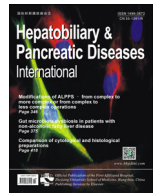




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Original Article/Liver

## Liver trauma: What current management?

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## ABSTRACT

**Background:** The liver is the most commonly damaged organ in abdominal trauma. The management of liver trauma has experienced many changes over the last two decades. Currently there is a trend toward a non-operative treatment warranted by the successful pediatric experience and better results recorded in many trauma centers worldwide. This study aimed to evaluate outcomes of operative and non-operative management of liver trauma in our institution over the last five years.

**Methods:** The patients with a diagnosis of blunt or penetrating liver injuries, admitted and managed in our hospital from January 2012 to December 2016 were retrospectively studied. The patients were divided into 2 groups, operated and non-operated groups, according to the initial management considered appropriate at the time of patient admission. Clinical features and outcomes were analyzed.

**Results:** The study involved 83 patients, with a mean age of 33 years and a marked male predominance (85.5%). The most common type of lesions was blunt trauma and the main cause was road traffic accidents. Sixty-eight liver injuries (81.9%) were of low severity (grades I, II, III), while 15 (18.1%) were of high severity (grade IV or greater). Fifty-six patients (67.5%) had multiple injuries. Surgical treatment was performed in 26 (31.3%) patients. Non-operative management was undertaken in 57 cases (68.7%). The morbidity and mortality rates were clearly lower in non-operative patients compared to those in the operated group.

**Conclusions:** Careful non-operative management is an adequate therapeutic strategy for the patients suffering from liver trauma with stable hemodynamics. Patients with complex hepatic trauma and especially those with other organ injuries continue to have significantly higher mortality.

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## Introduction

Despite its relatively well protected position, the liver is the most frequently injured organ in abdominal trauma [1,2]. The liver trauma is the most common cause of death after abdominal injury. Their mortality depends on grade of liver injuries and associated lesions to other organs. Management of liver trauma has changed considerably over the last few decades toward a non-operative treatment. Furthermore, poor outcomes of hepatic resections in emergency, and the understanding of the phenomena of nonsurgical hemorrhage, have led to a concept of damage control laparotomy with perihepatic packing. Subsequently, accompanied by advances in resuscitation and interventional radiology, the shift

toward a non-operative treatment provided a decrease in overall mortality rates.

This study aimed to present the experience of Ibn Sina Hospital of Rabat, Morocco and to analyze outcomes of different managements of liver trauma.

## Methods

Eighty-three patients with liver trauma between January 2012 and December 2016 at Ibn Sina Hospital of Rabat were included in this descriptive and retrospective study. The iatrogenic traumas were excluded. At presentation, all patients were initially assessed and resuscitated according to the Advanced Trauma Life Support (ATLS) guidelines. Patients who are unstable despite initial resuscitation were immediately taken to the operating room for emergency laparotomy. In contrast, stable patients underwent a rapid physical examination and further evaluation by imaging studies. Liver injuries were classified according to the Liver In-

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**Table 1**  
Liver injury scale.

Grade	Description of injury
I	
Hematoma	Subcapsular, nonexpanding, < 10% surface area
Laceration	Capsular tear, nonbleeding, < 1 cm in parenchymal depth
II	
Hematoma	Subcapsular, 10–50% surface area Intraparenchymal, < 10 cm in diameter
Laceration	Capsular tear, 1–3 cm in parenchymal depth, < 10 cm in length
III	
Hematoma	Subcapsular, > 50% surface area or expanding Intraparenchymal > 10 cm in diameter or expanding Ruptured subcapsular or parenchymal hematoma
Laceration	> 3 cm in parenchymal depth
IV	
Hematoma	Ruptured intraparenchymal hematoma with active bleeding
Laceration	Parenchymal disruption involving 25–75% of hepatic lobe or 1 to 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 (retrohepatic vena cava or central major hepatic veins)
VI	
Vascular	Hepatic avulsion

jury Scale (LIS) of the American Association for the Surgery of Trauma [1–3]. Indication for conservative management (careful observation of the patient) was based on the following criteria: hemodynamic stability (systolic blood pressure > 90 mmHg and no need for excessive blood transfusion); absence of peritonitis signs on abdominal examination; and no suspicion of abdominal associated injuries requiring surgery on imaging tests. These patients, initially non-operated were closely monitored in the intensive care unit during the first 24 h after admission and if hemodynamically stable, referred to the ward for further observation. Otherwise, we operated all patients who did not meet the aforementioned criteria. Omental evisceration in the penetrating trauma has not been considered as a formal criterion for surgery.

The patients with liver trauma were divided into the operated and non-operated groups. The following data were collected from medical records and analyzed: age, gender, type and mechanism of injury, systolic blood pressure and hemoglobin rate on admission, clinical signs, imaging findings, grades of liver injuries, abdominal and extra-abdominal associated injuries, number of red blood cell transfusions, therapeutic protocol (operative or conservative treatment), details of surgical interventions, length of hospital stay, and outcomes, including morbidities and mortalities.

Statistical analysis was performed using SPSS version 13.

## Results

We collected 535 cases of abdominal trauma over a period of five years. Eighty-three (15.5%) injuries were interested liver, 71 men (85.5%) and 12 women (14.5%). The age ranged from 16 to 80 years (mean  $33 \pm 14$ ); the age group 20–40 years is the most affected with a percentage of 68.3%. We counted 59 (71.1%) blunt hepatic traumas and 24 (28.9%) penetrating injuries. Road traffic accident was the main mechanism observed in 41 (49.4%) cases. Twenty-three (27.7%) lesions were due to stab injuries, 14 (16.9%) to fall from greater height, 2 (2.4%) to kick from horse, one to gunshot wounds, one to railway accident and one to an industrial accident.

Twenty-three patients were hemodynamically unstable at admission, 14 of them had refractory hypotension in spite of resuscitation measures, and they were immediately taken to the operating room for exploratory laparotomy. In stable or stabilized patients, physical examination and radiological exploration were undertaken with ultrasound and/or computed tomography (CT) scan according to the hemodynamic status. Referring to the LIS (Table 1) [1–3], 68

**Table 2**  
Liver injuries grades.

	Number	Percentage (%)
I	9	10.8
II	21	25.3
III	38	45.8
IV	12	14.5
V	3	3.6

**Table 3**  
Associated intra-abdominal injuries.

Abdominal affected organ	Number of patients
Spleen	14
Kidney	13
Diaphragm	9
Small bowel and colon	7
Duodenum and pancreas	3
Stomach	2
Suprarenal gland	2
Urinary bladder	2
Gall bladder	1

patients (81.9%) had simple hepatic injuries (grades I, II, III) while 15 patients (18.1%) suffered complex lesions (grade IV or greater) as shown in Table 2. Fifty-six patients (67.5%) had multiple associated injuries. Extra-abdominal lesions were seen in 46 patients (55.4%), and they were dominated by thoracic lesions followed by extremities and head injuries. These lesions, sometimes life threatening, had considerably worse prognosis, whereas, intra-abdominal lesions were present in 35 patients (42.2%). The spleen is the most affected abdominal organ followed by kidney and other organs as shown in Table 3.

Surgical treatment was carried out in 26 (31.3%) patients with almost half of them (14/26) were suffering from penetrating liver trauma. This group concerns the majority (11/15) of high-grade injuries (IV and V). Fourteen patients underwent surgery on admission because of refractory hemodynamic instability. Other indications for surgical treatment were: clinical signs of peritoneal irritation (2 patients), associated lesions requiring surgery (4 patients), and progressive fall of hemoglobin with recurrent blood transfusion (3 patients). Additionally, 3 patients with complex liver injuries (grades IV and V) were chosen for surgical treatment even with hemodynamic stability, fearing a possible re-bleeding of liver injury. Surgical techniques included suture hepatorrhaphy

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