

# Trends in the management of blunt liver trauma

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## ABSTRACT

**Objective:** Blunt liver trauma management has changed over the last 2 decades to include non-operative management as one of the standard approaches, particularly to those with minor liver injury. We reviewed the experience at a non-trauma hospital to identify trends in methods of evaluation and management of blunt liver trauma and discuss its outcome.

**Methods:** Medical records of 21 patients who sustained blunt liver trauma between June 1992 and July 1999 were retrospectively reviewed at King Fahad Military Medical Complex, Dhahran, Kingdom of Saudi Arabia.

**Results:** Thirty-three percent received non-operative management and recovered without complications. The rest received an operative management but in comparison had more severe liver injury scales, higher incidence of

associated injuries, significantly greater blood transfusion requirements, longer hospital stay and a mortality rate of 67%.

**Conclusion:** Non-operative management of blunt liver trauma is a valid effective option. It requires less blood transfusion and shorter hospital stay and is associated with a low complication rate. Severe liver injury can be associated with high mortality. Outcome can be significantly affected by both the severity of liver trauma and associated injuries particularly severe head injury. Management of the severely injured is expected to have a better outcome in a trauma centre.

**Keywords:** Blunt liver trauma, non-operative management, outcome.

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The overall mortality of liver trauma, which used to be very high, is now approximately 10%.<sup>1,2</sup> The positive impact of trauma systems on the outcome has been significant, and currently up to 55% of adult patients with blunt liver trauma are managed non-operatively.<sup>3-9</sup> The rate of missed enteric injury was observed in a number of studies to be very low.<sup>1,3,7,8</sup> We reviewed the experience of blunt liver trauma cases, managed at a non-trauma hospital, to identify our trends in methods of evaluation and management. We also reviewed the literature, to analyze some of the factors associated with improved outcome.

**Methods.** Medical records of all patients admitted with the diagnosis of blunt liver trauma between June 1992 and July 1999 in a non-trauma hospital were retrospectively reviewed. Abstracted data included glasgow coma scale (GCS), hemodynamic status, method of abdominal evaluation and injury grade were determined according to the organ injury scale (OIS), modified from Moore and revised in 1994.<sup>1,8</sup> As data was not complete, the GCS, hemodynamic status and severity of liver injury were estimated according to the descriptions obtained in casualty notes, radiological

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and operative reports. Method of management (operative versus non-operative), associated injuries (intra-abdominal and extra-abdominal), blood transfusion requirements and total hospital stay including length of stay (LOS) in the Intensive Care Unit (ICU), were also included. For simplicity, operative management (OM) was divided into minor and major.<sup>10</sup>

**Results.** The initial number of retrieved records was 21. Three patients were excluded from the study. Two of them had been already operated upon in another hospital before being transferred to us. The 3rd was suspected to have a liver tear indicated by computerized tomography (CT) scan however, subsequent laparoscopy revealed a minor splenic tear but no liver tear. Thus, only 18 were analyzed. Of these, OM was required in 12 (10 adults and 2 children) and non-operative management (NOM) in the remaining 6 (5 adults and one child). The 12 patients managed operatively had an average GCS of 8, and 11 of them were hemodynamically unstable. Four had diagnostic peritoneal lavage (DPL), 2 had ultrasound (U/S) examination and 2 were taken directly to theatre without diagnostic tests. The remaining 4 had a variable combination of DPL, U/S and CT scan. The 6 patients managed non-operatively had an average GCS of 15 and all were hemodynamically stable. None had DPL, 4 had CT scan, one had both U/S and CT scan and one had U/S but 3 days later, CT scan was performed which revealed a resolving liver hematoma. All of these 6 had liver injury, Grade I-III and one of them sustained both intra-abdominal and extra-abdominal associated injuries. In contrast, in the OM group, there were 5 patients who sustained liver injury Grade IV-V and 3 of them had major surgery (**Table 1**). In this group, 8 patients sustained both intra-abdominal and extra-abdominal associated injuries indicating the severity of trauma to this sub-group of patients. Out of the 12 patients who underwent OM, 11 received blood transfusion with an average of 12.3 units. Out of the 6 patients who received NOM, only 2 received blood transfusion with an average of 1.5 units. Length of stay (in days) for the OM group averaged 16.8 in total and 8.1 in ICU, where it averaged 9.3 in total and 3.5 in ICU for the NOM group. Non-operative management was associated with no mortality, a success rate of 6/6 (100%) with no complications. In contrast, OM was associated with mortality of 8/12 (67%). Thus, the overall mortality rate in the series was 8/18 (44%). Three died on the operative table (GCS 3-4) and one died the same day in ICU (GCS 3) indicating the severity and multiplicity of injuries to this group. Out of the 8 deceased victims 5 had sustained severe OIS grade IV-V and 3 sustained grade II-III but these 3 had a very low GCS of 3-4.

**Table 1** - Method of management by injury grade and magnitude of operations performed.

Injury grade	NOM N=6	OM N=12	Minor	Major	None
I-III	6	7	4	2	1
IV-V	0	5	1	3	1
<b>Total</b>	<b>6</b>	<b>12</b>	<b>5</b>	<b>5</b>	<b>2</b>
N - number, NOM - non-operative management, OM - operative management					

**Discussion.** Non-operative management has become a standard approach to both adults and children who sustain blunt liver injury.<sup>11-13</sup> Criteria for NOM include hemodynamic stability, absence of associated injuries requiring laparotomy and ICU monitoring.<sup>8,11</sup> Computerized tomography scan to delineate the extent of injury and to follow the progress of injury resolution is essential.<sup>8</sup> Overall, the success rate with this approach was reported to be above 90%. Non-operative management can be associated with complications such as bile collections as well as intra-abdominal abscess and hemorrhage but these can be treated non-surgically. One 3rd of our patients (6/18) met the criteria for NOM. They were all stable enough to be diagnosed with non-invasive scanning and were found to have sustained milder liver injury (grade I-III). None had severe head injury (average GCS of 15) and only one patient had multiple intra-abdominal and extra-abdominal injuries. This group required markedly less blood transfusion than the OM group and the average total LOS was less than 10 days, with 2 patients not requiring ICU. This group of 6 patients with NOM in our study recovered with no complications. Severe injuries (Grade IV-V) with stable hemodynamics had been successfully managed non-operatively in up to 33%,<sup>9</sup> but it has to be stressed that OM of patients with blunt hepatic injury is the appropriate option when it is associated with either intra-abdominal injuries requiring laparotomy or persistent hemodynamic instability during resuscitation.<sup>3</sup> Computerized tomography scan is the best diagnostic modality in the hemodynamically stable, as it will assess both the extent of injury and subsequently the progress of injury resolution.<sup>8</sup> Up to 60% of the patients with stable cardiovascular status who have abdominal pain or tenderness after a road traffic accident, in one study,<sup>14</sup> did not have serious intra-abdominal injuries and then laparoscopy was found helpful to reduce unnecessary laparotomy. Although, DPL particularly in stable patients has become much less used than in

the past, as it can lead to a high rate of non-therapeutic laparotomies,<sup>1,11</sup> sending an unstable patient to the Radiology Department for CT scan carries a definite risk and in this setting, surgical decisions made on the basis of clinical evaluation and DPL or U/S constitutes the current practice. Ultrasound in the Emergency Department by surgical staff has a definite learning curve, but it is a quick and non-invasive approach to an unstable patient, and is being successfully and increasingly used. In the group of 12 patients operated upon, 11 were hemodynamically unstable, 4 had DPL, 2 had U/S and 2 were taken directly to the theatre without diagnostic tests. The remaining 4 had additional scanning. These patients had sustained severe degrees of injuries with nearly half sustaining grade IV-V liver injuries, 2 sustained both intra-abdominal and extra-abdominal injuries and the average GCS was 8. Not surprisingly, massive blood transfusion was required and total, as well as ICU LOS, was longer than in the group who received NOM. Unfortunately, mortality in this severely injured group was 67%. Half of these trauma victims died on the same day with a GCS of only 3-4. In a study of 900 trauma victims,<sup>15</sup> 70% of deaths occurred within the first 24 hours of admission, and CNS injuries were found to be the cause of 43.6% of all trauma deaths. In addition to CNS injuries, exsanguination played a prominent role in these deaths. In complex hepatic injuries, temporary liver packing allows time for correction of hypovolemia, coagulopathy, acidosis and hypothermia and allows transfer to specialist care if necessary.<sup>16,17</sup> Blunt liver trauma is one of the most frequent indications for this kind of damage control approach and it is preferable to terminate the initial laparotomy before these physiologic disturbances become extreme.<sup>18,19</sup> In our study, the damage control approach was utilized in some situations, but overall the mortality was still as high as 67% in those who received OM. Despite the small size of this study, high mortality is believed to have been linked with a number of factors. Our hospital is located near the highway where the accidents are usually of a high magnitude. Multiple trauma is common and transport of trauma victims is sometimes carried out by passers-by who have a minimal knowledge of safe transport. Some patients either arrive dead or nearly so with dilated pupils. In the context of multiple trauma, minor liver injuries theoretically might have been overshadowed by other associated severe injuries making their under-reporting statistically critical to our high mortality rate. Preventing death of trauma patients, in general, should be a primary goal and in this context the impact of a trauma system has been found to be significant. The rates of preventable deaths reported in the literature vary from 30% at non-trauma centres to 1-5% at trauma centres.<sup>15,20</sup> Trauma systems have been shown in many studies to save lives by

appropriate pre-hospital treatment, triage and care by receiving trauma centres. Prevention of trauma itself should be a goal and further improvements in vehicle design may prove effective as did changes in the road environment in reducing the chance of a crash.<sup>21</sup> Improvements in management of liver injury patients and trauma victims in general are a necessity which needs to be discussed periodically among those concerned through regular meetings and trauma conferences. More collaboration between medical institutions and governmental divisions as a whole is expected to be of great benefit in preventing or reducing the severity of injuries, or both. Hospitals with sufficiently trained staff and with modern equipment and facilities will continue facing these challenging trauma victims, and will be expected to save more lives as they fully apply a trauma system to their management.

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