

Liver Injury in Abdominal Trauma: Management and Association with Other Solid Abdominal Organ Injury

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Abstract

Background and objective : Blunt abdominal injury remains one of the commonest injuries. The solid organs, namely the Liver, Spleen & Kidney are the most commonly injured intra-abdominal organs. Non operative line of management is now considered the line of treatment for patients with intra-abdominal organ injury who are hemodynamically stable. In the case of polytraumatized patients with open or blunt abdominal trauma, the liver is the most frequently injured abdominal organ. Earlier, surgical treatment was the standard procedure globally for all kinds of trauma-related liver injuries. However, development of new interventional radiological techniques has changed the paradigm towards a non-surgical patient management. **Methodology:** An observational study of 50 patients with solid organ injuries of the abdomen following abdominal trauma admitted over a period from July 2018 up to August 2020 was carried out. Patient management either operative or conservative was decided on basis of hemodynamic status and they were divided in groups OP (Operated) and NOM (Non Operative Management). **Interpretation and conclusion :** In our study, majority of liver injury were treated conservatively. Splenic injury patients were mostly managed by operative intervention and renal injury patients were managed according to grading of organ injury.

Keywords : Abdominal Trauma, Hemodynamic status, Operative, Solid organ injury

Introduction:

Trauma has been defined as damage to the body caused by an exchange with environmental energy that is beyond the body's resilience. Trauma is a major worldwide health problem. It is a pandemic & one of the major causes of death in developing as well as developed countries. Trauma remains the most common cause of death for all individuals between the age of 15 & 44 years and is the third most common cause of death worldwide regardless of age. It kills more people of up to 35 years age than all other causes combined.⁽¹⁻³⁾

Overall, blunt abdominal injury remains one of the commonest injuries affecting people worldwide. Abdominal trauma accounts for 15% to 20% of all trauma deaths. The solid organs, namely the Liver, Spleen & Kidney are the most commonly injured intra-abdominal organs. These deaths primarily occur soon after injury as a result of uncontrolled haemorrhage if not treated early, although some occur later due to complications from sepsis. In the recent years, there has been a dramatic change in management of abdominal trauma patients worldwide in non-operative and operative management. Non operative line of management is now considered the line of treatment for patients with intra-abdominal organ injury who are hemodynamically stable.^(4,5)

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In the case of polytraumatized patients with open or blunt abdominal trauma, the liver is the most frequently injured abdominal organ. The main cause of liver injury-related death is uncontrolled bleeding, and it is associated with a mortality rate of 54 % in patients due to active bleeding and biliary complications. However, the management of traumatic liver injuries has changed during recent years, and the outcome of patients has markedly improved. Earlier, to control the bleeding and prevent biliary complications, surgical treatment was the standard procedure globally for all kinds of trauma-related liver injuries. However, improved understandings of the natural course of liver injuries and the development of new interventional radiological techniques have changed the paradigm toward a more non-surgical patient management. More than 80 % of patients with blunt hepatic trauma are treated in a non-surgical fashion.^(6,7)

In addition, introduction and comprehensive use of CT scanning enabled a reliable diagnosis of liver injuries within a short time after admission to the emergency room, and has become the gold standard for assessing abdominal trauma patients.⁽⁸⁾

Common mechanisms of trauma of upper abdomen:

In patients encountering abdominal solid organs injury, more energy is transferred over a wider area during blunt trauma than from a gunshot or stab wound. As a result, blunt trauma is associated with multiple widely distributed injuries, whereas in penetrating wounds the damage is localized to the path of the bullet or knife.

1). Blunt Trauma:^(9,10)

In blunt abdominal trauma, organs that cannot yield to impact by elastic deformation are most likely to be injured are the solid organs like liver, spleen, and kidney.⁽⁹⁾ The most common mechanism of blunt abdominal trauma in India is a motor vehicle crash.

Injuries involving High Energy Transfer¹¹ include auto-pedestrian accidents, accidents in which the patient has been ejected and motorcycle collisions. Low-Energy Transfer,⁽⁹⁾ such as being struck with a club or falling from a bicycle, usually does not result in widely distributed injuries.

2). Penetrating trauma:^(9,10)

Organs with the largest surface area when viewed from the front are most prone to injury like liver, small bowel and colon by sharp weapons like knives and daggers or bullets. Because bullets and knives usually follow straight pathway, adjacent structures are not commonly injured. Penetrating injuries are classified according to the wounding agent, into Stab wound, Gunshot wound, and Shotgun wound.

Objectives:

- 1) To study in detail about clinical profile of patients and to draw conclusions about clinical presentation, various management protocols and surgical procedures of liver injury associated with other solid organ injuries of abdomen in the patients admitted at our emergency care dept.
- 2) To thoroughly study profile of patients coming to LG hospital with abdominal trauma presented with liver injury in emergency ward.
- 3) To study the management protocols for intra-abdominal solid organ injury with reference to liver injury at our emergency care dept.
- 4) To observe, record and analyze all clinical data of the patients which is helpful to define basis of conservative or operative management.
- 5) To record and critically analyze operative and post-operative data of abdominal trauma patients.

Methodology:

An observational study of patients with solid organ injuries of the abdomen following abdominal trauma

admitted over a period from July 2018 up to August 2020 was carried out. Total 50 patients were included in this study. All patients were classified according to the type of management. Those operated immediately after admissions were named as being OP (Operated) group and those managed conservatively were named as being NOM (Non Operative Management) group. Those among the NOM group were further divided into two groups. Those managed conservatively which did not require subsequent operative management formed the NOM SUCCESS group and those that required subsequent operative intervention formed NOM CONVERTED group.

Inclusion criteria: Patients who were diagnosed with liver injuries in blunt and penetrating abdominal injuries on clinical and radiological basis along with other abdominal solid organ injuries including spleen and kidney.

Exclusion criteria: Patients who were presented with abdominal trauma without liver injury and associated pancreatic injury.

Table 1: Age and Gender Distribution of study participants (n=50)

Age	Frequency (%)	Gender	Frequency (%)
Adolescents (11-19 years)	14 (28%)	Males	43(86%)
Middle aged adults (20-44 years)	30 (60%)	Females	7 (14%)
Elderly (>44 years)	06 (12%)		
Total	50 (100%)	Total	50 (100%)

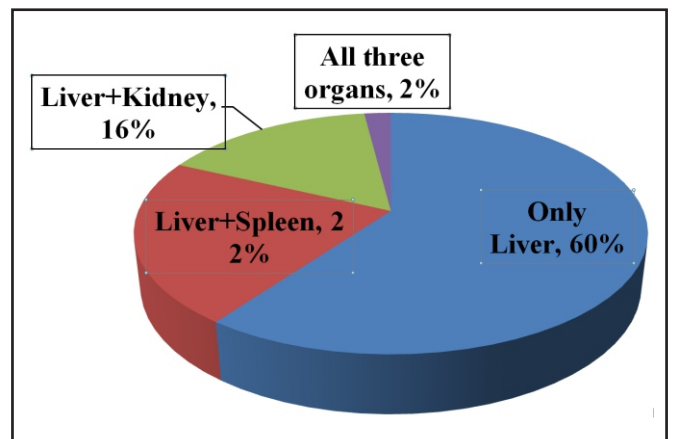
Table 2: Mode of Trauma among study participants (n=50)

Mode of injury	Patients	Percentage
Blunt	44	88%
Penetrating	5	10%
Poly trauma	1	2%
Total	50	100%

Results:

In this study, 50 patients of different age and sex and various mechanisms and patterns of injury, admitted at trauma centre were observed for the study. More number of male patients were there because of common practice of outdoor and earning activities which in turn expose them for traumatizing conditions. Maximum numbers of patients affected were from middle aged adult group because of more mobility and involvement in traumatizing activities more commonly.

Figure 1: Organ involvement after radiological investigations



As explained earlier, liver is most commonly involved organ in abdominal trauma due to its loose visceral attachments leading to twisting and shearing of liver, larger surface area, anterior placement of an organ and high vascularity.

Figure 2: Grading of injury of abdominal organs

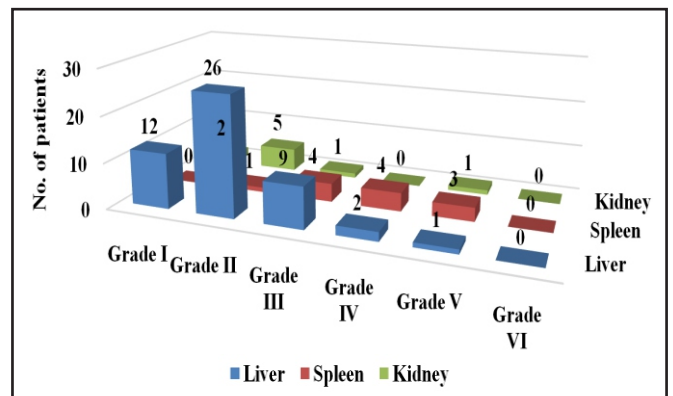


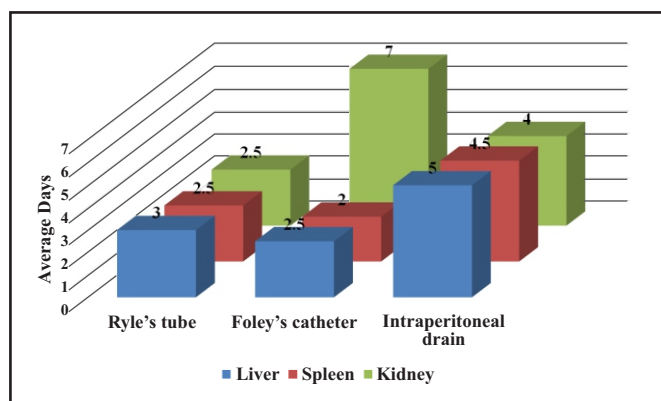
Table 3: Summary of all organs involvement and their management strategies

Management Strategy	Liver	Spleen	Kidney	All Organs	Total
Operated (OP) group	1	9	2	1	13
NOM-Success	28	0	6	0	34
NOM-Converted	1	2	0	0	3
Total	30	11	8	1	50

The average length of Intensive care unit (ICU) stay for Operative (OP) group was 4.5 days whereas that for Non-operative management converted (NOM Converted) group was 6 days.

None of the patients of NOM Success group were kept in ICU setup. Those patients were treated in general ward. The average duration of hospital stay for patients of Operative(OP) group was 13 days. For NOM Converted group it was 15.5 days. For NOM Success group it was 8 days.

Figure 3: Average days of requirement of Ryle’s tube, Foley’s catheter and intraperitoneal drain in post-operative patients



Discussion:

A study of 50 patients of liver injury with or without other intra-abdominal solid organ injury was done at our hospital from June 2018 to September 2020. There was a predominance of males over females. In all age groups, individuals 20-45 years of age were

more susceptible to solid organ injury. Blunt trauma was more common as compared to penetrating trauma with liver the most commonly injured solid organ in our study⁵.

In Operative (OP) group, total 13(26%) patients were managed operatively. All patients were kept in surgical ICU. In OP group incidence of liver+ splenic injuries are highest who were operated mainly for splenic injury (69%). In Non-operative management (NOM) group, all patients with hemodynamic stability were managed in surgical ICU with close observation, serial investigations & immobilization. Patients with NOM Converted group were given an extra 2 days of ICU stay. Only 3(6%) patients required operative management later on in NOM group. Requirement of ICU stay was highest in patients of NOM Converted group.

In patients with liver injuries, grade 1 & 2 patients were managed successfully conservatively. 93% of liver trauma patients were managed conservatively under NOM Success group. 7% patients required operative interventions. This result was similar to reference study of Croce M A et al. Department of Surgery, University of Tennessee-Memphis, USA, 2009’ in which the conclusion says that nonoperative management is safe for hemodynamically stable patients with blunt hepatic injury, regardless of injury severity. There are fewer abdominal complications and less transfusions when compared with a matched cohort of operated patients⁵.

In patients with splenic injuries, all the patients were operated, hence, 100% operative intervention. This higher incidence of operative intervention suggests that, while operating for spleen injury, a surgeon also has to suspect other solid organ injury so that he can predict blood loss, hypovolemia and other operative challenges. In patients with renal injuries, grade 1 & 2 were managed successfully in ward with close monitoring and serial investigations. Out of all renal injury patients, 25% patients were operated who had higher grade renal injuries.

Conclusion:

From this study, it is concluded that, even today, hemodynamic instability remains the most important parameter in decision making between conservative and operative management of trauma patients with solid organ injury. For solid organ injuries, CT scan of abdomen is the prime investigation for grading of organ specific injuries and management. Liver injury continues to predominate the spectrum of solid organ injuries of the abdomen but majority can be managed conservatively. Splenic trauma has high prevalence of operative intervention in view of associated hemodynamic instability. Renal trauma patients can be managed conservatively under surgical ICU set up excellently. However, those with definitive indications & high grade injuries require operative intervention.

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