

Management of Penetrating Liver Injuries

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A two year study from October 1997 to September 1999 regarding the management of penetrating liver injuries was carried out at the West Surgical Ward of Mayo Hospital, Lahore. The study comprised of 35 patients. All the patients underwent exploratory laparotomy. 97% patients were male. 68.57 % of the total patients were in the age group between 13 to 30 years. 80 % patients had grade I to grade III injuries and 20 % had grade IV and V injuries. 60 % of the patients underwent suture ligation and 2.86 % underwent hepatotomy and resectional debridement. Mortality in the study was 20 %. High incidence of mortality was seen in patients with multiple organ injuries and with grade IV and V injuries.

Key words: Penetrating liver injuries, suture ligation, resectional debridement.

The increase in the incidence of violence continues unabated. Increased social disharmony, frustration and a lack of faith in the institutions responsible for law and order and delivery of justice, encourage a fatalistic attitude to settle the issues by violent means. Because of this violence and rapid urbanization, trauma has become a major health problem in our country. Emergency departments in major urban hospitals are inundated by trauma patients and it accounts for almost one third of the total hospital admissions¹. Among the patients presenting with penetrating abdominal trauma, the liver is second only to small bowel as the organ most commonly injured and also second commonest solid intra-abdominal organ injured surpassed only by the spleen². Firearm injuries are more lethal as compared to stab injuries because of their blast and cavitation effect³. Liver injuries run the wide spectrum from minor capsular tears to lobar destruction³.

Material and methods

The purpose of the study was the assessment of pattern of penetrating liver trauma, its management and the results of various procedures in our own local setup. These results were compared with similar studies conducted in the other countries. The study was conducted over a period of two years in West Surgical Ward of Mayo Hospital, Lahore i.e. from October 1997 to September 1999. 35 patients were included in the study who presented in Emergency and Accident Department with firearm and stab injuries of lower chest and upper abdomen. Haemodynamically unstable patients (40%) were directly shifted to the operation theatre for resuscitation and exploration while the stable patients (60%) were shifted to the operation theatre after resuscitation and carrying out relevant investigations^{3,4}. Antibiotics, tetanus prophylaxis and analgesics were given to all the patients and they were kept nil by mouth post operatively up till the time they pass flatus. Duration of the stay in the hospital varied between 5 to 36 days.

Results

Thirty five patients were admitted through Accident and Emergency Department with right lower thoraco-abdominal and upper abdominal injuries. Age of the patients ranged from 13 to 55 years with the mean of 25 years. 34 patients (97.14%) were male and only one female patient (2.86%) was admitted. 25 patients (71.43%) were admitted with fire arm injuries and 10 patients (28.57%) with stab wounds (Table I).

Table 1. Mechanism of Injury

Mode of injury	n=	%age
Fire arm	25	71.43
Stab	10	28.57

Liver injuries were graded according to the organ injury scale by Moore's, which was revised in 1994⁵. 80% had grade I to III injuries and 20% had grade IV and V injuries (Table II).

Table 2 Grades of liver injury

(According to Moore's classification revised in 1994)

Grade	n=	%age
I	4	11.43
II	10	28.57
III	14	40
IV	5	14.28
V	2	5.71

Table 3. Associated Organ Injury

Associated injuries	n=	%age
None	7	20
1 organ	11	31.43
2 organs	8	22.86
3 or more	9	25.71

Various operative procedures performed were, suture Hepatorraphy (simple sutures, horizontal mattress sutures alone or over spongoston) in 21 patients (60 %), omental packing in 2 patients (5.71%), intra hepatic roll gauze packing in 2 patients (5.71%), peri-hepatic packing with

abdominal packs in 2 patients (5.71%), resectional debridement with individual vascular ligation or intra-hepatic gauze packing in 4 patients (11.43%) and right lobe segmentectomy in one patient (2.86%) (Table IV). 20% patients had no associated organ injuries and 80% patients had one or more associated organ injuries (Table III). There were 7 deaths (20%) noted in the study (Table V).

Table 4 Operative Procedures

Grade of injury	n=	Procedure performed
I - II	5	None (14.28%)
I	2	Suture ligation (5.71%)
II - III	13	Mattress sutures (37.14%)
III	6	Sutures over spongoston (17.14%)
III	2	Resectional debridement (5.71%)
IV	2	Omental pack (5.71%)
IV	2	Debridement with packing (5.71%)
IV	1	Segmentectomy (2.86%)
V	2	Peri-hepatic packing (5.71%)

Out of them 3(8.57%) were per operative mortalities. These patients had grade IV and V injuries associated with multiple organ injuries. 3 patients (8.57%) died within first 24 hours of the operation due to shock and multiple organ failure. One patient died on 12th post operative day with sepsis and G. I. T. bleed. Major post operative complications noted in the study were respiratory tract infections, hemorrhage and biliary fistula. Table VI depicts the major post operative complications with their management.

Table 5. Mortality Status

Grade	n=	%age
I	-	-
II	-	-
III	2	5.71
IV	3	8.57
V	2	5.71

Table 6. Major post operative complications with management

Complication	n=.	%age	Management
Respiratory tract infections	12	34.28	Conservative (25.71%) Decortication (8.57%)
Hemorrhage	3	8.57	Re-exploration (5.71%) Conservative (2.86%)
Biliary fistula	4	11.43	Conservative
Jaundice	4	11.43	Conservative
Sepsis	4	11.43	US guided aspiration (5.71%) Re-exploration (5.71%)

Discussion

Liver is the frequent site of injury by penetrating trauma of right lower chest and upper abdomen⁶. The injuries may vary from minor laceration to major lobar destruction. The results of the treatment of hepatic trauma has improved throughout the 20th century due to wide spread advances in

communication, transportation, fluid therapy and multiple organ support and also due to fine tuning of technical skills based on well defined principles of surgical therapy.

Hepatic trauma predominantly occurs in young males. In the study mean age was 25 years in comparison to Peter R. et al. who reported an average age of 30 years in the study of 99 cases⁷.

Fire arm injuries were more common as a mode of injury (71.43%) in comparison to stab wounds (28.57%) and this is due to the increase in civilian violence and easy availability of weapons.

Right lobe of the liver was more frequently injured (57.14%) in our study, which coincides with the study conducted by Trunkey et al. on 811 patients⁸.

20% patients had only liver injury and 80% had associated injuries in addition to liver as compared to the study conducted by Defore et al.⁹ They observed that in 37% of the cases, there was injury to the liver alone and 73% of the cases presented with associated organ injuries.

Horizontal mattress sutures was the major suture ligation technique applied to treat the liver injuries, grade II to III in 13 (37.14%) patients, in comparison to the study conducted by Trunkey et al.,^{8,10} who applied horizontal mattress sutures technique in 20.4% of his patients. Omentum with its advantage of being autogenous and viable was used in 2 (5.71%) patients in comparison to the study conducted by Fabian T C et al.¹¹ They used omental pack in 60% of their cases. Intra hepatic gauze packing was done in 2 (5.71%) patients. They used this technique with satisfactory results. Peri hepatic packing was performed in 2 (5.71%) patients of grade V injuries in our study which coincides with the study conducted by Feliciano D V et al¹² and Feliciano D V et al¹³. They used this technique in 4-5% of the patients. Right hepatic segmentectomy was performed in 1 (2.86%) patient in our study. This percentage coincides with the percentage in the study conducted by Cogbill T H et al¹⁴ and Moore EE¹⁵ where segmentectomy was done in 2 to 4% of the patients.

Regarding major post operative complications, respiratory tract infections were observed in 12 (34.28%) patients, hemorrhage in 3 (8.57%) patients, biliary fistula in 4 (11.43%) patients and intra abdominal sepsis in 4 (11.43%) patients.⁹ (25.71%) patients with respiratory tract infections were managed conservatively and 3 (8.57%) patients were shifted to the specialty of chest surgery for decortication. The incidence of respiratory tract infections in our study was lower in comparison with the study conducted by Krige JE, et al¹⁶ and Parks RW, et al¹⁷ where 40% incidence was observed. All the patients with biliary fistulas were managed conservatively. Two (5.71%) patients were re-explored to control the hemorrhage in comparison with the study conducted by Pachter H L¹⁸ where 1.9% patients underwent re-operation to control hemorrhage. Two patients (5.71%) were re-explored to drain the intra-abdominal abscess. This coincides with the

study of Bender J S et al.¹⁹ where 10% of his patients developed intra-abdominal sepsis. 2 (5.71%) patients developed upper G I bleed. One (2.86%) patient managed conservatively and the other (2.86%) patient was re-explored to control the hemorrhage in comparison with the study of Defore et al.⁹ where 1.5% of the patients suffered upper G I bleed.

There were 7 (20%) deaths in the study. Three (15.7%) of these were per-operative deaths. They had associated major vascular and visceral injuries. One (2.86%) patient died because of coagulation disorder. 2 (5.71%) patients were provided ventilatory support because of multiple organ trauma but they died within 24 hours of the operation.³ One (2.86%) patient died on 12th post operative day due to sepsis and upper G I bleed. All these patients had grade III to V liver injuries with associated visceral and vascular injuries. Ivatury R R et al.²⁰ reported mortality rate of 57% in his study for grade IV and V injuries while Cogbill et al.¹⁴ observed 30% and 66% mortality rate for grade IV and V injuries respectively. In our study the mortality rate for grade IV and V injuries was 60% and 100% respectively. The high mortality rate in our study was due to associated multiple organ injuries and non-availability of blood.

Management of penetrating hepatic trauma remains a significant challenge for the surgeon. Better monitoring and resuscitation, improved anesthesia, experienced liver surgeon, intensive care, early detection and prompt management of post operative complications may contribute to a significant reduction in the morbidity and mortality rates from liver trauma definitely. We recommend a more close working relationship between district surgeon and trauma specialists in teaching hospitals. We also recommend more prospective studies in liver trauma to have clearer guidelines for better management.

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