Operative Management versus Conservative in Patients with Liver Trauma Injury

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Background: *The liver is one of the most frequently damaged organs when abdominal trauma occurs. Currently, conservative management becomes the treatment of choice in hemodynamic stable patients.*

Aim: *To evaluate the results of an operative and conservative management of liver injury patients.*

Patients and methods: *From March 2011 to June 2015, 113 patients suffered from hepatic trauma were referred to Zagazig University hospital, trauma unit. The patients were classified according to the way of management: Group I, operative management; Group II, conservative management. Variables analyzed included demographic data, injury classification, associated lesions, surgical treatment, morbidity, mortality, and hospital stay.*

Results: *113 patients had hepatic trauma. 39 (34.5%) patients were managed non-operatively. The commonest type of trauma was blunt and the main cause was motor vehicle in 59 (52.2%) patients. The second cause was stab injury with 33 (29.2%) patients. The least cause was gunshot injury in 21 (18.6%) patients. There was no significant difference in hospital stay between patients operated on and these managed non-operatively. There was no mortality in the patients managed conservatively.*

Conclusions: *Conservative management is a safe approach for hemo-dynamically stable patients with liver trauma. Conservative management patients should be admitted to intensive care unit for at least 48-72 hours for close monitoring of vital signs repeated clinical examinations and follow up investigations as indicated. Failure of conservative treatment did not show a higher incidence of complications or mortality. Good results obtained from conservative management resulted from a highly cooperated trauma team including surgery, anethesia, intensive care, cardiothoracic and neurosurgery doctors.*

Key words*: Conservative management, liver trauma and operative management.*

Introduction:

The liver is the largest solid abdominal organ with a relatively fixed position, which makes it prone to injury.[1] In Egypt in the last 3 years the incidence of liver trauma increased due to the increase in the frequency of abdominal firearm injury. Many studies during the last decade changed the therapeutic protocols in management of liver trauma.[2] Conservative management took its role in liver injury hand by hand with operative management. So surgery is no longer the only option available.[3] Surgery has to done for extensive lesions with hemodynamic instability or for the treatment of the complications. Surgical techniques include mass sutures, resection, caval shunting, SHAL (selective hepatic artery ligation), gauze pack or omental pack.[4] Multiple studies showed that conservative management of liver injuries is effective. However, most of these studies were retrospective. In addition, the criteria for conservative management differed among centers and included different thresholds of age, hemodynamic compromise, abdominal tenderness, injury severity, associated extra-abdominal injuries, and grade of liver injury.[5–7] The aim of this

study was to analyze the effectiveness and the morbidity, the mortality of both conservative and surgical treatment in patients with hepatic injury attended in our trauma unit.

Patients and methods:

This was a review of our experience in the treatment of liver trauma from March 2011 ending in June 2015 including all the patients diagnosed with liver injury reported in our casualty unit. Injuries were graded according to the Organ Injury Scale as described by the American Association for the Surgery of Trauma.

To analyze the results the patients were divided into two groups:

Group I: operative treatment in 74 patients.

Group II: conservative treatment in 39 patients.

Surgeon decided which way of treatment to apply.

Conservative treatment was depending on fulfilling the following criteria:

a) Hemodynamic stability.

b) Absence of signs of diffuse peritonitis physically.

c) No suspicion of associated injuries.

The initial radiological assessment was carried out with ultra- sonography and/or abdominal computerized tomography (CT) scan.

Conservative treatment for these patients included:

a) Strict clinical control.
b) Hemodynamic monitoring.
c) Daily pelvi-abdominal US.
d) Serial determination of hemoglobin.
e) Absolute bed rest for a period of 48–72 hours.

Conservative treatment considered failed and surgery indicated when:

a) The appearance of hemodynamic instability.
b) Clinical signs of peritonism.
c) And/or a continued reduction in hematocrit values.

On confirmation of the hemo-dynamically stability and if the associated injuries doesn't need surgical interference, the patients were transferred to inpatient wards. Abdominal CT and liver functions were routinely performed prior to hospital discharge. Follow up via US after 1, 3 and 6 weeks. CT repeated after 2 - 3 months to verify the resolution of the injuries **Figure (1)**.

Regarding exploration, our policy was to achieve perfect haemostasis. Big exploratory incision was done for good exposure; either j shaped incision from the start or right subcostal extension if we consulted to deal with liver trauma after midline incision. Liver mobilization was the next step. Identification of the bleeder, and dealing with the cause were done accordingly (either suture ligation or haemostaic diathermy when the bleeding is minimal). We never took haemostatic through and through sutures, for bleeding control. After good haemostasis we searched for biliary leak which was death and deled with accordingly (when the patient was stable, we did intra-operative cholangiogram to search for the bile leak cause in difficult hidden leaks). We did damage control in unstable patients, packing and re- explore the patient when became stable. In major lacerations we sometimes did non-anatomic resection. Lastly good drainage was applied **Figure (2)**.

The variables analyzed for the two groups of patients included classification of hepatic injury, associated lesions, surgical technique, morbidity, mortality and hospital stay.

Results:

From March 2011 ending in June 2015, 113 patients with liver trauma were treated in our center. 72 male patients (63.7%), 29 female patients (25.7%) while only 12 child patients (10.6%). The most type of trauma was blunt 59 (52.2%) patients and the main cause was motor vehicle accident. The second cause was stab injury with 33 (29.2%) patients. The least cause was gunshot injury with 21 (18.6%) patients.

Associated abdominal lesions were presented in 56 patients (49.5%). Common associated organ injuries were Spleen (8), Diaphragm (13), Kidney (5), Ureter (1), Stomach (5), Colon (4), Duodenum (1), Chest (12 haemo-thorax), small bowel (6)

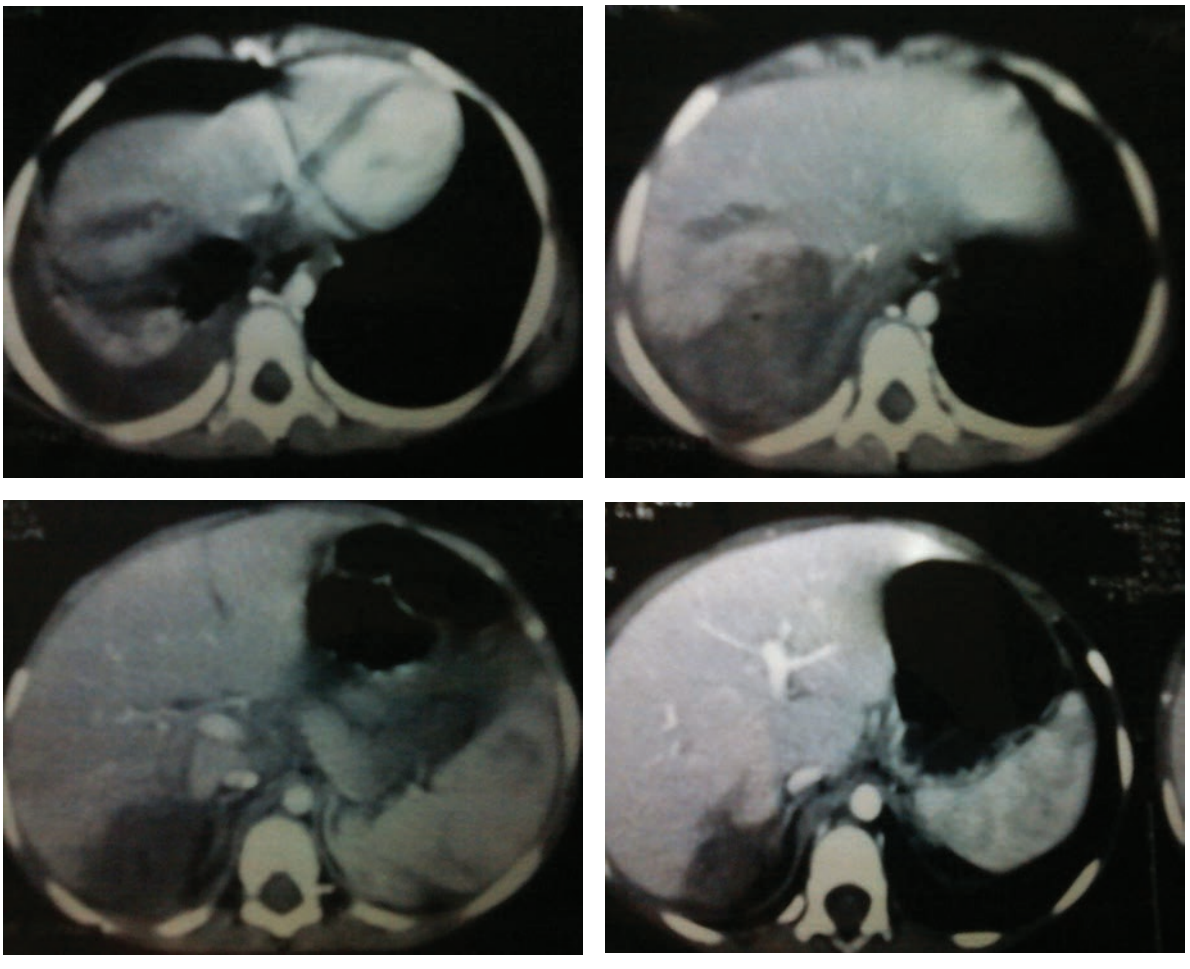

Figure (1): A&B: Right posterior liver injury at time of trauma. C: CT follow- up after one month. D: CT follow- up after 3 months.

Figure (2): A: Segment 6 injury. B: IVC Injury repair. C: Shuttered liver. D: Diathermy haemostasis after minor liver injury.

Table (1): Postoperative morbidity and mortality.

Complications	Number	Management
Morbidity: 1. Biliary leakage	6 (22.2%) 3 blunt 2 gunshot 1 stab	Reoperation (Segmentectomy) (Leakage from Segment 6 duct due to necrosis). Reoperation with ligation of segment 4 duct. Reoperation, leakage from cut surface. Pigtail in 3 cases.
2. Pleural effusion	3 (11.1%)	Conservative.
3. Wound problems • Dehiscence • Infection • Seroma	14 (51.9%) 2 5 7	 Closure. Antibiotic+ Repeated dressing. Repeated dressing.
Chest infection	4 (14.8%)	Chest physiotherapy and antibiotics.
Mortality:	18 (15.9%) 11 M 5 F 2 children.	 7 Chest causes. 11 Irreversible shocks (un-controlled bleeding).

Table (2): Conservative cases in blunt and gunshot injuries.

Injury Type	Nu	Age	Gender	Injury Site
Blunt Grade I	16 (41.1%)	15-35 Yrs	M: 12 F: 4	Rt. Lobe: 12 Rt. Post.: 9 Rt. Ant.: 3 Lt. Lobe: 4
Blunt Grade II	19 (48.7%)	10-35 Yrs	M: 9 F: 4 Ch: 6	Rt. Lobe : 10 Rt. Post.: 4 Rt. Ant.: 6 Lt. Lobe: 9
Blunt Grade III	2 (5.1%)	5yrs	Ch:2	Rt. Lobe: 2
Gunshot	2 (5.1%)	27-43 yrs	M: 2	Rt. Lobe: 1 Rt. Post.: 1 Lt. Lobe: 1

and pancreas (1).

The classification of the severity of the liver injuries (in blunt trauma 59 patients) according to the HIS criteria was as follows: Grade I: 16 (27.1%); Grade II: 24 (40.7%); Grade III: 11(18.6%); Grade IV: 6 (10.2%); and Grade V: 2 (3.4%).

Surgical treatment: 74 patients (65.5%) underwent surgery on admission due to hemodynamic instability. Other causes for surgical treatment were: signs of peritoneal irritation on physical exploration, pneumo-peritoneum, suspicion of diaphragmatic injury, renal injury.

Management of the liver injury as stratified according to grade of injury at exploration:

Surgical options for management of liver injuries at exploration included application of absorbable gelatine sponge (gelfoam), suture of the liver injury, peri-hepatic packing and resection. Resection was non-anatomical.

Eighteen patients died (15.9%); 5 patients (27.8%) following blunt trauma, 4 patients (22.2%) for stab wounds and 9 patients (50.5%) following gunshot injury. Eleven

patients (61.1%) were presented with shock on admission died compared to 7 patients (38.9%) were presented without shock. Among 19 patients with delay of >6 h, 14 patients (73.7%) died, compared to 5 patients (26.3%) of those whose delay was >6 h. Patients with grade V injuries had a significantly higher mortality rate compared to patients with grades I-IV injuries. Significantly more patients with associated injuries died (15) compared to those with isolated injury (3) **Table (1)**.

Fifteen (13.3%) patients required a re-exploration for various reasons including damage control (3), removal of packs (7), biliary fistula (3) and burst abdomen (2). Postoperative complications arose in 27 patients (23.8%) and included biliary leak (6), pleural effusion (3), and chest infection (4) and wound problems (14).

Conservative treatment: 39 patients (34.5%) initially received conservative treatment that was effective in 33 (84.6%) cases. The morbidity in this group was 5 (12.8%) cases. Complications with the conservative treatment were a respiratory infection in 3 patients, one adult respiratory distress syndrome (ARDS) and one paralytic ileus **Table (2)**.

Failure of conservative treatment: In 6 patients (15.4%), non surgical treatment failed with surgery being required. The reason for failure was hemodynamic instability in 4 cases and a maintained low hematocrit values in 2 cases. Four patients underwent surgery during the first 24 hours and the remaining two cases had surgery on the 3rd and 4th day, respectively.

Compared with the patients who underwent conservative management, patients who underwent a surgical treatment had a higher injury grade, more morbidity, mortality and more use of packed red blood cell (RBC), fresh frozen plasma (FFP), Platelet (PLT).

The risk factors for injury grade were: hemodynamic instability, vascular injury, surgical technique, hepatic mortality, hemo-peritoneum, lesion size, red blood cell (RBC), fresh frozen plasma (FFP), Platelet (PLT), hospital stay.

There was no difference in morbidity between the three injury mechanisms. There was no difference in morbidity between patients with associated hollow visceral injury and those without associated hollow visceral injury but patients with hollow visceral injury had a higher mortality. Shock on admission and delay before surgery affected mortality.

Discussion:

In the last 15 years, the treatment of liver trauma had progressively evolved.[8] At the beginning of 1990's several papers discussed the possibility of non surgical treatment in patients with hemodynamic stability similar to pediatric surgeons in cases of hepatic and splenic injuries.[4]

The aim of this type of treatment was not only to decrease the number of non therapeutic explorations[9] but also to decrease morbidities and mortalities. Fortunately, a high percentage of injuries, around 85%, were not severe (<grade IV), these were previously managed with coagulation diathermy, hemostatic agents or superficial ligature. In these injuries, hemorrhage stopped at the time of surgery in a considerable number of cases.[10] Conservative treatment undoubtedly achieved the greatest percentage of success in this group of patients. However, in the remaining 10%-20% of the severe hepatic injuries the decision as to whether surgery was necessary represented a difficult challenge for the surgeon.

In our center we routinely used abdominal ultra-sonography as the first diagnostic step in the study of abdominal trauma. This is a cheap, non-invasive investigation which is rapid and has a high sensitivity and specificity of 80%-95%,[8] for the detection of intra-abdominal injuries, although it is operator-dependent with little specificity for detecting visceral lesions. Abdominal CT is more rapid, sensitive and specific in the diagnosis of abdominal injuries.[10] We believed that an abdominal CT should be carried out within the first 24 hours on suspicion of liver injury.

The applicability of conservative treatment in patients with liver injury has varied from 35% to 82% in publication.[11] The two main

variables guiding the therapeutic approach were hemo- dynamic instability and the need for transfusion.[12,13]

The application of conservative treatment in cases of liver trauma forces surgeon to put the patient under continuous monitoring during the first 48 hours and to have rapid and efficient facilities to explore the patient once deteriorated.[2] During the first years most series limited conservative management to non-severe injury (grade ≤III),[14] restricting its use to values below 40% of the cases. Nowadays, the good results achieved led to progressive widening of the inclusion criteria.[10]

Non-operative management of hepatic injuries is the treatment modality of choice in hemo-dynamically stable patients, irrespective of the grade of injury.[15] Also Feliciano et al suggested conservative treatment for any lesion regardless of the injury force as long as the patient hemo-dynamically stable and with hemo-peritoneum of less than 500 ml estimated by CT scan.[16] Currently most authors consider that the decisive factor in deciding the conservative treatment should be hemodynamic stability independently of the injury grade and the quantity of hemo-peritoneum estimated by CT.[9,12]

In our study all the patients with grade V injury underwent surgery. In our limited experience severe grade V injuries were required surgical treatment. Nonetheless, in a series of 500 patients who received conservative treatment, Malhota et al., described a failure rate of only 23% in the group of patients (n = 30) with grade V lesions.[17] Other series show that a non-operative management of high-grade liver injury have been successful 10 but is associated with significant morbidity and correlates with the grade of liver injury.[18] We have failure rate (15.4) in 6 patients from 39 patients.

High-grade injuries can be managed conservatively, if operative intervention is not required for hemodynamic instability or associated injuries, with a low mortality.[19–21] In this subgroup with high risk of conservative treatment failure, the use of angiography with selective embolization of the hepatic injuries may be useful.[22-24]

The mortality from juxta-hepatic venous injuries is generally reported from 50% to 80% and the direct approach is the correct and rapid interference in these lesions.[25] In our study the morbidity and mortality were not greater in the patients with conservative treatment failure compared to similar injuries in the surgical group.

The fact that 50-80% of liver injuries stop bleeding spontaneously, coupled with better imaging of the injured liver by CT, has led to the acceptance of conservative management with resultant decrease in mortality rates.[26] This is especially more applicable to blunt liver injuries.[27] Also, selective non-operative management of liver injuries is now becoming acceptable for firearm injuries as well.

Conclusion:

Conservative treatment in liver injury is applicable in hemodynamic stability patients. It is associated with a low overall morbidity and does not result in increases in length of stay. Also it is safe and effective regardless of the grade of liver injury. But, in our opinion, patients with grade V lesions should undergo surgical treatment after diagnosis.

Failure of conservative treatment does not necessarily lead to an increase in the incidence of complications or mortality in well equipped hospitals which permits the immediate possibility of performing surgery. Usually failure of conservative management was caused by associated abdominal injuries and not the liver. The degrees of injury severity, blood requirements, and the presence of other abdominal organ injuries have its role in conservative management failure.

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