Original research article

Comparison of non-operative and operative management of isolated liver injury in blunt abdominal trauma

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Abstract

Aim: 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.

Material and methods: This Prospective observational study was done in the Department of Surgery, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 12 months. 50 patients aged between 18-65 years of both sex with isolated liver injury due to blunt abdominal trauma with or without associated injury were included in this study. All 50 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).

Results: The majority of the patients (46%) belonged to 20-30 years age group, followed by 10-20 and 30-40 years age group (18%). The majority of patients were male 90% whereas female patients were only 10% (Table 2). MVA was responsible for 80% of blunt abdominal trauma cases, while fall from height accounted for 20% of cases. Majority of the patients presented with abdominal pain (100%) and abdominal tenderness (100%). Associated extra-abdominal injuries were found in 21 cases. All case-patients with head injury were managed conservatively with neurosurgery consultation. In present series, most of the liver injuries due to blunt trauma abdomen were minor type (grade I, II and III), they are (92%) of the total blunt liver injuries, major injuries (grade IV, V and VI were seen in (8%) cases of blunt liver trauma. In present series, the majority of the blunt liver injuries were grade II (46%), 1 (28%) and III (18%) injuries followed by grade IV (6%) and V injury (2%) have the lowest incidence.

Conclusion: 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

Liver trauma is one of the most common abdominal lesions in severely injured trauma patients.[1] Managing liver injuries is technically challenging and may need availability of a comprehensive medical facility for optimal management. Advances in the development of trauma surgery have led to improvement in outcomes following liver injury. Historically, before World War II, “house surgeons advocated expectant or conservative treatment, or no

treatment at all for the majority of wounds of the liver". During World War II, drainage of liver injuries and abandonment of the use of gauze packs decreased mortality from 30% to 17%. Subsequent understanding of the injured patient's pathology as well as development of minimally invasive technologies led to a shift towards damage control in most severe trauma victims, resulting in a paradigm shift towards nonoperative management. The relatively fixed position of the liver and its large size makes it more prone for injury in blunt trauma of the abdomen. Liver and spleen together, account for 75% of injuries in blunt abdominal trauma.[2] Though liver is the second most commonly injured organ in abdominal trauma, it is the most common cause of death following abdominal injury. Compared to splenic injuries, management of liver trauma still remains a challenge in the best of trauma centers. In the past, most liver injuries were treated surgically. However evidence confirms that about 86% of liver injuries have stopped bleeding by the time surgical exploration is performed and 67% of laparotomies done for blunt trauma abdomen are non-theraupetic.[3] The liver is the most frequently injured organ in blunt abdominal trauma[4], occurring in approximately 1-8% of cases. Roughly 85-90% of blunt hepatic traumas are treated with a non-operative approach. The published rate of successful nonoperative management of patients with isolated blunt liver injury is 91.5% for grade I and II, 79% for grade III, 72.8% for grade IV, and 62.6% for grade V injuries. Because of this shift towards non-operative management, there have been increased rates of complications, with a rise in morbidity rate to 7%. Delayed hemorrhage is the most common complication of non-operative treatment and generally occurs in the first 72 hours following the traumatic incident[5] Delayed hemorrhage has been shown to occur in 1.7 to 5.9% of blunt abdominal injuries, most often related to either an initially small injury which has expanded or to a biloma-induced pseudoaneurysm .[6] Initially skeptical but now NOM is standard of care with aim of obtaining a reduction in morbidity and mortality.[7,8] Surgery is also limited to limited debridement, selective vascular ligation and perihepatic packing.[9,10] 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.

Material and methods

This Prospective observational study was done in the Department of Surgery, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 12 months, after taking the approval of the protocol review committee and institutional ethics committee. Total 50 patients of isolated liver injury due to blunt abdominal were included in this study. Isolated liver trauma was defined as a liver injury with no other intra or extra-abdominal involvement.

Inclusion criteria

50 patients aged between 18-65 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.

Methodology

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 50 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).[11]

Grade	Injury description
I	Hematoma: Sub capsular <10% of surface area Laceration: Capsular tear, <1 cm depth
II	Hematoma: Sub capsular, 10-50% surface area intraparenchymal <10 cm Laceration: 1-3 cm parenchymal depth,<10 cm length
III	Hematoma: Sub capsular >50% surface area expanding, ruptured sub capsular 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.

Results

A retrospective study of 50 patients of isolated liver injury due to blunt abdominal trauma was conducted and had the following findings. In this series, the majority of the patients (46%) belonged to 20-30 years age group, followed by 10-20 and 30-40 years age group (18%) Thus majority of the patients were of a young age group In this series, the majority of patients were male 90% whereas female patients were only 10% (Table 2).

Table 2: Age and gender distribution of patients

Age group (in years)	No of patients=50	%
Below 10	3	6
10-20	9	18

20-30	23	46
30-40	9	18
40-50	2	4
Above 50	4	8
Gender		
Male	45	90
Female	5	10

Table 3: Mechanism of injury

Mechanism of injury	No. of patients	%
MVA	40	80
Falls from a height	10	20

MVA was responsible for 80% of blunt abdominal trauma cases, while fall from height accounted for 20% of cases (Table 3).

Majority of the patients presented with abdominal pain (100%) and abdominal tenderness (100%) (Table 4).

Associated extra-abdominal injuries were found in 21 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 7 cases of chest injury of which 2 case of rib fractures with considerable amount of hemopneumothorax which was managed by insertion water-sealed intercostal drainage tube. 7 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 5).

Table 4: Symptoms and signs

Symptoms and sign	No. of patients	%
Abdominal pain	50	100
Abdominal tenderness	50	100
Abdominal guarding	11	22
Abdominal rigidity	0	00
Abdominal distension	23	46
Tachycardia (pulse >100/min)	26	52
Hypotension (SBP <90 mm of Hg)	6	12

Table 5: Associated injuries

Associated injuries	No. of patients	%
Head injury	7	14
Chest injury	7	14
Extremity or pelvic injury	7	14
No associate injury	29	58

Table 6: Assessment of grade of liver injury

Grade of liver injury	No. of patients	%
Minor injury (grade I, II and III)	46	92
Major injury (grade IV, V and VI)	4	8

In present series, most of the liver injuries due to blunt trauma abdomen were minor type (grade I, II and III), they are (92%) of the total blunt liver injuries, major injuries (grade IV, V and VI were seen in (8%) cases of blunt liver trauma (Table 6).
In present series, in the present series, the majority of the blunt liver injuries were grade II (46%), 1 (28%) and III (18%) injuries followed by grade IV (6%) and V injury (2%) have the lowest incidence. All 46 (92%) patients with AAST grade I, II and III were successfully managed conservatively and only 1 (2%) patients of blunt liver trauma were managed by surgical intervention. That patient had grade V liver injury and associate head injury (Table 7).

Table 7: Liver injury scale and its relation with management modalities

Liver injury scale	Conservative management		Operative management	
	No. of patients	%	No. of patients	%
I	14	28	0	0
II	23	46	0	0
II	9	18	0	0
IV	3	6	0	0
V	0	0	1	2
VI	0	0	0	0

Table 8: Outcome

Outcome	No. of patients	%
Discharge	49	98
Expired	1	2

In the present study, 49 (98%) patient discharge and 1 (2%) patient expired (Table 8).
In the present study overall mean duration of hospital stay in this study was 8-22 days. The mean hospital stay for the operative group patients was 10.5 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.[12,13]
In the present study, the mean age of the patient is 27.3 whereas Bernardo et al (n=143) reported mean age was 32±14.7 and in Gustave et al reported mean age was 33±19.[14] In the present study, the maximum incidence of blunt liver trauma was seen in the age group of 20-30 years of age. (Mean age of occurrence being 22.5 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 40-50 years, lead a relatively sedentary life and therefore have less incidence of trauma. In this study, nearly 88% 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, 90% of patients were male whereas 10% of patients were female. In another study Bernardo et al (n=143) majority (83.6%) of patients were males.[8] 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 demo- graphic data have been reported in other studies with most injuries affecting males and being incurred due to blunt trauma.

In this study MVA was responsible for 80% of blunt abdominal trauma cases, while fall from height accounted for 20% of cases. 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.[8,15] 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, Majority of the patients presented with abdominal pain (100%) and abdominal tenderness (100%). 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.[16,17]

CECT abdomen is currently the standard of investigation modalities for the stable patient of isolated liver injury due to blunt abdominal injury.[18,19] Hoff et al reported the sensitivity of 92-97% and a specificity of 98.7% in diagnosing the liver injury.[20] 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.[21] 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 94% 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.[8,15,16]

As highlighted by Bernardo et al (n=143) majority of liver injuries can be managed nonoperatively, with few absolute indications for surgical intervention.[8] 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.[22]

Conclusion

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.

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