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A prospective study on the surgical management of liver trauma: Our experience

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Abstract

Aims and Objectives: to estimate the incidence of liver trauma and grade their severity among patients attending casualty department, at Osmania general hospital, Hyderabad and to evaluate the surgical options and common surgical hemostatic procedures in the management of liver trauma.

Results: In the present study the maximum number of patients are in the age group of 21-30 yrs (42%). Survival rate of patients who were operated within 24hrs of injury was 69. 22 % higher than patients who were operated after 12hrs of injury. Death rate of patients who presented with hemodynamically unstable was 47. 5% higher than the patients who presented with hemodynamically stable. The most common grade of injury was grade II constituting 30%. Survival rate of patients with intra operative findings of grades I, II, and III injuries was 69% higher than patients with Grades IV, V and VI injuries. More than one surgical technique was used in a single patient to secure surgical hemostasis. 86% (43/50) hepatorrhaphy with or without gel foam augmentation is for surgical hemostasis. Perihepatic packing is used in 10% (5/50) of patients.

Conclusion: This prospective study of 50 patients done during a time span of 30 months from June 2007 to November 2009 with the aim of presenting the incidence, grade of the liver injury and various surgical methods employed. Incidence – 22. 3% of abdominal trauma resulted in liver injury. Age incidence – 42% of patients (21/50) presented to us are in the age group of 21-30 yrs and 28% (14/50) of patients are in the age group of 11-20yrs. Those patients who were in younger age group had good outcomes. Various surgical techniques like hepatorrhaphy with and without gel foam augmentation, peri hepatic packing, resectional debridement and resectional procedures are employed in the surgical management.

Keywords: surgical management, liver trauma, our experience

Introduction

Despite its well protected position, the liver is frequently involved in intraabdominal injury. In India automobile driver sitting on right side, due to greater exposure of right torso, that is against door of automobile, liver is the organ often involved.

Road traffic and assaults are increasing day to day with the civilization, so with the rise in liver injuries. Due to the advances in the management of liver injuries the morbidity and mortality have come down when compared to the past.

Associated injuries to other organs, uncontrolled haemorrhage from liver and subsequent development of septic complications contribute significantly to morbidity and mortality.

Materials and Methods

Sample: the present prospective study was of 50 patients who admitted at Osmania general hospital, Hyderabad who were managed operatively or non-operatively for abdominal trauma and having liver injury forms the material of the study. This study was conducted over a span of 30 months from June 2007 to November 2009.

Inclusion criteria

- Age above 15 (female and male)
- History of blunt/ penetrating injury to abdomen with liver involvement

Exclusion criteria

- Patients with debilitating illnesses before trauma such as chronic respiratory /renal/gi/cns disorders are excluded.

- Patients who had severe head injury with GCS scores below 8 were not included into the study.

Methods

All patients were first received at casualty department and general survey of the patient is done and injuries noted. After securing airway and breathing an intravenous line is secured and blood is drawn and sent for blood grouping and typing, cross matching, urea and sugar, haemoglobin percentage. Initially ringer lactate is infused for resuscitation. Depending on severity of injury if the patient is not responding to initial crystalloid, compatible whole blood transfusion are given which are brought after cross matching from our own blood bank. A brief history about the time of injury and complaints with special reference to pain abdomen, vomiting, and distention of abdomen is taken. Specific examination of abdomen is done with special reference to tenderness, guarding, rigidity, presence of free fluid and bowel sounds. The diagnostic tap of abdomen is done for all cases. All patients were taken up for surgery after reasonable time of resuscitation.

All grade I and II lacerations are dealt with hepatorrhaphy. Grade III lacerations are dealt with Hepatorrhaphy and gel foam augmentation. In addition hepatotomy with direct suture ligation is done in grade III lacerations. Grade IV and Grade V lacerations are managed with resectional debridement and anatomical resection of liver. Grade VI vascular lesions were repaired with 6-0 polypropylene or 5-0 polypropylene by intermittent technique. Perihepatic packing is done if patient is unstable haemodynamically and reexploration is done for pack removal after stabilizing within 36-48 hours and if active bleeding present then we proceeded with resectional debridement

Results: Total number of 50 cases were included in our study who were assessed and treated. The data was collected and analysed and the following observations were made and inferences were drawn.

Table 1: Distribution of patients in relation with age

Age in yrs	Survival	Death	Total
Up to 19 years	7(58.33%)	5(41.67%)	12(100%)
20- 29 years	14(93.3)	1(6.67%)	15(100%)
30- 39 years	12(80%)	3(20%)	15(100%)
40- 49 years	3(75%)	1(25%)	4(100%)
>50 years	3(75%)	1(25%)	4(100%)
Total	39(78%)	11(22%)	50(100%)

It is clear from the data that maximum number of patients are in the age group of 21-30 years (42%). Mean age of presentation is 28.96 years (12-65). Death rate among >40 years age group was 3% higher than age group >40 years.

Table 2: Distribution of patients in relation to time of injury to surgery

Time duration	Survival	Deaths	Total
Upto 4 hrs	4(80%)	1 (20%)	5 (100%)
>4 to 8 hrs	12 (92.31%)	1 (7.69%)	13 (100%)
>8 to 12 hrs	11 (91.67%)	1 (8.33%)	12 (100%)
>12 to 24 hr	6 (54.55%)	5 (45.45%)	11 (100%)
>24 hrs	6 (66.67%)	3 (33.33%)	9 (100%)
Total	39 (78%)	11 (22%)	50 (100%)

Survival rate of patients who were operated within 24hrs of injury was 69.22% higher than patients who were operated after 12hrs of injury. This observed difference was statistically significant (P<0.015) at 95% interval.

Table 3: Distribution of patients in relation to hemodynamic status

Clinical pattern	Survival	Death	Total
Hemodynamically stable	35(87.5%)	5(12.5%)	40(100%)
Hemodynamically unstable	4(40%)	6(60%)	10(100%)
Total	39(78%)	11(22%)	50(100%)

Death rate of patients who presented with hemodynamically unstable was 47.5% higher than the patients who presented with hemodynamically stable (P=0.004) at 95% confidence intervals.

Table 4: Distribution of patient in relation to grade of liver injury

Grade of liver injury	Survival	Deaths	Total
I	13(100%)	0(0%)	13(100%)
II	15(100%)	0(0%)	15(100%)
III	8(88.89%)	1(11.11%)	9(100%)
IV	3(33.33%)	6(66.67%)	9(100%)
V	0(0%)	3(100%)	3(100%)
VI	0(0%)	1(100%)	1(100%)
Total	39(78%)	11(22%)	50(100%)

The most common grade of injury was grade II constituting 30%. Survival rate of patients with intra operative findings of grades I, II, and III injuries was 69% higher than patients with Grades IV, V and VI injuries. This observed difference was statistically higher significant (P=0.000003) at 95% confidence interval.

Table 5: Distribution in relation to associated bony injuries

Associated bony injuries	Survival	Deaths	Total
Fracture clavicle	1(100%)	0	1(100%)
Fracture femur	0	2(100%)	2(100%)
Fracture tibia	1(100%)	0	1(100%)
Fracture humerus	1(100%)	0	1(100%)
Fracture ribs	5(100%)	0	5(100%)
Fracture pelvis	1(100%)	0	1(100%)
Fracture both bone forearm	1(100%)	0	1(100%)
Faciomaxillary fracture	1(100%)	0	1(100%)
Total	11(84.62%)	2(15.38%)	13(100%)

26% of patients (13/50) had associated bony injuries, out of which 4% of patients (2/50) expired due to primary hemorrhage of fracture femur. Associated bony injuries & head injuries were managed by orthopedician and neurosurgeon accordingly. 5 patients had hemothorax and pneumothorax which was confirmed and intercostals drainage tubes were inserted at the time of admission.

Table 6: Distribution of patients in relation to other intra abdominal injuries

Other intra abdominal injuries	Survival	Deaths	Total
Right kidney laceration	1(100%)	0	1(100%)
Mesenteric tear	1(100%)	0	1(100%)
Splenic lacerations	1(50%)	1(50%)	2(100%)
Bladder neck injuries	2(100%)	0	2(100%)
Omental tear	1(100%)	0	1(100%)
Retroperitoneal hematoma	1(100%)	0	1(100%)
Ileal perforation	1(100%)	0	1(100%)
Total	8(88.89%)	1(11.11%)	9(100%)

18% of patients had intra abdominal injuries, 2% of patients (1/50) underwent splenectomy for splenic laceration and died due to primary hemorrhage. Omental and mesenteric

tear repaired. Ileal perforation primary closure done. Bladder neck injuries repaired.

Table 7: Distribution of patients in relation to surgical hemostasis

Surgical hemostatic procedure	Survival	Deaths	Total
Hepatorrhaphy with suturing	11(91. 67%)	1(8. 33%)	12(100%)
Hepatorrhaphy with gel foam	28(90. 32%)	3(9. 68%)	31(100%)
Resectional debridement	0	1(100%)	1(100%)
Perihepatic packing	1(20%)	4(80%)	5(100%)
Hepatorrhaphy with suturing + abgel	1(25%)	3(75%)	4(100%)
Total	41(77. 36%)	12(22. 64%)	53(100%)

More than one surgical technique was used in a single patient to secure surgical hemostasis. 86% (43/50) hepatorrhaphy with or without gel foam augmentation is for surgical hemostasis. Perihepatic packing is used in 10% (5/50) of patients.

Time interval between injury and surgery: within 2 hrs 11 patients reached hospital, out of which 7 patients were taken up for laprotomy. 1 patient died due to hemodynamic instability. Within 24 hrs 30 patients reach the hospital and has good outcome (P<0. 015).

Table 8: Distribution of patients in relation to postoperative complications

Type of complication	Survival	Deaths	Total
Respiratory complications	8(80%)	2(20%)	10(100%)
Bile leak	2(40%)	3(60%)	5(100%)
Septicaemia	4(50%)	4(50%)	8(100%)
Hemorrhage	1(20%)	4(80%)	5(100%)
Wound infection	5(100%)	0	5(100%)
Liver abscess	1(100%)	0	1(100%)
Sudiaphragmatic abscess	1(100%)	0	1(100%)
Total	22(62. 86%)	13(37. 14%)	35(100%)

Reexploration: 6% (3 patients) of patients underwent reexploration within 48 hours of perihepatic packing. In these one patient resectional debridement was done and 2 others pack retrieval was done after securing surgical hemostasis.

Discussion

This prospective study of 50 patients done during a time span of 30 months from June 2007 to November 2009. Incidence – 22. 3% of abdominal trauma resulted in liver injury. Age incidence – 42% of patients (21/50) presented to us are in the age group of 21-30 yrs and 28% (14/50) of patients are in the age group of 11-20yrs. Those patients who were in younger age group had good outcomes. In our series mean age of presentation is 28. 96 yrs. Similar results were found in study done by Chiennlc *et al*. In Gackowski *et al* mean age was 35. 3 yrs. In study by Wagih Mommtaz Ghnam *et al* mean age was 37 yrs.

Mode of injury: In our series 7 pts were penetrating injuries and 43 were blunt injuries.

Clinical presentation: 39/50 were hemodynamically stable and 11/50 were hemodynamically unstable. Pts who were hemodynamically stable had good outcome (P=0. 004).

Ultrasound sensitivity

Sensitivity	Study group
63%	Kinge. B <i>et al</i>
82%	Golleti <i>et al</i>
87. 23%	Osmania general hospital

Grades of injury: in our study, grade I &II comprised of 56% (28/50) and did not contribute to any mortality. Grade III comprised of 18% (9/50) and contributed to 9% (1/11) of mortality. Grade IV injuries comprised of 18% (9/50) and contributed to 54. 54% (6/11) of mortality. Grade V comprised of 6% (3/50) and all 3 died. Grade VI comprised of 2% (1/50) and patient died. In Essomba A *et al* Grade I and II liver injuries are common (68. 04%) and in our series Grade I and II accounting to 56%. According to Bajec DD *et al* mortality rate was low in grade I, II, III when compared to higher grades. According to Kozar RA *et al* more complications are noted in higher grade liver injuries. A study done by Starvos Goungiotis *et al* concluded that 57% of liver injuries were low grade and 43% are of high grade.

Surgical hemostatic procedure

Surgical hemostatic procedure	Kinge B <i>et al</i>	Essomba A <i>et al</i>	Gackowski <i>et al</i>	Our series
Hepatorrhaphy	80%(259)	61. 9%(26)	47. 6%(20)	86%(43)
Peri hepatic packing	72%(25)	9. 52%(4)	28. 57%(12)	10%(5)
Resectional debridement	9%(31)	2. 38%(1)		2%(1)

In other series as in our series hepatorrhaphy is the commonest surgical procedure. Hepatorrhaphy with gel foam 62%, hepatorrhaphy with suturing 24%, hepatorrhaphy with gel foam and suturing 8%. In studies by Osama Hegazy *et al* and Wagih Mommtaz Ghnam *et al* similar techniques were used for operative management. Damage control surgery is preferred over anatomical resection according to Nasim Ahmed *et al* and SA Badger *et al* due to increased mortality associated with resectional techniques.

Conclusions

Liver trauma constitutes 22. 3% of abdominal trauma in Osmania general hospital. Younger patients have good outcome. Mean age group involved is 28. 96yrs. timelapse between injury and treatment has significant association with the outcome of management. Patients who were operated within 12 hrs of injury were having good prognosis. Pts who were presented within 2 hrs of injury were having better prognosis. The grades of liver injury, pre

and post operative care of the patient had association with outcome of management. The PTS who presented with hemodynamic stability had good prognosis. ($P < 0.004$). Overall, liver injuries of grade I, II, III had excellent outcome of surgical management ($P < 0.0000003$). perihepatic packing is having a definite role in managing grade III, IV, V liver lacerations and vascular injuries. Preoperative ultrasound scan is useful tool in evaluating liver injuries. CT scan is still diagnostic tool for evaluating liver injuries. Associated injuries add to morbidity and mortality of liver trauma pts. Mortality rate is higher in pts with increasing age, hemodynamic instability, increasing severity of grade and multiple injuries. Multimodal surgical strategies are available for controlling bleeding from liver and mortality can be reduced by multidisciplinary approaches.

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