Send Orders for Reprints to reprints@benthamscience.net

8 *The Open Emergency Medicine Journal,* **2013, 5, 8-11**

Open Access

Complications Associated with Non-Operative Management of Blunt Hepatic Injury: a Review

Ramia JM*, Ramiro C, De la Plaza R, Arteaga V, Adel F and García-Parreño J

Unidad de Cirugía Hepatobiliopancreática, Servicio de Cirugía General y Aparato Digestivo, Hospital Universitario de Guadalajara, Guadalajara, Spain

Abstract: Non-operative management (NOM) is considered the gold standard treatment for blunt liver trauma in hemodynamically stable patients since it is both feasible and safe. The reported rate of NOM ranged from 82 to 100% according to different series. The feasibility of NOM is lower in patients with severe liver injury. Since NOM has reduced mortality rates, the focus now has shifted to lowering hepatic morbidity, which is reported to be significant, from 10 to 25%. There are four types of complications after NOM: abdominal compartment syndrome, bleeding, Infectious complications and biliary complications. When present, complications of complex blunt hepatic injuries are difficult to treat, the hospital stay is longer and the ICU mortality is higher. 85% of these complications can be safely managed non-operatively. A strict clinical follow-up and keeping in mind every possible complication let clinicians diagnose and treat quickly.

Keywords: Liver, trauma, blunt, morbidity, emergency, review, surgery.

INTRODUCTION

Approximately 5% of trauma patients admitted to the hospital have a liver trauma [1]. Traffic accidents are the most common mechanism of injury [1, 2]. 74% are blunt hepatic trauma and 17% are classified as severe, greater than grade III of AAST (Fig. **1**)(American Association for the Surgery of Trauma) [1]. Mortality in hepatic trauma is currently between 4 and 15% and depends on the severity of liver injury and other associated injuries [1, 3, 4].

Management of blunt liver trauma (BLT) has changed dramatically in recent decades [3, 5, 6]. The presence of hemodynamic stability in 75% of BLT patients, the absence of active bleeding at the time of laparotomy in 50-86% of patients and the high morbidity of nontherapeutic laparotomies have changed the therapeutic strategy [1]. Currently, non-operative management (NOM) is considered the gold standard treatment for BLT in hemodynamically stable patients since it is both feasible and safe [1, 2, 5-11, 12]. The advantages of NOM include lower hospital cost, earlier discharge, avoiding non-therapeutic laparotomies, fewer complications, and reduced transfusion rates [12].

The reported rate of NOM in BLT ranged from 82 to 100% according to different series, with a success greater than 90% and a very low mortality related to the liver injury (<8%) [2,3,5,6,9,10,1]. The feasibility of NOM is lower in patients with severe liver injury: 60-80% in grade IV and 30-70% in V grade [1-3] (Fig. **1**, **2** and **3**). Furthermore, the failure rate is 14% in hepatic trauma grade IV, and 23% in grade V [1, 3]. The presence of hemoperitoneum in six compartments is also associated with a higher failure rate in NOM [3]. Other factors associated with failure of NOM in BLT are splenic or renal injuries grade IV-V or shock on admission [3]. Severity of hepatic injury, neurologic status, age and associated injuries are not contraindications to trial NOM in a hemodinamically stable patient [12].

There is no established consensus on how much blood loss or transfusion requirement mandates the decision to intervene, whether operatively or angiographically [12].

Since NOM has reduced mortality rates in BLT, the focus now has shifted to lowering hepatic morbidity, which is reported to be significant, from 10 to 25% [2, 3, 5, 8, 9, 12]. Some authors claim we have gone too far in the NOM of complex liver injuries, with occasionally unacceptable morbidity rates [5]. In some referral centres delayed laparoscopy is even routinely proposed as a part of the therapeutic strategy to decrease the complication rates but this is not an internationally accepted approach [10].

The morbidity related to NOM of BLT is produced by the release of bile and blood into the peritoneal cavity that may cause a severe inflammatory response and specific complications [2, 8]. Hepatic-related complications of NOM can be classified into four groups: bleeding, biliary, infectious and abdominal compartment syndrome [1, 2, 5, 7]. Bleeding and abdominal compartment syndrome occurs in the first three days post-BLT, while delayed complications (from the third day post-BLT) are primarily biliary and infectious in nature with few exceptions [5, 12].

The complication rate correlates with the AAST grade of hepatic injury and the need for transfusion at 24 hours post-injury [1, 2, 5, 9, 12]. Thus, the incidence of complications is 5-7% in grade III lesions, 22% in Grade IV, and 52-63% in grade V [5, 6, 12]. This is not surprising as high-grade liver

*Address correspondence to these authors at the C/General Moscardó 26, 5-1, Madrid 28020, Spain; Tel: 0034-616292056; Fax: 0034949829218; E-mail: jose_ramia@hotmail.com

1876-5424/13

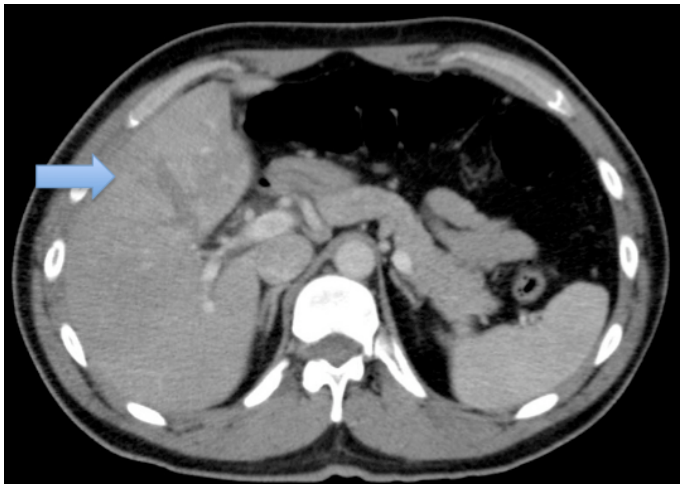

Fig. (1). Abdominal CT: Grade III AAST liver injury managed non-operatively. Arrow: laceration >3cm.

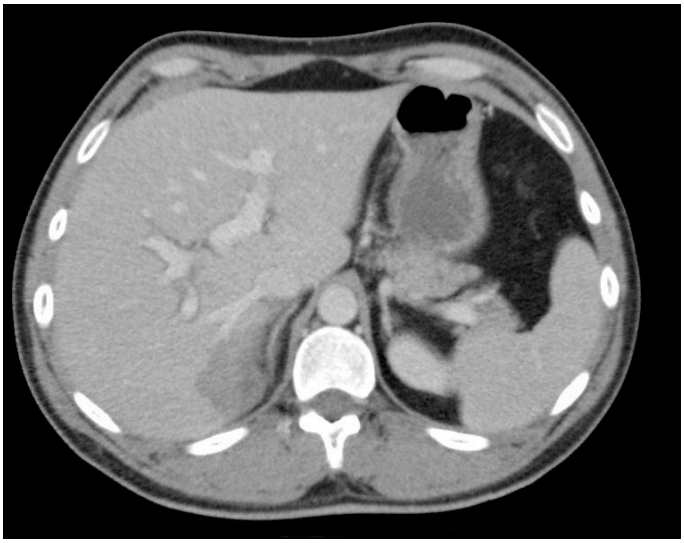

Fig. (2). Abdominal CT: Grade IV AAST liver injury managed non-operatively (haematoma <10 cm).

injury causes significant hepatic parenchymal disruption, injuring both vascular and biliary structures [6]. When present, complications of complex blunt hepatic injuries are difficult to treat, the hospital stay is longer and the ICU mortality is higher [5]. 85% of these complications can be safely managed non-operatively [7].

TYPE OF COMPLICATIONS AFTER NOM OF BLT

• Abdominal compartment syndrome: occurs only in 1% of patients and requires surgery [1, 2, 5].

• Bleeding: occurs in 2-8% of patients and is the most frequent cause of mortality [1, 5]. Bleeding can occur in an early phase (85% of patients in the first three days) or delayed [5]. In both cases, it can be treated initially by percutaneous angioembolization. It can be tried again if it fails or it could require surgical intervention, around 20% of those with recurrent bleeding require operative strategies [1, 5].

The use of angioembolization to control active bleeding in patients with BLT has become increasingly common, with a high rate of success (90%) [1, 6, 7]. Patients treated with angioembolization can present the following complications: groin hematoma, arterial pseudoaneurysm, hepatic necrosis, bile leak, cholecystitis, gallbladder necrosis and liver abscess [1, 6]. The post-embolization morbidity is high (about 60%) [2, 7, 9]. Patients receiving early embolization seem to have fewer complications than those who underwent a late one [7].

• Infectious complications: hepatic-related infectious complications of BLT include liver or perihepatic abscesses and hepatic necrosis [10, 12]. These complications occur in 4% of patients and they usually appear late (day 15 post-BLT) [5]. The resolution rate of liver abscesses treated by percutaneous drainage and antibiotics is nearly 90% [1, 5]. The hepatic necrosis requires a laparotomy for debridement of necrotic tissue [8]. As mentioned earlier, patients with hepatic necrosis usually had underwent previously arterial embolization for bleeding control (1.5).

• Biliary complications (Fig. **4** and **5**): these complications include traumatic bile duct injuries, biloma, biliary sepsis, biliary-venous fistula and biliary peritonitis [5,10-12]. Biliary complications have been reported in 3.2-7% of patients and they are more frequent in grade IV-V lesions [12]. They developed at a mean of 12 days post-injury and exceptionally in the first 72 hours [5, 9]. Biliary complications of

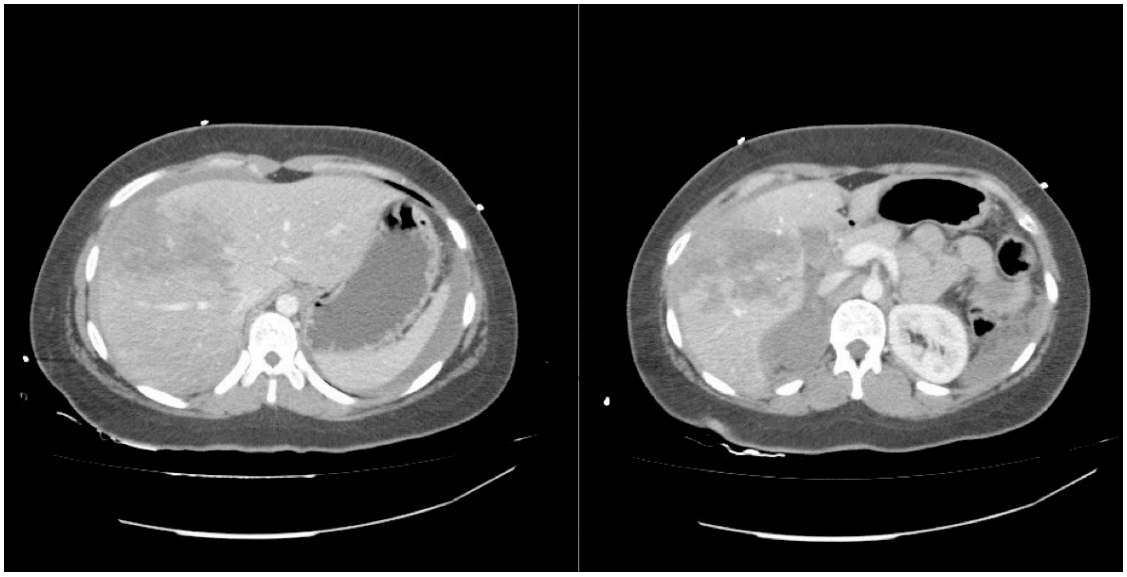

Fig. (3). Abdominal CT: Grade IV AAST liver injury managed non-operatively without morbidity.

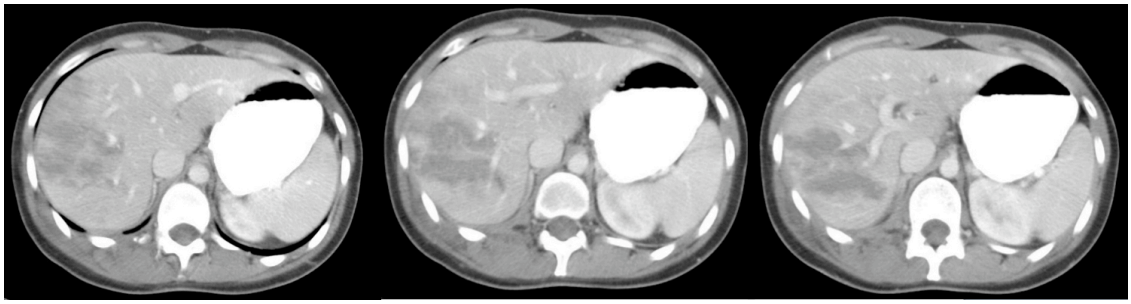

Fig. (4). Abdominal CT showing a grade IV AAST liver blunt trauma (Axial images).

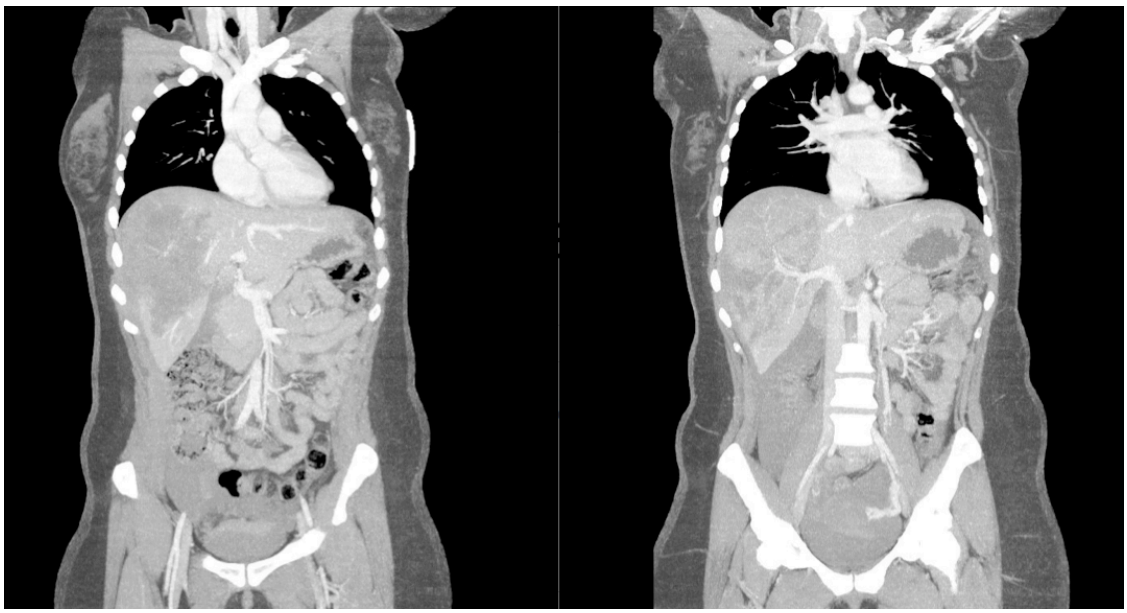

Fig. (5). Abdominal CT showing a grade IV AAST liver blunt trauma (Coronal images).

BLT rarely cause mortality but they increase morbidity rates and length of hospital stay. Injuries can affect peripheral bile ducts or more uncommonly first- or second-order hepatic duct [11, 12]. The severity of complications is related to the level of the injured duct [11].

Diagnosis is based on clinical worsening appearing several days after injury (abdominal pain, worsening of cardiopulmonary function), changes in analytical parameters (hyperbilirubinemia and leukocytosis) and imaging test (cholangioRM, Tc-HIDA scintigraphy and CT) [1, 5, 10, 12]. Most

of the biliary complications of the BLT require some kind of percutaneous, endoscopic or surgical procedures for their management [1, 5, 10].

When a biloma is diagnosed the best treatment is a percutaneous drainage, with a resolution rate of 70%, although observation could be an option in small asymptomatic biloma [1]. If a persistent high out-put biliary leak is diagnosed, ERCP with stenting is the best choice with a therapeutic success rate close to 90% [1, 7, 9, 12]. Hemobilia should be treated by angioembolization [1].

Surgery is performed on those patients who develop generalized biliary peritonitis or after failure of non-surgical techniques [5, 10]. Bile peritonitis causes abdominal pain and an "inflammatory syndrome" (fever and leukocytosis) [2, 12]. Classically, surgery was performed by laparotomy but the laparoscopic approach has been reported to be safe and effective [1, 2, 5, 10, 12]. The procedure consists of washing the abdominal cavity and placing drains. Cholecystectomy and transcystic drainage should be performed selectively [2, 8, 10]. There is no consensus regarding the decision of performing any surgical procedure on the liver injury if it is not actively bleeding [8, 10]. Some authors have employed hemostatic and tissue sealing agents to control biliary fistula [10]. Liver resections have been proposed when a first-order bile duct is injured although conservative management (ERCP with stenting and percutaneous drainage) is the most widely accepted strategy [11].

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

ACKNOWLEDGEMENT

Declared none.

REFERENCES

[1] Silvio L, Madrazo Z, Ramos E. Actualización del tratamiento de los traumatismos hepáticos. Cir Esp 2008; 83: 227-34.

[2] Letoublon C, Chen Y, Arvieux C, *et al.* Delayed celiotomy or Laparoscopy as part of the nonoperative management of blunt hepatic trauma World J Surg 2008; 32:1189-93

[3] Leppaniemi AK, Mentula PJ, Streng MH, Koivikko MP, Handolin LE. Severe hepatic trauma: non operative management, definitve repair or damage control surgery. World J Surg 2011; 35: 2643-9.

[4] Asensio JA, Petrone P, Garcia-Nuñez L, Kimbrell B, Kuncir E. Multidisciplianry approach for the management of complex hepatic injuries AAST-OIS grades IV-V: a prospective study. Scand J Surg 2007; 96: 214-20.

[5] Kozar RA, Moore FA, Cothren CC, *et al.* Risk factors for hepatic morbidity following nonoperative management. Arch Surg 2006; 141: 451-9.

[6] Dabbs DN, Stein DM, Scalea TM. Major hepatic necrosis: a common complication after angioembolization for tretament of high-grade liver injuries. J Trauma 2007; 66: 621-9.

[7] Mohr AM, Lavery RF, Barone A, *et al.* Angiographic embolization for liver injuries: low mortality, high morbidity. J Trauma 2003; 55: 1077-82.

[8] Goldman R, Zilkoski M, Mullins R, Mayberry J, Deveney C, Trunkey D. Delayed celiotomy for the treatment of bile leak, compartment syndrome and other hazards of non operative management of blunt liver injury. Am J Surg 2003; 185: 492-7

[9] Bala M, Gazalla SA, Faroja M, *et al.* Complications of high grade liver injuries: management and outcome with focus on bile leaks. Scand J Trauma Res Emerg 2012; 20: 20-7.

[10] Marzano E, Rosso E, Oussoultzglou E, Collange O, Bachellier P, Pessaux P. Laparoscopic treatment of biliary peritonitis following nonoperative management of blunt liver trauma. World J Emerg Surg 2010; 5: 26-8.

[11] D´Amours SK, Simons RK, Scudamore CH, Nagy AG, Brown DRG. Major intrahepatic bile duct injuries detected after laparotomy: selective nonperative management. J Trauma 2001; 50: 480-4.

[12] Stassen NA, Bhullar I, Cheng JD, *et al.* Nonoperative management of blunt hepatic injury: An Eastern Association for the Surgery of Trauma practice management guideline. J Trauma Acute Care Surg 2012; 73(Sppl 4): S288-93.

Received: April 13, 2013 Revised: June 06, 2013 Accepted: June 07, 2013