospital.

METHODS

A retrospective study of 30 patients of isolated liver injury due to blunt abdominal injury conducted at the Department of Surgery, New Civil Hospital Surat, Gujarat during 2013-2018. The medical record of the patients with isolated liver injury was extracted.

Isolated liver trauma was defined as a liver injury with no other intra or extra-abdominal involvement.[15]

Inclusion criteria

30 patients aged between 18-60 years of both sex with isolated liver injury due to blunt abdominal trauma with or without associated injury.

Exclusion criteria

Those patients who had associated intra-abdominal injuries, penetrating injuries and head injury patient with GCS <13 were excluded in this study.

Method of collection of data

Data were collected from the medical record section and entered into the proforma.

All the patients were with isolated liver injury due to blunt abdominal injury included in the study all the relevant information extracted from the case paper noted in proforma. This includes demographic data, mechanism of injury, clinical examination and investigation laboratory as well radiological recorded. Postoperative follow up was done to not for complication.

All 30 patients were first attended by the emergency trauma center of our hospital, where vitals were recorded. Followed by the patient were resuscitated according to ATLS guidelines, following which the patients were subjected to radiological investigation with focussed assessment sonography for trauma (FAST) in hemodynamically unstable patients and contrast-enhanced computed tomography (CECT) abdomen in hemodynamically stable patients. All injuries were classified according to the American Association for the Surgery of Trauma (AAST).

Table 1: Liver injury scale (revision 1994).[8]

Grade	Injury description
I	Hematoma: Subcapsular <10% of surface area Laceration: Capsular tear, <1 cm depth
II	Hematoma: Subcapsular, 10-50% surface area intraparenchymal <10 cm Laceration: 1-3 cm parenchymal depth,<10 cm length
III	Hematoma: Subcapsular >50% surface area expanding, ruptured subcapsular or parenchymal hematoma Laceration : >3 cm parenchymal depth
IV	Laceration: Parenchymal disruption involving 25%-75% of hepatic lobe or 1-3 couinaud's segments within a single lobe
V	Laceration: Parenchymal disruption involving >75% of hepatic lobe or >3 couinaud's segments within a single lobe Vascular: Juxtahepatic venous injuries i.e. retrohepatic venacava or major hepatic veins
VI	Vascular: Hepatic avulsion

Hemodynamically stability defined as systolic blood pressure (SBP) more than 90 mm of Hg after adequate resuscitation (1-2 litre of intravenous fluid within 1 hr).

Criteria for NOM were hemodynamically stable patient with simple hepatic injury (grade I, II and III); absence of signs of peritonitis; no suspicion of other intraabdominal injuries on imaging studies.

NOM includes monitoring of the patient in ICU or in wards; monitoring of vitals, urine output; intravenous fluids and intravenous antibiotics; serial hemoglobin and serial hematocrit measurement; review ultrasonography of the abdomen or CECT abdomen.

Failure of non-operative management and indication of surgery during observation includes hemodynamically unstable patient during the observation; major hepatic injuries with a hemodynamically unstable patient; signs

of peritonitis; progressive expansion of hematoma or hemoperitoneum on radiological examination.

Hemodynamically unstable patient at presentation and after resuscitation according to ATLS guidelines immediately shifted for Surgery.

Statistical analysis

After the completion of data collection, data entry was done into the Excel data file. Data analysis was done by Epi_info version 6.04 software.

RESULTS

A retrospective study of 30 patients of isolated liver injury due to blunt abdominal trauma was conducted and had the following findings.

Table 2: Age incidence.

Age group (in years)	No of patients	%
1-10	2	7
11-20	6	20
21-30	13	43
31-40	6	20
41-50	1	3
>50	2	7

In this series, the majority of the patients (43%) belonged to 21-30 years age group, followed by 11-20 and 31-40 years age group (20%) Thus majority of the patients were of a young age group (Table 2).

Table 3: Sex ratio.

Gender	No of patients	%
Male	26	87
Female	4	13

In this series, the majority of patients were male 87% whereas female patients were only 13% (Table 3).

Table 4: Mechanism of injury.

Mechanism of injury	No. of patients	%
MVA	25	83
Falls from a height	5	17

MVA was responsible for 83% of blunt abdominal trauma cases, while fall from height accounted for 17% of cases (Table 4).

Majority of the patients presented with abdominal pain (100%) and abdominal tenderness (100%) (Table 5).

Associated extra-abdominal injuries were found in 12 cases. The common extra abdominal injuries were chest injuries including rib fractures, pneumothorax, and lung contusion, extremity fractures including pelvic fractures and head injuries including subarachnoid hemorrhage, extradural and subdural hematoma, brain contusion, depressed or non-depressed skull fractures of these associated injuries, there were 4 cases of chest injury of which 1 case of rib fractures with considerable amount of hemopneumothorax which was managed by insertion water-sealed intercostal drainage tube. 4 cases of fracture of extremities were managed by the orthopedic surgery department. All case-patients with head injury were managed conservatively with neurosurgery consultation (Table 6).

Table 5: Symptoms and signs.

Symptoms and sign	No. of patients	%
Abdominal pain	30	100
Abdominal tenderness	30	100
Abdominal guarding	6	20
Abdominal rigidity	0	00
Abdominal distension	13	43
Tachycardia (pulse >100/min)	15	50
Hypotension (SBP <90 mm of Hg)	3	10

Table 6: Associated injuries.

Associated injuries	No. of patients	%
Head injury	4	13
Chest injury	4	13
Extremity or pelvic injury	4	13
No associate injury	18	60

Table 7: Assessment of grade of liver injury.

Grade of liver injury	No. of patients	%
Minor injury (grade I, II and III)	27	90
Major injury (grade IV, V and VI)	3	10

In present series, most of the liver injuries due to blunt trauma abdomen were minor type (grade I, II and III), they are (90%) of the total blunt liver injuries, major injuries (grade IV, V and VI were seen in (10%) cases of blunt liver trauma (Table 7).

In present series, in the present series, the majority of the blunt liver injuries were grade II (43%), 1 (27%) and III (20%) injuries followed by grade IV (7%) and V injury (3%) have the lowest incidence. All 27 (90%) patients with AAST grade I, II and III were successfully managed conservatively and only 1 (3%) patients of blunt liver trauma were managed by surgical intervention. That patient had grade V liver injury and associate head injury (Table 8).

Table 8: Liver injury scale and its relation with management modalities.

Liver injury scale	Conservative management		Operative management	
	No. of patients	%	No. of patients	%
I	8	27	0	0
II	13	43	0	0
II	6	20	0	0
IV	2	7	0	0
V	0	0	1	3
VI	0	0	0	0

Table 9: Outcome.

Outcome	No. of patients	%
Discharge	29	97
Expired	1	3

In the present study, 29 (97%) patient discharge and 1 (3%) patient expired (Table 9).

In the present study overall mean duration of hospital stay in this study was 9-21 days. The mean hospital stay for the operative group patients was 9.5 days.

DISCUSSION

The paradigm for management of liver trauma had shifted over the past decades from surgical management to NOM. This shift had been attributed to the following factors: 50-80% of liver injuries stop bleeding spontaneously; successful NOM in children; significant development of radiological investigation like CECT abdomen, interventional radiology, intensive care unit, and trauma centers.[10,16]

In the present study, the mean age of the patient is 26.5 whereas Bernardo et al (n=143) reported mean age was 32±14.7 and in Gustave et al reported mean age was 33±19.[25] In the present study, the maximum incidence of blunt liver trauma was seen in the age group of 20 years of age. (Mean age of occurrence being 21.6 years). This is probably because the patient in this age group lead a more active life and have more outdoor activities. Patients in the age group 50 years, lead a relatively sedentary life and therefore have less incidence of trauma. In this study, nearly 92% of patients were from the age group l-40 years. This age represents the working population. Thus trauma is not only a problem for an individual but also social, as society loses a large number of human resources. Similar demographic data have been reported in other studies.

In the present study, 87% of patients were male whereas 13% of patients were female. In another study Bernardo et al (n=143) majority (83.6%) of patients were males.[12] The incidence of abdominal trauma in the male population is higher because in our country males are the leaders of the family and hence lead a more active life and undergo more outdoor activities. Similar demographic data have been reported in other studies with most injuries affecting males and being incurred due to blunt trauma.

Vehicular accident was the commonest mode of injury in case of blunt trauma followed by fall from height Trauma mostly observed is contusion, which in its greatest proportion is caused by road traffic accidents and falls from height: the presence of signs of intoxication was not assessed, which would be related with traffic accidents. Similar results have been published in other studies Bernardo et al and Croce et al with most injuries due to road traffic accidents.[12,24] Vehicular accidents occur more frequently because every year there is increase in number of vehicles on road, poor maintenance of road, general public and drivers not following the rules and regulations, nonuse of seat belts, helmets, airbags in vehicles and lack of motivation and education in general- assault due to hit or by animal also is significant mode of trauma in rural parts of the country were run over or goring by a bullock is quite common.

In the present study, abdominal pain was the most common presenting clinical feature in the case of abdominal trauma. Abdominal pain could not properly be assessed in patients with a significant head injury and spine injury co-existing with blunt abdominal injuries. This is also supported by other clinical studies.

Focused assessment with sonography for trauma (FAST) has become an initial screening tool and extension of physical examination in all patients with intraabdominal trauma. It has a sensitivity to detect intraabdominal fluid but it is relatively insensitive for parenchymal injuries and retroperitoneal hemorrhage. Several well-conducted prospective observational studies found this technique to be sensitive (79-100%) and specific (95.6-100%), particularly in hemodynamically compromised patients.[17,18]

CECT abdomen is currently the standard of investigation modalities for the stable patient of isolated liver injury due to blunt abdominal injury.[19,20] Hoff et al reported the sensitivity of 92-97% and a specificity of 98.7% in diagnosing the liver injury.[21] Active extravasation of contrast media during CT Scan of the abdomen is evidence of acute bleeding from either the parenchyma of the liver or from the major hepatic veins. Fang et al reported 75% of patients with hemodynamically unstable with contrast extravasation to require operative management.[22] In the present study, liver injury was diagnosed accurately by CECT of the abdomen in 100% of cases as compared to USG which had a positivity of 92% in diagnosing liver injuries.

In this study minor liver injury (grade I. II and III) accounts for 92% of all patients while major liver injury

(grade IV, V and V) accounts for 8%. This is comparable with other studies as demonstrated by Norman et al, Croce et al and Bernardo et.al.[12,24,25]

Table 10: Comparison of management modalities between studies.

Study	Non-operative management (%)	Operative management (%)
Bernardo et al[12] (n=143)	69.1	30.9
Croce et al[24] (n=136)	73.5	26.5
Noraman et al[25] (n=46)	68	15

As highlighted by Bernardo et al (n=143) majority of liver injuries can be managed nonoperatively, with few absolute indications for surgical intervention.[12] CT imaging results factor prominently in the initial management strategy for blunt liver trauma, allowing for reliable injury grading that has been shown to correlate well with the need for surgical intervention. However, there is little consensus on the role of routine reimaging once a non-operative management course has been selected.

The surgical options for the management of blunt liver injuries depend on the type of injury to the subscapular, intrahepatic parenchymal injuries. Surgery includes a wide range of temporary and definitive surgical procedure. Direct suture ligation of the parenchymal bleeding vessel, perihepatic packing, hepatorrhaphy repair of venous injury under vascular isolation. The present study shows that conservative management is feasible even for higher grade blunt liver injuries.

At our institution, the decision to treat a liver injury is primarily based on hemodynamic instability while considering the grade of liver injury and the presence of concomitant injuries. In the present study, conservative management was successful in all grade l, II, III liver injuries. One patient with grade V injury required operative management.

Hemorrhage can result in the lethal triad of hypothermia coagulopathy and acidosis, each exacerbates the others. Mortality rapidly increase if patient core temperature less than 34ºC so warm blankets and intravenous fluids were given to the patient to avoid hypothermia.[23]

CONCLUSION

The most common cause for blunt liver injury is road traffic accidents for which FAST of abdomen is first valuable investigation but CECT is the investigation of choice because of its accuracy. A majority of all the patients with minor and major liver injuries can be managed conservatively and surgical exploration is required only in hemodynamically unstable patients with severe associated injuries.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of Government Medical College Surat

REFERENCES

1. Feliciano DV. Surgery for liver trauma. Surg Clin North Am. 1989;69(2):273-84.
2. Way WL, Dobarty GM. Management of the injured patient, In Dohanty GM eds. Current surgical diagnosis and treatment. 11th ed. McGraw Hill publication: London; 2003: 23-66.
3. Jarnagin WR, Allen PJ, Chapman WC, D'Angelica MI, DeMatteo RP, Do RKG, et al. Blumgart, Blumgart's Surgery of the Liver, Biliary Tract, And Pancreas 6th Edition. Chapter 115. Elsevier Publication; 2017: 1889-1897.
4. David RJ, 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(3):324-30.
5. Pachter HL, Hofstetter SR. The current status of nonoperative management of adult blunt hepatic injuries. Am J Surg. 1995;169(4):442-54.
6. Carrillo EH, Richardson JD. The current management of hepatic trauma. Adv Surg. 2001;35:39-59.
7. Brammer RD, Bramhall SR, Mirza DF, Mayer AD, Mc-Master P, Buckels JA. A 10-year experience of complex liver trauma. Br J Surg. 2002;89(12):1532-7.
8. Moore EE, Cogbill TH, Jurkovich GJ, Shckford SR, Malangoni MA, Champion HR. Organ Injury Scaling:spleen and liver(1994 revision). J Truama. 1995;38(3):323-4.
9. 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.
10. Stein DM, Scalea TM. Nonoperative management of spleen and liver injuries. J Intensive Care Med. 2006;21:296-304.
11. Jacobs IA, Kelly K, Valenziano C, Pawar J, Jones C Nonoperative management of Blunt splenic and hepatic trauma in the pediatric population: significant differences between adult and pediatric surgeons? Am Surg. 2001;67(2):149-54.
12. Bernardo CG, Fuster J, Bombuy E, Sanchez S, Ferrer J, Loera MA. Treatment of Liver Trauma: operative or Conservative Management. Gastroenterol Res. 2010;3(1):9-18.
13. Parks RW, Chrysos E, Diamond T. Management of Liver Trauma. Br J Surg. 1999;86(9):1121-35.
14. David RJ, Franklin GA, Luken JK, Carillo EH, Spain DA, Miller FB, et al. Evolution in the

management of adult blunt hepatic injuries. Am J Surg. 2000;232(3):324-30.
15. Li M, Yu WK, Wang XB, Ji W, Li JS, Li N. Non-operative management of isolated liver trauma. Hepatobiliary Pancreatic Dis Int. 2014;13(5):545-50.
16. Stylinos S. Evidence based guidelines for resource utilization in children with isolated spleen or liver injury. The APSA Trauma Committee. J Pediatr Surg. 2000;35:164-9.
17. Healey M, Simons RK, Winchell RJ, Gosink BB, Casola G, Steele JT, et al. A prospective evaluation of abdominal ultrasound in trauma: is it useful? J Trauma. 1996;40:875-85.
18. Boulanger BR, McLellan BA, Brenneman FD, Wherrett L, Rizoli SB, Culhane J, et al. Emergent abdominal sonography as a screening test in a new diagnostic algorithm for blunt trauma. J Trauma. 1996;40:867-74.
19. Becker CD, Mentha G, Terrier F. Blunt abdominal trauma in adults: role of CT in the diagnosis and management of visceral injuries. Part 1: liver and spleen. Eur Radiol. 1998;8:553-62.
20. Poletti PA, Mirvis SE, Shanmuganathan K, Killeen KL, Coldwell D. CT criteria for management of blunt liver trauma: correlation with angiographic and surgical findings. Radiology. 2000;216:418-27.
21. Hoff WS, Holevar M, Nagy KK, Patterson L, Young JS, Arrillaga A, et al. Practice management guidelines for the evaluation of blunt abdominal trauma: the East practice management guidelines work group. J Trauma. 2002;53:602-15.
22. Fang JF, Chen RJ, Wong YC, Lin BC, Hsu YB, Kao JL, et al. Pooling of contrast material on computed tomography mandates aggressive management of blunt hepatic injury. Am J Surg. 1998;176:315-9.
23. Jurkovich GJ, Greiser WB, Luterman A, Curreri PW. Hypothermia in trauma victims: an ominous predictor of survival. J Trauma. 1987;27:1019-24.
24. 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. Ann Surg. 1995;221(6):744-55.
25. Norrman G, Tingstedt B, Ekelund M, Andersson R. Non-operative management of blunt liver trauma: feasible and safe also in centers with a low trauma incidence. HPB (Oxford). 2009;11(1):50-6.

Cite this article as: Mangukiya L, Astik H. Management modalities of isolated liver injury in blunt abdominal trauma. Int Surg J 2020;7:58-63.