Study Of Clinical Outcomes In Patients With Severe Hepatic Injury: Experience At A Tertiary Care Centre

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Abstracts: Background**:** Management of liver trauma earlier used to be primarily surgical. With advancement in diagnostic modalities it has gradually shifted to non operative management. Methods: The present study was conducted on 40 patients with severe hepatic injuries (grade 3 onwards). All the patients were compared in terms of various methods adopted for their management and their clinical outcomes Results: Out of a total of 40 patients, maximum numbers of patients were in age group 18-24 years. 82.50 % patients had grade IV and rest had Grade V. 12 patients presented with shock on admission. Failure of NOM (non operative management) was seen in 25% of cases . The average requirement of blood transfusion in our study was 2.157 1.74 units. Average hospital stay in successful NOM cases was lower than in failed NOM. A total of 6 patients had to be operated upon in our study. Active bleed was seen on laparotomy in four patients with no evidence of any injury causing peritonitis. Conclusion: The success rates of non-operative management were significantly higher than the failures rates of non-operative management, without any significant incidence of complications and delayed laparotomies. Grade of liver injury or the amount of hemoperitoneum as detected on CT scan did not influence the outcome of non-operative management. Non-operative management is thus the gold standard in hemo-dynamically stable patients. [Singh R NJIRM 2016; 7(3): 45 - 51]

Key Words: Severe hepatic injury, Non operative management, Blunt trauma abdomen,Grade III and IV Liver injury.

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Introduction: According to various surveys trauma accounts for 3.5-6% of all admissions in surgical units and 14-25% of patients involved in the road traffic incidents have abdominal injury[2]. Moreover abdominal trauma accounts for 10% of all deaths following roadside accidents.

Abdomen is a large region containing multiple organs and there are limitations to physical examination and diagnostic aids especially in a polytrauma patient. Therefore, unrecognized injury to the intra abdominal contents remains a distressingly frequent cause of preventable deaths.

Various surveys have studied the relative incidence of injury to organs present in abdominal cavity and concluded that liver is the most commonly injured organ in abdominal trauma.

Before the advent of modern surgical and diagnostic aids laparotomy for visceral injuries associated with blunt trauma abdomen was in an embryonic stage and all the visceral injuries were diagnosed post mortem. However, the observations made during last decade of 19th century established that surgical intervention in such cases of visceral injuries in blunt trauma abdomen had a possibility of successful result in otherwise hopeless case. Since then, hepatic injuries in cases of blunt trauma abdomen have been indication for surgical exploration.

It was further observed in many cases of blunt trauma abdomen undergoing laparotomy for liver injuries that the hepatic injuries had stopped bleeding by the time of surgery and required no operative intervention. Thus, the patient undergoes a non-therapeutic laparotomy increasing the morbidity of the patient besides increasing the monetary constrains.

Although the mortality rate from liver trauma has declined steadily since the review by Madding, Lawrence, and Kennedy[1,3] following World War II, liver injuries continue to present vexing problems of intra-operative hemostasis and postoperative complications. Recent series cite mortality rates from 13 to 15%.[2,6] Mortality for acutely bleeding lesions necessitating hepatic lobectomy ranging from 40 to 60%. Reports by Trunkey and associates[8]and by Lucas and Ledgerwood emphasize the importance of shock and parenchymal hemorrhage as causes of death in the patient with liver injuries.

Sandblom[9] documented delayed biliary tract hemorrhage (hemobilia) following destruction of hepatic tissue and formation of an intraparenchymal cavity and emphasized the relatively benign

appearance of the outer surface of the liver at initial laparotomy.[6] Interest in selective hepatic dearterialization as a means of initial hemostasis began to evolve with the suggestion by Madding in 1954 that this modality might be useful.[2]Subsequent experience has confirmed the utility of hepatic artery ligation before elective hepatic operation.[7] Extensive studies have documented the prevailing anatomic pattern of the hepatic vasculature and potential collateral channels.[5]

With the development of adjuvant diagnostic aids like CT scan, the fears regarding the undiagnosed concomitant enteric injuries and other diaphragmatic, retroperitoneal and bladder injuries have mostly been dispelled. In addition, the extent and severity of injury to the visceral organ can largely be quantified.

However, this approach initially met with skepticism but has now gradually gained acceptance among most trauma surgeons.

With this mindset, we in our institute, Dayanand Medical College and Hospital, planned a prospective study to evaluate the outcome of management of liver injuries in selected patients of blunt trauma abdomen, under strict monitoring and to study the various morbidity and mortality factors associated with such management.

Material and Methods: The study was conducted on 40 patients with severe hepatic injuries (grade 3 onwards) coming to Dayanand Medical College & Hospital.After clearance from the institutional review board a detailed history and examination of the patients was done. Patients were followed throughout their stay in the hospital. All the 40 patients were then compared in terms of various methods adopted for their management, if that effect the clinical outcome in patients and result were analysed in terms of survival of patients.

Protocol Of Procedure

Inclusion and exclusion criteria were applied to patients presenting with blunt trauma abdomen.

Patients were educated about the study and only those patients consenting to participate in the study were included. Written informed consent was taken from every participant enrolled for the study.

Database collection included documentation of history, age, sex, pre hospital interval, vital signs and abdominal signs.

After initial resuscitation according to ALTS, stabilisation of ABC done.

Routine investigations were send like haemogram, RFT, LFT, Amylase/ lipase, ABG, CXR.

USG abdomen was done to diagnose liver injuries and associated other injuries.

Patients with documented hepatic injuries on CT scan were taken into the study.

On the basis of CT scan injury was graded according to Modified Organ Injury Scale (1994 revision) (Moore et al1995).[20]

Course was seen in terms of various procedures done for management, need for blood transfusion, duration of ICU stay, total duration of hospital stay.

Method Of Collection Of Data:

Inclusion Criteria

1. All patients with blunt trauma abdomen with documented severe hepatic injuries.
2. Age 18 years and above.

Exclusion Citeria

1. Any grade of pancreatic trauma.
2. Any other injury requiring laparotomy like hollow organ injuries as proved by air under diaphragm.

Statistical Analysis

Results were analysed by using appropriate statistical tools.

Results: This study was done on 40 consecutive patients in whom liver traumawas diagnosed on CECT abdomen.

Following observations were made .

1. Age and Sexdistribution :Mean age of the patients included in the study was 21.4 years males.
2. Mode of injury : Roadside accidents were seen to be the most common cause of blunt trauma involving 32 (80.00%) patients followed by fall from height 2 (11.8%) patients.

3. Shock: Shock was defined systolic BP < 90 mm Hg. 15 (37.5%) patients presented to the hospital with shock ($p < 0.01$). Rest of the 15 patients responded to initial resuscitation and were therefore selected for present study according to inclusion criteria.
4. Time gap between injury and admission :Most of the patients i.e. 15 (37.5%) presented to our hospital after 12 hours of injury. However, 14 (35.0%) patients were presented between 2-6 hours of injury. All the patients were admitted within 24 hours of injury.
5. ASSOCIATED EXTRA ABDOMINAL INJURIES :Out of 40 patients included in the study significant number of patients i.e. 24 (66.67%) had associated injuries to other systems of the body.
6. GRADE OF LIVERINJURY :All the liver injuries on the basis of CT findings were graded according to modified organ injury [20]. Of the 40 cases of liver injury in this study the most common injury grade was IV seen in 33 (82.5%) patients. Remaining 7 (17.5%) cases had grade V injury. There was no significant difference in the relative incidence of various grades of liver injury.(p value > 0.10)
7. AMOUNT OF HEMOPERITONEUM : Most patients 21 (52.5%) had moderate amount of hemoperitoneum while remaining patients had small amount of hemoperitoneum.
8. ACTIVE IV CONTRAST LEAK :In the 30 patients of conservative group only 2 patients i.e. 6.67% had active IV contrast leak whereas in case of operative group 30%(3/10) had active leak.
9. OUTCOME OF NON-OPERATIVE MANAGEMENT :Failure of non-operative management and occurred in 10 (25.0%) patients. Success rate of non-operative management was 75.0% which was statistically significantly higher than failure rate of non-operative management ($p < 0.001$).
10. COMPARISON OF BLOOD TRANSFUSION REQUIREMENTS:. Out of the 30 conservatively managed patients, blood was transfused to 22 (73.3%) patients. However, blood was transfused to all the surgical patients (10). The mean number of packed cell transfused to those managed conservatively was 3.09 and 4.70 in those with operative management. Similarly the mean number of FFP was 3.18 and 4.20 in conservatively and operated patients, respectively
11. COMPARISON OF HOSPITALS STAY :The mean hospital stay of all patients in the study was 16.550 $\pm$ 11.215 days. The difference in the hospital stay of successful and failed non operative management was insignificant statistically (p value > 0.10).
12. FAILURE RATES RELATED TO GRADE OF INJURY :Failure rates of 23.33 % for grade IV and 30.00% for grade V injuries were observed
13. SUCCESS RATE OF NOM IN PATIENTS WITH AGE $\geq$55 YEARS :There were only 3 patients with age more than 55 years and out of them 1 had successful uneventful NOM. Hence the success rate in this group was 33.33%.
14. OUTCOME OF NOM IN CASES OF MULTIPLE ABDOMINAL INJURIES :16 cases of multiple abdominal injuries were seen in our study. Out of which 9 had renal and 7 had spleen injury.. The success rate of NOM in single and multiple intra abdominal injuries was statistically equivalent (P value >0.10). Hence multiple intra abdominal organ injuries did not affect the outcome of NOM in our study.
15. COMPARISON OF NON OPERATIVE MANAGEMENT :In the conservative group, 10 patients required inotropic support, 22 required blood transfusion, 30 required antibiotics and 29 required fluids. The corresponding values for these parameters in the operative patients were 4, 10, 10 and 10, respectively.
16. ETIOLOGY OF FAILURES :Of the 6 cases, that were operated upon, 4 were operated due to constant fall in hematocrit. On laparotomy, 4 of these patients had active bleed, PV ligation with packing was done followed by relaprotomy and removal of packs. 2 of the patients were operated upon because of suspicion of peritonitis, bile leak was seen in them and placement of drains was done. There was no incidence of any liver abscess or missed intra-abdominal injury in our study.
17. COMPLICATION RELATED TO NOM : The complications encountered in NOM of solid organ injuries in our study was re-bleeding (n=6), bilioma formation (n=1) and ACS formation (n=1). All the patients who had complications were operated and all recovered well.

Discussion: Blunt Trauma Abdomen is a frequent cause of morbidity and mortality in poly-trauma patients. Initially with much fear regarding the nature of injury sustained in blunt trauma abdomen, laparotomy was the treatment of choice. It was soon observed that in many cases surgical intervention was merely restrained to drainage of hemoperitoneum because the organ injured had already stopped bleeding at the

time laparotomy. These were termed as non therapeutic laparotomies. Holland et al (1991)[16] reported 30% incidence of such laparotomies. However with time accumulation of experience and advent of modern diagnostic aids surgeons realized that most solid organ injuries in blunt trauma abdomen can be managed conservatively according to certain inclusion criteria and hence the patients can be saved of the surgical trauma in acute stage.

The present study was conducted to study the outcome of management of liver injuries grade IV onwards and to study the various prognostic factors associated with such management.

In our study patients aged 18 years and above were included. Out of a total of 40 patients, maximum numbers of patients (45%) were in age group 18-24 years. Mean age of 21.17±12.45 years in this study compare well with those of Fabrice et al (1993)[33] and Kimura et al (1991)[34] in whose series the mean age of patient was 39 years and 33 years respectively.

Majority of the patients in this study were males (82.5%) and only 17.5% were females. Pachter et al (1995)[35] and Kimura et al (1991)[34] also showed a greater number of male patients in their studies.

Vehicular accidents are by far the leading cause of abdominal trauma. Incidence of traffic collision was reported to be 91.9% by Sherman et al (1994)[36] and 61% by Kimura et al (1991)[34] in comparison to 80% in this study. Incidence of fall from height (5%) occupational and other injuries (7.5.%) and assault (12.5%) also compare well with descending order of frequency of mechanism of injury i.e. falls, assault and others as reported by Sherman et al (1994)

Clinical signs and symptoms are helpful indicators of blunt trauma abdomen but are non-specific in the prediction of severity and nature of intra abdominal injury. A clear history of abdominal symptoms may not be narrated due to low GCS in traumatized patient.

The incidence of abdominal signs on examination in our study included tenderness (72.5%), guarding (30%), distension (32.5%), and absence of bowel sounds in 35% cases. In the study by Mohapatra et al (2003)[25] the incidence of abdominal tenderness and guarding was 70.8%, abdominal distension (25%), shifting dullness (16.7%) and absence of bowel sounds in 15.3% cases.

Of the 40 cases only 12 (23.5%) presented with shock (systolic BP <9OmmHg) on admission. The incidence of shock at presentation in the study, by Mohapatra et al (2003)[25] was 13.9%, which is comparable.

Ours being tertiary trauma referral center the time gap between injury and admission was variable but most patients presented within 24 hours of injury. Most patients were referred from far places after initial resuscitation.

Associated injuries to other systems of the body in addition to intra abdominal injury was detected in 66.67% cases. The incidence of various injuries in our study was fracture ribs (41.67%), limb bone fractures (20.83%), head injury (16.67%), pelvic fractures (12.50%), vertebral fractures (4.17%), and fractures rib clavicle and scapula 4.17%. Overall the incidence of chest injury was the highest(40.4%). These are comparable to the incidence of various injuries seen by Malhotra et al (2000)[23]in their study (53.9%). Overall the most common associated injury with blunt trauma abdomen was chest injury probably due to close anatomical association with liver and common impact at that area.

We selectively included patients with documented liver injury in our study. Therefore, the incidence of various intra abdomen organ injuries in cases of blunt trauma abdomen could not be calculated in our study. Multiple intra abdominal injuries were seen only in 55% patients in our study, which is comparable to 53% cases of multiple abdominal injuries as seen by Malhotra et al (2000)[23]. Of the intra abdominal injuries associated with liver injuries, the corresponding kidney was most commonly injured i.e. 9.8% cases.

The incidence of CT graded liver injury in our study was grade IV (82.50%) and a grade V (17.50%) cases. No case of grade VI injury was present in our study. This is comparable to incidence seen by Malhotra et al (2000)[23] in their study i.e., grade IV (80.9%), grade V (12.7%), grade VI (0.6%).

Failure of non-operative management (NOM) was defined as any form of intervention done in a patient initially selected for NOM. Failure of NOM was seen in

25% of cases in our study, which is comparable to 10.2 % as seen by Mohapatra et al (2003)[25] in their study.

In our study the differential failure rates in relation to small andmoderate hemoperitoneum were studied and it was concluded that amount of hemoperitoneum had no correlation with success or failure of NOM. Same was concluded by Pachter et al (1992)[19] and Goan et al (1998)[37] in their studies.

The average requirement of blood transfusion in our study was 2.157 ± 1.74 units. However it was 3.09 units in case of successful NOM and 4.7 units in cases of failed NOM. On comparing the blood requirements in successful and failed NOM groups it was found that there is no significant difference in blood requirement in both groups. Similar findings were derived in another studies by Velmahos et al (2003).[38]

Average hospital stay in successful NOM cases was lower than in failed NOM.Similar findings were derived in other studies by Malhotra et al (2000)[23] that reported a hospital stay in successful NOM group as significantly lower than in failed NOM group.

In our study the differential rate as regards liver injury grade on CT scan were calculated and it was derived that there was no significant difference of failure rates in relation to grade of injury. Thus concluding that the CT grade of injury did not affect the outcome of NOM. Same was observed by Goan et al (1998).[37]

In our study the blood pressure (BP) on admission was studied in relation to outcome of NOM and it was derived that there was no significant difference in the outcome of the patients (successful NOM or failed NOM) in relation to BP on initial presentation.

A total of 6 patients had to be operated upon in our study . Active bleed was seen on laparotomy in four patients and no evidence of any injury causing peritonitis was found in any of them. Post operatively all patients recovered well and had no significant complications. The complications encountered in our study on NOM wasrebleeding which was seen in four patients, bilioma/bile peritonitis seen in 2 patients.

Thus the results of our study conclude that haemodynamic stability is the key word in the non operative management of liver injuries in blunt trauma abdomen and that the amount of hemoperitoneum and the grade of liver injury do not significantly influence the outcome of non operative management. Moreover age 55 years or multiple solid organ injuries should not preclude the non operative management of such injuries.

Conclusion: The medical field has seen significant advancements in terms of diagnostic aids, newer drugs and cures and treatment options over a the last couple of decades and they have added much to decrease the morbidity and mortality in the field of medicine. However on the other hand, the avalanche of gold rush of these newer management techniques is so rapid and lucrative that in many instances there seems to be little endeavor to evaluate these procedures.

In the same prospective and upcoming approach in the treatment of blunt trauma abdomen is non-operative management of liver injuries in hemodynamically stable patients.

The success rates of non-operative management were significantly higher than the failures rates of non-operative management, without any significant incidence of complications and delayed laparotomies in our study. Hence non-operative management is the treatment option of choice in a hemodynamically stable patient with solid organ injury in blunt trauma abdomen.

The morbidity related to successful non operative management was much less than the failed non operative management group as indicated by the fact that patients having successful non operative management had lower blood requirements.

Success rates of non operative management in patients with multiple intra abdominal organ injuries was statistically equivalent to those in single solid organ injury. Therefore presence of multiple intra abdominal organ injuries should not preclude non operative management.

Hence in today's era non-operative management is the gold standard in hemodynamically stable patients with blunt hepatic injuries who lack any other indication for laparotomy.

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