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# Hepatic trauma treatment in a general hospital: analysis of 5.5 years

## Abstract

**Introduction:** Liver damage occurs in 20% of closed abdominal traumas but damage of the liver alone without involving other organs occurs only in 10%.

**Material and method:** A retrospective, observational and cross-sectional study was conducted over a period of 5.5 years (2013-2018) in a general hospital where all patients admitted to shock or emergency services with a diagnosis of abdominal trauma were included, there were no exclusion criteria.

**Results:** We treated 12 patients with abdominal trauma and liver damage, ten of the male sex and two of the female sex; nine stable patients and three patients with shock status; nine cases for open abdominal trauma and three for closed trauma; eight with abdominal trauma and four with abdominal-thoracic trauma; seven caused by a knife, three cases by automobile accidents, one case by firearm and one case by fall; two cases with admission to the Intensive Care Unit. Six cases were classified as Grade I liver injury and six with Grade III.

**Discussion:** There are two ways to approach these patients, anatomical resection and non-anatomical resection and approximately 80 to 90% are not candidates for surgery. The packaging is the best option in our environment because it favors the containment of the hemorrhage which would allow the patient to be transferred to a hospital with greater resources. We use raffia in injuries Grades I and II and the packing in Grades III and IV due to not having the resource of embolization.

**Keywords:** Liver, blunt trauma, stab trauma, non-operative management, hemostatics, thrombin, tissue adhesives, embolization, contrast-enhanced ultrasound, package

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## Introduction

In 1812 Larrey surgeon Napoleon Bonaparte claimed that the lacerations of the liver if communicated with the abdominal cavity, were fatal and that the escape of bile into the abdomen was equally fatal.[1] The liver, due to its anatomical position and its fixations, is a low elastic organ, which favors that it can be injured in different ways in such a way that Hitzrot JM,[2] collected 10 cases of liver injury since January 1908 with nine cases operated on and of these two died, the other case was detected postmortem in autopsy in an undiagnosed case. One case was a subcapsular hematoma, a giant hemorrhagic cyst and the other eight cases were various hepatic lacerations. Liver damage occurs in 20% of closed abdominal traumas but damage of the liver alone without involving other organs occurs only in 10%. Lately there has been a change in the approach in this type of injuries due to more accurate imaging studies and as a result of this we try to handle cases conservatively.[3] This is because the classification of liver injuries is based on computed tomography, which allows a selection of the patient that could be handled in this way, however, do not forget that the main requirement to decide to operate or not to operate is stability hemodynamics of the patient and that does not require laparotomy due to other causes.[4,5] Laugesen NG,[6] in their study in the pediatric population have found that ultrasound with contrast medium (CEUS) has a comparable utility with CT and MRI with a specificity of 98% to identify liver lesions and a predictive value negative 100% in addition to avoiding exposure to radiation at this age.

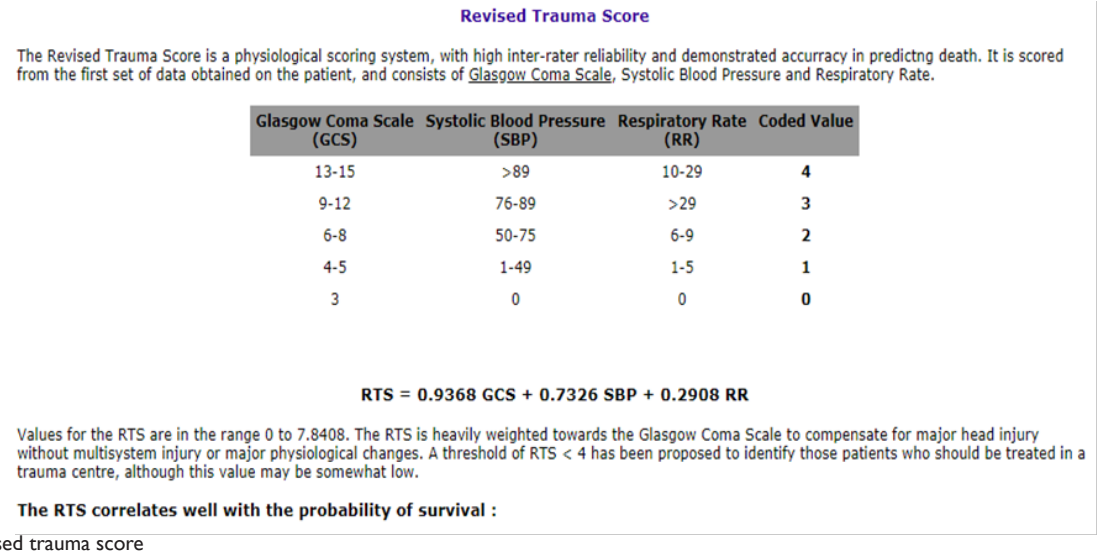
## Material and method

To know the incidence, etiology, clinical characteristics and morbidity of hepatic trauma due to open and closed abdominal trauma in a population of southeastern Mexico, a retrospective, observational and cross-sectional study was conducted over a period of 5.5 years (June 2013-June 2018) in a hospital In general, all patients who were admitted to the shock or emergency department with a diagnosis of abdominal trauma were included, there were no exclusion criteria. The demographic variables were obtained: age and sex; etiology; laboratory tests: group and Rh, hemoglobin; cabinet studies: (US, TC), admission to ICU, intrahospital stay and morbidity. For the analysis descriptive statistics were used, the qualitative variables were expressed in percentages; and the quantitative variables in means, medians and standard deviation.

## Results

During the study period, 12 (100%) patients with abdominal trauma and liver damage were treated, 10 (83%) of the male sex and two (17%) of the female sex; nine (75%) stable patients and three (25%) patients with shock status; nine (75%) cases due to open abdominal trauma and three (25%) cases due to closed trauma; eight (67%) patients with abdominal trauma and four (33%) with abdomino-thoracic trauma; seven (58%) cases caused by stab wounds, three (25%) cases due to automobile accidents, one case (8%) due to firearm and one case (8%) due to fall; two cases (16%) with admission to the packed intensive

care unit. Six cases (50%) were classified as grade I liver injury and six (50%) with grade III. The statistical analysis is presented in Table 2. The injured organs and the procedures used in Table 3. RTS and ISS (Figure 1 & Figure 2, Table 1-3).



**Revised Trauma Score**

The Revised Trauma Score is a physiological scoring system, with high inter-rater reliability and demonstrated accurracy in predictng death. It is scored from the first set of data obtained on the patient, and consists of Glasgow Coma Scale, Systolic Blood Pressure and Respiratory Rate.

| Glasgow Coma Scale (GCS) | Systolic Blood Pressure (SBP) | Respiratory Rate (RR) | Coded Value |
|---|---|---|---|
| 13-15 | >89 | 10-29 | **4** |
| 9-12 | 76-89 | >29 | **3** |
| 6-8 | 50-75 | 6-9 | **2** |
| 4-5 | 1-49 | 1-5 | **1** |
| 3 | 0 | 0 | **0** |

**RTS = 0.9368 GCS + 0.7326 SBP + 0.2908 RR**

Values for the RTS are in the range 0 to 7.8408. The RTS is heavily weighted towards the Glasgow Coma Scale to compensate for major head injury without multisystem injury or major physiological changes. A threshold of RTS < 4 has been proposed to identify those patients who should be treated in a trauma centre, although this value may be somewhat low.

**The RTS correlates well with the probability of survival :**

**Figure 1** Revised trauma score

**Table 1** Hepatic trauma, classification and treatment

| Grade | Type | Description | Treatment |
|---|---|---|---|
| I | L | Capsular < 1 cm | 1. Observation (G I y II) / exploration. G III embolization |
| | | | 2. Hemostatics |
| | | | 3. Packing, direct compression |
| | | | 4. Suture |
| | H | Subcapsular < 10 of surface | |
| II | L | 1-3 cm depth and < 10 cm surface | 5. Direct ligature |
| | H | Subcapsular 10-50% surface or intraparenchymatous < 10 cm diameter | |
| III | L | 25-75% of a lobule or 1-3 segments | 6. Pringle´s maneuver |
| | H | Subcapsular >50% surface, intracapsular or open intraparenchymatous. Intraparenchymatous >10 cm or 3 cm expansive | |
| IV | L | >75% of one lobule or more of 3 segments | 7. Lobectomy with drainage |
| | | | 1. Direct compression + repair |
| | | | 2. Cavo-cava Shunt |
| | | | 3. Temporary vascular clamping |
| | | | 4. Veno-venoso bypass |
| V | V | Retrohepatic cava vein or suprahepatics | 5. Packing |
| VI | V | Avulsion | 6. Arterial-venosa ligature |

Note L, laceration; H, hemorrhagic; V, vascular

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**Table 2** Statistical analysis

| Value | Age (years) | Hb (mg/dl) | EIH* (days) |
|---|---|---|---|
| Average | 30.5 | 11.5 | 9.2 |
| Medium | 29 | 11.3 | 6 |
| Moda | 26 | N/A | 3 |
| SD | 8.7 | 1.8 | 9 |
| Rank | 31 | 5.1 | 32 |
| Minimum | 17 | 9.3 | 3 |
| Maximum | 48 | 14.4 | 35 |
| Confidence level (95%) | 5.6 | 1.1 | 5.7 |

*EIH = intrahospital stay

**Table 3** Injured organs and procedures applied

| Cases | Injured organs | Procedures |
|---|---|---|
| 1 | Liver injury grade I, stomach, pleura | Hepatic raphia, pleural seal |
| 2 | Liver injury grade III, grade I splenic lesion, transverse colon, pancreas | Hepatic raphia, splenectomy, primary closure, distal pancreatectomy |
| 3 | Liver injury grade I | Hepatic raphia, omentum closure, epiploic raphia |
| 4 | Liver injury grade III, splenic lesion grade IV | Hepatic raphia, splenectomy |
| 5 | Liver injury grade III, pneumothorax | Hepatic raphia, packaging, pleural seal |
| 6 | Liver injury grade I, spleen, diaphragm rupture | Hepatic raphia, splenectomy, closure of the diaphragm, pleural seal |
| 7 | Liver injury grade I, transverse colon, hemothorax | Hepatic raphia, primary colon closure, pleural seal |
| 8 | Liver injury grade I, stomach, small Intestine, pancreas | Hepatic raphia, primary closure, pancreatic fistula |
| 9 | Liver injury grade I | Hepatic raphia |
| 10 | Liver injury grade III, right breast injury | Hepatic raphia, wound closure |
| 11 | Liver injury grade III, duodenum, transverse colon, fx ulna and radius | Hepatic raphia, primary closure, colostomy, T and O interconsultation |
| 12 | Liver injury grade III | Hepatic raphia, packaging |

**Injury Severity Score**

The Injury Severity Score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an Abbreviated Injury Scale (AIS) score and is allocated to one of six body regions (Head, Face, Chest, Abdomen, Extremities (including Pelvis), External). Only the highest AIS score in each body region is used. The 3 most severely injured body regions have their score squared and added together to produce the ISS score.

An example of the ISS calculation is shown below:

| Region | Injury Description | AIS | Square Top Three |
|---|---|---|---|
| **Head & Neck** | Cerebral Contusion | 3 | 9 |
| **Face** | No Injury | 0 | |
| **Chest** | Flail Chest | 4 | 16 |
| **Abdomen** | Minor Contusion of Liver<br>Complex Rupture Spleen | 2<br>5 | 25 |
| **Extremity** | Fractured femur | 3 | |
| **External** | No Injury | 0 | |
| | **Injury Severity Score:** | | **50** |

The ISS score takes values from 0 to 75. If an injury is assigned an AIS of 6 (unsurvivable injury), the ISS score is automatically assigned to 75. The ISS score is virtually the only anatomical scoring system in use and correlates slinearly with mortality, morbidity, hospital stay and other measures of severity.

It's weaknesses are that any error in AIS scoring increases the ISS error, many different injury patterns can yield the same ISS score and injuries to different body regions are not weighted. Also, as a full description of patient injuries is not known prior to full investigation & operation, the ISS (along with other anatomical scoring systems) is not useful as a triage tool.

**Figure 2** Injury severity score

## Discussion

Hur'iev SO,[7] in their study about the cause of death in patients with liver trauma 87.5% is the lack of replacement of the lost blood and in 12.5 of the patients in state of traumatic shock with a prolonged prehospital scenario . In the group of survivors 76% was due to the adequate application of hemostats. Morales Uribe CH,[8] remind us that there are two ways to approach these patients, anatomical resection and non-anatomical resection and that approximately 80 to 90% of patients are not candidates for surgery. In 117 patients with closed abdominal trauma, 19 patients required surgery in the first 24 hours of their admission but 11 of them died, the management was perihepatic packing and raffia of the lesions. 98 patients did not require surgery and in seven cases this behavior failed and they had to undergo surgery. Concluding that the presence of associated intra-abdominal lesions is an indication of immediate laparotomy as well as the application of the RTS and ISS scores.[9] Currently due to technological advances, the treatment of liver injuries can be with conservative management and/or immediate surgery. InukaiK,[10] have found that when all the necessary elements are available, conservative management can be made both in hemodynamically stable patients and in some cases of instability.

Regarding laparoscopic surgery, it has many defenders such as Liu Jing,[11] who report in 32 cases treated for open or closed hepatic trauma managed by coagulation, application of glue in spray, packing with hemostasis gas, ligature and hepatectomies. Michelino de Oliveira F,[12] they are currently working on an experimental phase method of patches based on collagen, thrombin and fibrinogen with encouraging results to obtain fast and easy hemostasis. Bilomas in hepatic surgery due to trauma are rare, Al-Hassani A,[13] reported one case in a young man with grade IV liver injury resolved by means of CEPRE and stenting without complications. Mzoughi Z,[14] report the case of a 54-year-old man with liver injury from open stab trauma) who developed arteriovenous fistula resolved by embolization. Ayuso Velasco R,[15] in their study about the management of hepatic trauma, they conclude that the best option is the packaging, which allows adequate containment of the hemorrhage, which would allow the patient to be transferred to a hospital with greater resources and experience in liver surgery. In our hospital, in addition to the raffia in lesions Grades I and II, the behavior is packaging due to the lack of recourse to embolization or interventional radiologist. Fortunately we did not have injuries Grades IV and V.

## Acknowledgements

None.

## Conflict of interest

The author declares that there is no conflict of interest.

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