

Post Operative Complications Of Hepatic Trauma And Their Management: An Experience at Mayo Hospital.

A A ALI K M GONDAL I AHMED M N ASLAM A M CHAUDHRY

Department Of Surgery, Mayo Hospital Lahore.

Correspondence To Dr. Abrar Ashaf Ali

A prospective study of Fifty patients with postoperative complications following hepatic trauma during two and half years is presented. Of these 84% were male and 16% were females. Age ranged from 13 years to 55 years with a mean of 24 years. Penetrating injuries were more common 80% than blunt trauma 20%. Missile injury (firearm) was the cause in 64% cases, stab in 16% cases. Diagnostic peritoneal lavage was performed in 4 out of 10 cases of blunt trauma. Forty one patients had associated injuries. Twenty two percent patients had multi-regional injuries. Fourteen patients (28%) had 47 different complications, these are haemorrhage 6%, hypothermia 10%, hypoglycaemia 6%, respiratory complications 18%, jaundice 6%, wound infection 18%, wound dehiscence 8%, intraabdominal sepsis 12%, liver abscess 4%, bile peritonitis 2% and biliary fistula 8%. Morbidity was 46% and mortality 10%.

Key Words : Liver trauma, complications of hepatic trauma.

Liver injury is suspected in all patients with penetrating or blunt trauma involving lower part of chest and abdomen. With the increase in civilian trauma the incidence of liver injury, better prehospital care, swift means of transport and improved methods of resuscitation have increased likelihood of a surgeon encountering severe liver trauma.

Early exploration, prompt replacement of blood and use of balanced electrolyte solution, use of antibiotics proper choice of surgical treatment plus adequate drainage are factors which lead to increase survival rates and decrease in number of post operative complications.

This study was undertaken to assess the magnitude and pattern of liver trauma as it presented in a major metropolitan teaching hospital, management of liver trauma, outcome of various procedures, post operative complications and their management.

Material And Methods

During the two and half years study period i.e. from May 1994 to September 1996, fifty patients with liver injury admitted in East Surgical Unit of Mayo Hospital, Lahore were considered for evaluation.

All patients were assessed clinically particularly looking for hemodynamic impairment, peritoneal signs and associated non-hepatic visceral injuries. Abdominal ultrasonography (USG) and diagnostic peritoneal lavage (DPL) were done to diagnose the case of hepatic trauma. Patient were resuscitated to maintain optimal tissue perfusion both prior to and during operation by the help of two or three large bore intravenous lines.

Complete blood examination, urinalysis, blood sugar, serum/creatinine, serum/electrolyte, x-ray abdomen and chest were done in all cases.

Laparotomy was restored to in patients with the evidence of continued bleeding from liver trauma suggested by deterioration of signs and symptoms, a positive DPL, positive wound exploration in stab cases, presence of signs of peritoneal irritation and non hepatic visceral injuries. Once the bleeding was controlled, the

extent of liver injury was assessed. The liver injuries were graded according to organ injury scaling as mentioned in surgical clinics of North America. The procedures which carried out for the management of hepatic trauma were drainage alone, suture hepatorrhaphy hepatomentorrhaphy, resectional debridement with selective vascular ligation, right hepatic lobectomy and perihepatic packing.

In the post operative period patients were given antibiotics with gram positive and gram negative cover, metronidazole was added where ever there was a bowel perforation. Patients were observed for early detection of post operative complications. The most common complications that developed in relation to severe hepatic trauma are shown in Table I.

Table I : Complications

Complications	n=	%Age
EARLY		
Heemorrhage	3	06%
Hypothermia	5	10%
Hypoglycaemia	3	06%
DELAYED		
Respiratory complications	9	18%
Jaundice	3	06%
Wound infection	9	18%
Wound dehiscence	4	08%
Intraabdominal sepsis	6	12%
Liver abscess	2	04%
Bile peritonitis	1	02%
Biliary fistula	4	08%

These patients are, however, prone to the same wide spectrum of complications that may occur in any abdominal injury also the extra-abdominal complications associated with injury to other organs such as the brain, heart, lung, diaphragm, kidneys, spleen and long bones were combated in their own right.

Ventilatory support was provided to patients suffering from pulmonary contusion, fractured ribs and intraperitoneal sepsis. Ventilatory support was prolonged both to prevent and to treat any evidence of the adult respiratory distress syndrome

Renal failure was prevented by curtailing the length and depth of hypotension and by ensuring urinary flow throughout the operative procedure and beyond.

Coagulopathies were diagnosed by presence of heavy drainage and ooze from the wounds and managed by correcting acidosis hypothermia and platelet deficiency.

Haemorrhage was identified by the presence of heavy drainage and signs and symptoms of shock. These patients were managed by re-exploring the abdomen and proceeding accordingly.

Hypothermia and hypoglycaemia detected early and managed accordingly. Patients who remained febrile for prolonged period and showed signs and symptoms of intra-abdominal sepsis were subjected to abdominal ultrasound. Perihepatic or intrahepatic abscess confirmed by abdominal ultrasonography was treated either by ultrasound guided aspiration or by open drainage depending on the site, size, loculation and failure of percutaneous drainage.

Patients who developed jaundice were treated conservatively. Patients who developed external biliary fistulas were subjected to fistulogram, PTC and ERCP. All patients were aimed to manage conservatively. Operative treatment was reserved if drainage persists or is excessive or there is a biliary-bronchial fistula.

Results

Fifty patients were included in the study. Of these forty two (84%) were male and eight (16%) females. Age of the patients ranged from 13 to 55 years with a mean of 24 years. Most of the patients presented soon after injury. Average interval being 2 hours. However, this varied from 30 minutes to 24 hours.

In this study penetrating injuries were much more common 40 (80%) than blunt trauma 10(20%). Missile injury (firearm) was the cause in 32(64%) cases, stab in 8(16%) cases. The diagnosis of liver trauma was mainly based on site of injury and clinical findings. The clinical findings with traumatic injury to the liver can be divided into two categories one is systemic signs of acute haemorrhage and the other are local symptoms of peritoneal irritation in the region of the liver.

Diagnostic peritoneal lavage was performed in 4 out of 10 cases of blunt trauma. In these cases no evidence of bleeding was present, but to exclude an intra-peritoneal source because of the magnitude of the trauma, diagnostic peritoneal lavage was performed and it was found to be safe, rapid inexpensive and accurate technique if performed carefully. A positive DPL was a useful indication for laparotomy. In cases of stab wound of lowerchest and abdomen in which peritoneal signs were absent and patients were stable. Exploration of stab wound

under local anaesthesia was done to see perforation of peritoneum. In only 2 cases (4%) with blunt trauma who were otherwise stable and with minimal peritoneal, abdominal ultrasonography was employed for the diagnosis and monitoring of liver injury. These patients are managed conservatively. These patients were managed conservatively and they had smooth recovery without any complication.

Forty one patients had associated injuries. Eleven (22%) patients had multi-regional injuries including chest, head, neck and extremities. Thirteen cases needed insertion of chest tube before we could proceed with the laparotomy.

After opening the abdomen thorough exploration revealed multivisceral injuries in 36(72%). Nine (18%) cases had isolated hepatic injuries. The details of the procedures carried out are given in Table II.

Table II; Grades of liver injury and procedures performed

Grades Of Liver			
Injury	n=	Procedures Performed	n=
I	10	Conservative management	2
		Drainage alone	3
		Simple hepatorrhaphy	5
II	15	Simple hepatorrhaphy	4
		Mattress sutures over spongaston	11
		Hepatomentorrhaphy	8
III	18	Mattress sutures over spongaston	6
		Resectional debridement with selective vascular ligation	4
		Hepatomentorrhaphy	8
IV	5	Resectional debridement with selective vascular ligation,	3
		Right hepatic lobectomy	1
		Perihepatic packing	1
V	2	Perihepatic packing	2

Fourteen patients (28%) had 47 different complications of different types either due to hepatic trauma itself or due to associated injuries.

It is seen that as the severity of hepatic trauma increases the number of complications also increases. The other factors which contribute towards the increased rate of complications are the associated injuries, the skills of the surgeon, and the resuscitative measures (the details of complications in different grades of hepatic trauma are mentioned in Table III&IV).

There were 5(10%) deaths in our series, two were table deaths in patients with Grade IV and V liver injuries as a result of exsanguination. A young boy was a victim of motor vehicle accident having Grade III liver injury with associated, Grade II duodenal injury and biliary peritonitis, referred to us four days after the injury and was in septic shock. The patient died on 3rd post operative day due to septic shock.

Another patient with Grade II liver trauma and associated pancreatic and colonic injury died on 13th post

operative day due to multiple organ failure. .

A young girl of 13 years age had Grade II liver injury, Grade III gallbladder injury, Grade I duodenal injury and Grade III colonic injury due to firearm injury. The girl died on day 15th due to duodenal fistula followed by sepsis and multiple organ failure. Duration of the hospital stay varied between 7 to 32 days with a mean of 10 days.

Table III: Complications in different Grades of hepatic trauma

Complications	Grades Of		n=	%age
	Liver Injury			
Haemorrhage	III		3	6
Hypothermia	III		3	6
	IV		2	4
Hypoglycaemia	III		1	2
	IV		2	4
Respiratory complications	II		2	4
	III		4	8
	IV		2	4
Wound infections	V		1	2
	I		1	2
	II		3	6
	III		1	2
	IV		2	4
Wound dehiscence	V		2	4
	II		2	4
	III		2	4
	I		1	2
	II		1	2
Intra-abdominal sepsis	III		2	4
	IV		1	2
	V		1	2
	IV		1	2
	Bile peritonitis	IV		1
Liver abscess	II		1	2
	IV		1	2
Jaundice	II		1	2
	III		1	2
	IV		1	2
Biliary fistula	III		3	6
	IV		1	2

Discussion

Even today major hepatic trauma remains a formidable surgical challenge with considerable deaths from exsanguination, which is cited as the cause of death in 31.76% in large series on liver trauma by Varney M et al and Ring B et al^{1,2}

A very high (82%) incidence of associated injuries in our study is probably because of preponderance of firearm injury (64%) as the mechanism. Most published reports in liver trauma suggest both morbidity and mortality have a linear correlation with not only the amount of liver parenchymal injury but also with the magnitude of surgical intervention^{7,8}. In making the diagnosis of intra-abdominal injury and case selection for abdominal exploration, we were very little helped by the sophisticated diagnostic armamentarium.

The main objective of our study is to decrease the morbidity of the patients of hepatic trauma by preventing post operative complications. We observed that we can limit the number of post operative complications by ensuring rapid resuscitation, early identification of the presence of liver injury, accurate clinical assessment of the need for laparotomy, efficient and lasting hemostasis, minimization of bacterial contamination and the support before, during and after operation of the cardiopulmonary, renal and metabolic systems.

Table IV: Complications and their management

Complications	n=	Management	n=
Haemorrhage	3	Conservative	2
		Re-exploration	1
Hypothermia	5	Use of blankets	5
Hypoglycaemia	3	Infusion of 25% Dextrose water	3
		Postural drainage	6
Respiratory Complications	9	steam inhalation and antibiotics	
		Decortication of empyema	1
		Artificial ventilation	2
		After opening the wound pus taken for culture & sensitivity followed by saline irrigation and ASD	9
Wound infection	9	Closure of the wound	2
		Ultrasound guided aspiration	2
Wound dehiscence	2	Open drainage	4
		Re-exploration	1
Intra-abdominal sepsis	6	Closed drainage under ultrasound guidance	2
Bile peritonitis	1	Conservative	3
Liver abscess	2	Conservative	4
Jaundice	3		
Biliary fistula	4		

Bleeding and sepsis, primarily peri and intrahepatic are the most common complications of hepatic trauma^{5,6}. These patients are however, prone to the same wide spectrum of complications that may occur in any abdominal injury.

Pulmonary contusion, fractured ribs and intraperitoneal sepsis may all have profound effects on ventilation and gas exchange. This leads to acid base alterations, changes in blood gas tensions and patterns of ventilation. All these factors contribute towards the post operative respiratory complications, particularly adult respiratory distress syndrome in patients with multiple system trauma. We strongly recommend prolongation of ventilatory support to patients with multiple trauma not only to treat but also to prevent the ARDS. Chest physiotherapy with strong post operative analgesia is the best remedy to prevent atelectasis. Once the chest infection develops it is treated

by chest physiotherapy, saline nebulization or steam inhalation and antibiotics.

Patients with hepatic trauma develops hypothermia⁷ particularly in cold weather. Considering this we use warm intravenous solutions, and blood lavage of abdominal cavity with warm hospital saline, covering of the intestines with hot moist packs and post operatively the blankets to cover patients. These measures give very good, results as only 10% of patients in this study developed hypothermia.

Only 6% of our patients developed hypoglycaemia as we routinely infuse our patients with 10% Dextrose water in post operative period with a check on blood glucose level. We recommend strongly the postoperative supplements of Dextrose in patients with severe hepatic trauma as recommended by others⁷.

We experience as other^{8,9} that post operative haemorrhage is either due to coagulopathies or as a result of poor surgical technique. We observed as is evident from our results of only 4% coagulopathies that prophylactic measures can reduce the number of coagulopathies in patients with major hepatic trauma such as the administration of blood less than 24 hours old whenever possible, one unit of frozen plasma after each 4-6 units of blood, and calcium chloride (1g intravenously) after each 4-6 units of blood

The high percentage of wound infection in our study is particularly attributed to high incidence of associated hollow visceral injury particularly to colon, late presentation at hospital after the injury and prolonged hypovolaemic shock.

One of the main complication of major hepatic trauma is the perihepatic abscess (particularly subphrenic) formation. The major contributing factors in our study are the associated colonic injury, severity of hepatic trauma, faulty surgical technique blockage of the drain and presence of foreign body (wad of cartridge). Twelve percent of our patients developed perihepatic abscess. We experienced that abdominal ultrasound along with suspicion in the mind due to clinical picture of the patient and type of injury, is the best modality not only to diagnose but also to treat the patient. We performed open drainage only in those patients where ultrasound guided aspiration failed.

Intrahepatic abscess are the result of missed intrahepatic haematoma or suturing hepatorrhaphy in the presence of arterial bleeding¹⁰. In this study percutaneous drainage with ultrasound guidance is the method of choice for dealing with hepatic abscess as is the experience of others¹⁰.

External biliary fistulae are generally the sequela of localized liver necrosis or missed intrahepatic bile duct injury. Eight percent of our patients developed biliary

fistulae^{11,12}. In our experience all these patients had, at presentation, a chronic bile leak the assessment of these patients requires ultrasonography to delineate the area of necrosis and a sinogram to locate the bile leak and ERCP to ascertain the integrity of the common bile duct.

In our experience, the results of an adequate external drainage were favourable, since the fistulae were peripheral without obstruction of the main bile duct.

Hemobilia is a rare complication of liver trauma but can result from what appears to be trivial injury. The diagnosis is confirmed angiographically and the treatment is a direct surgical attack on the hepatobiliary fistula^{13,14}. In our study we do not come across any case of hemobilia.

The major cause of death in our series was sepsis(60%) and its complications ARDS and multiple organ failure. Exsanguination is the cause of death in only 2 cases (40%)

References

1. Varney M; Becker H, Roher HD: Prognosis and therapy of liver injuries in patients with multiple injuries. *Chirurg*, 1990 Oct;61(10):71-6
2. Ring B, Pichlmayr R, Zeilger H, Grosse H, Kuse E, Oldahfec K: Management of severe hepatic trauma by two stage total hepatectomy and subsequent liver transplantation. *Surgery* 1991 Jun;109(6):792-5.
3. John TG, Greig JD, Hohnstone AJ, Garden OJ: Liver trauma a 10 year experience. *Br J Surgery* 1992 Dec;79(12):1352-6.
4. Eisner L, Ackermann CF, Raggazzone P, Harder F: Therapy and prognosis in 102 liver injuries *Helv Chir Acta* 1989 Jan 55(5):593-6.
5. Lim RC Jr, Guillena AE, Trunkey DD: Postoperative treatment of patients after liver trauma. *Arch Surg* 1977;112:429-435.
6. Mays ET: Hepatic trauma. *Curr Probl Surg* 1976;11:47.
7. Lucas CE, Walt AJ: Analysis of randomized biliary drainage for liver trauma in 189 patients. *Trauma* 1972;12:925.
8. Clagetl GP, Oslan WR: Coagulopathies causing haemorrhage in severe liver injury. *Ann Surg* 1978;187:369.
9. Svoboda JA, Peter ET et al: Severe liver trauma in the face of coagulopathy. A case for temporary packing and early re-exploration. *Am J Surg* 1982;144:717.
10. Defere WW, Maltos KL, Jordan GL, Beall AC Jr: Management of 1,590 consecutive cases of liver trauma. *Arch Surg* 1976;111:493-497.
11. Standblom P, Mirkovitch V: Minor hemobilia. *AnnSurg* 190(2):254,1979.
12. Sparkman R: Massive hemobilia following traumatic rupture of the liver. *Ann Surg* 1953;138(6):899.
13. Floyd W: Traumatic hemobilia. Coordination of roentgenographic, scintigraphic and angiographic findings.
14. Franklin RH, Broom WF, Schoffstall RO et al: Angiographic embolization as the definitive treatment of post-traumatic hemobilia. *J trauma* 1980;20(8) 702.