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Original Research

Comparison of management and outcome in single versus multiple solid organ injury after blunt abdominal trauma

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ABSTRACT

Background: The rapid proliferation of motor vehicles has led to a substantial increase in blunt abdominal trauma cases, with approximately 75 to 80% attributed to motor vehicle accidents. The present study was conducted to compare the management and outcome in single versus multiple solid organ injury after blunt abdominal trauma.

Materials & Methods: The study was carried out on all blunt abdominal trauma patients with solid organ injury, admitted in ICU / Surgical wards through surgical emergency at NIMS Hospital, Jaipur. Patients were divided into 2 groups. Group A: Single organ injury and Group B: Multiple organ injury. Parameters such as mode of injury, post- operative complications and follow up was recorded.

Results: The average age of Group A was 31.30 years and Group B was 37.01 years.Road traffic accident is a major cause to injured single and multiple organs. In this study, majority of the cases had road traffic accidents in both the groups. 24 patients underwent emergency laparotomy in Group A and 46 patients in Group B because of pneumoperitoneum or hemodynamic instability. 66 patients in Group A and 30 patients in Group B were managed non-operatively. Mostly 22 patients had cardio pulmonary postoperative complication in Group B and 4 patients in Group A. Surgical site infection was mostly 14 patients in Group B. Pleural effusion complication was more in Group B. Most of the patients had no postoperative complication in both the groups. Good results was found in majority of the 86 cases in Group A (solid organ injury) and 56 cases in Group B (multiple organ injury).

Conclusion: Blunt trauma patients with concomitant injury to liver and spleen have higher injury, mortality, length of stay, and transfusion requirements. Liver with different injury grades is the most frequently injured organ; however, the mortality was greater in patients with pancreatic injury.

Keywords: solid organ,trauma, liver,

Introduction

In recent times, there has been a remarkable improvement in the quality of life and conveniences for individuals. However, alongside these comforts, there has been a surge in serious threats to human health. Notably, advancements in the automobile industry and the widespread use of vehicles have elevated motor vehicle accidents to the sixth position among the leading causes of death. The prevalence of trauma, particularly among young adults, has become a significant global public health concern, resulting in an annual death rate of 5.8 million, anticipated to rise to 8.4 million by 2020.

The rapid proliferation of motor vehicles has led to a substantial increase in blunt abdominal trauma cases, with approximately 75 to 80% attributed to motor vehicle accidents. Disturbingly, the fatality rates for trauma in India are 20 times higher than those in developed countries. Blunt abdominal trauma can also arise from accidental falls, assaults with blunt objects, industrial incidents, sports injuries, bomb blasts, and bicycle accidents.

Among the consequences of blunt abdominal trauma, solid organ injuries (SOIs) present a significant challenge, often associated with considerable morbidity and mortality. These injuries, constituting 1 out of 7 blunt trauma admissions, frequently involve the liver and spleen. The approach to managing single versus multiple organ injuries depends on the patient's hemodynamic status. Hemodynamically unstable patients necessitate damage control laparotomy

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and/or definitive surgery. Nonoperative management (NOM)is typically favored for patients with lower injury grades, as higher grades often result in NOM failure and a higher likelihood of surgical intervention. Patients with organ injuries following blunt abdominal trauma tend to exhibit frequent concomitant injuries, a need for blood transfusion, elevated serum lactate levels, and Sequential Organ Failure Assessment (SOFA) scores.The present study was conducted to compare the management and outcome in single versus multiple solid organ injury after blunt abdominal trauma.

Materials & Methods

The study was carried out on all blunt abdominal trauma patients with solid organ injury, admitted in ICU / Surgical wards through surgical emergency at NIMS Hospital, Jaipur. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. In stable blunt abdominal trauma patients with suspected renal injury [flank trauma, H/O gross hematuria, lower limb fractures, flank ecchymosis], Diagnostic imaging was performed with IV contrast enhanced computed tomography [CECT]. In Renal injury patients who are hemodynamically stable, non-operative management [NOM] was done as per guidance of urologist. Patients were divided into 2 groups. Group A: Single organ injury and Group B: Multiple organ injury. Parameters such as mode of injury, post- operative complications and follow up was recorded.Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table: I Distribution of patients

Age group	Group A: Single Organ Injury		Group B: Multiple Organ Injury		P value
	No.	%	No.	%	
≤ 20	16	17.78%	13	17.11%	$\chi2$=86.296 P<0.05 (S)
20-30	42	46.67%	11	14.47%	
31-40	11	12.22%	23	30.26%	
41-50	13	14.44%	18	23.68%	
> 50	8	8.89%	11	14.47%	
Total	**90**	**100.0%**	**76**	**100.0%**	
Mean±SD	**31.30±13.499**		**37.01±15.000**		

Table I shows that out of the maximum 42 patients from the age group of 20-30 years in Group A and 23 patients from the age group of 31-40 in Group B. The average age of Group A was 31.30 years and Group B was 37.01 years.

Table: II Mode of injury in both the groups

Mode of Injury	Group A: Single Organ Injury		Group B: Multiple Organ Injury		P value
	No.	%	No.	%	
Assault	3	3.3%	3	3.9%	$\chi2$=2.457 P=0.293 (NS)
Others	0	0.0%	2	2.6%	
Road Traffic Accident	87	96.7%	71	93.4%	
Total	**90**	**100.0%**	**76**	**100.0%**	

Road traffic accident is a major cause to injured single and multiple organs. In this study, majority of the cases had road traffic accidents in both the groups. The difference was non- significant (P>0.05).

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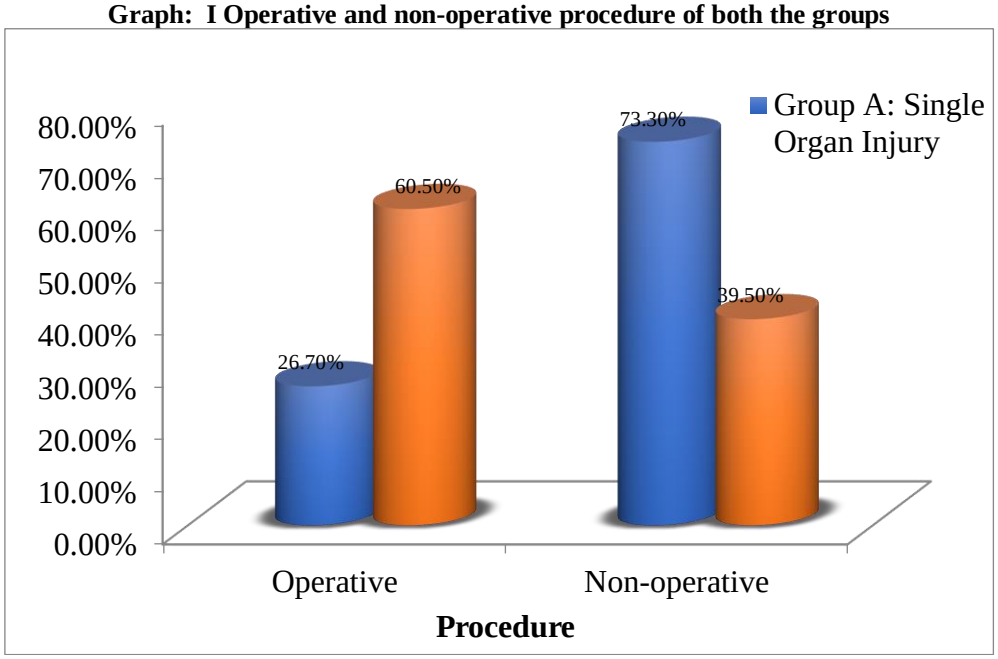
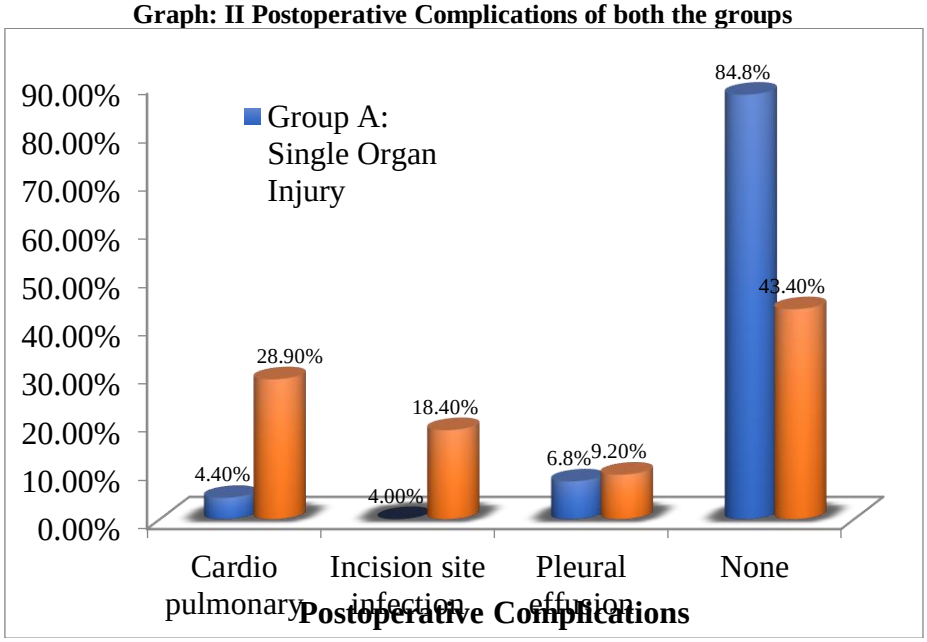
Graph: I Operative and non-operative procedure of both the groups



24 patients underwent emergency laparotomy in Group A and 46 patients in Group B because of pneumoperitoneum or hemodynamic instability. 66 patients in Group A and 30 patients in Group B were managed non-operatively because they had no signs of peritonitis and they were hemodynamically stable. Using chi-square test, this results was statistically highly significant difference between both the groups (P<0.01; P=0.000).

Graph: II Postoperative Complications of both the groups



Mostly 22 patients had cardio pulmonary postoperative complication in Group B and 4 patients in Group A. Surgical site infection was mostly 14 patients in Group B. Pleural effusion complication was more in Group B. Most of the patients had no postoperative complication in both the groups. Using chi-square test, this results was statistically highly significant difference between both the groups (P<0.01; P=0.000).

Table: III Final follow-up status of both the groups

Final follow-up status	Group A: Single Organ Injury		Group B: Multiple Organ Injury		P value
	No.	%	No.	%	
Expired	4	4.4%	20	26.3%	$\chi 2=23.132$ P<0.05 (S)
Good	86	95.6%	56	73.6%	
Total	**90**	**100.0%**	**76**	**100.0%**	

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According to final follow-up, good results was found in majority of the 86 cases in Group A (solid organ injury) and 56 cases in Group B (multiple organ injury). Using chi-square test, this result was statistically highly significant difference between both the groups (P<0.01; P=0.000).Thus, multiple solid organ injury is more severe with prognostically poor outcomes than single solid organ injury.

Discussion

The present study included observations made in 166 cases (90 cases of solid organ injury and 76 cases of multiple organ injury) admitted with the history of blunt trauma with solid organ injuries. Forty- two patients from the age group of 20-30 years in Group A and 23 patients from the age group of 31-40 in Group B. The average age of Group A was 31.30 years and Group B was 37.01 years. Goyal M et al.[5] and Jain BC et al.[6] reported similar results. This shows that persons in the active period of life are more susceptible for accidents and injuries. 158 patients were males accounting for 94.3% and only 8 were females accounting for 5.7%. Jain BC et al.[6] and Connecticut society of surgeons study on abdominal trauma reported similar results. This increased incidence in males is probably due to outdoor nature of occupation and aggressive behaviour in males.

In our study the commonest mode of injury was the road traffic accidents which occurred in 158 cases. Then there is assault which occurred in 6 cases and all other mode of injuries are grouped in others which account for 2 cases. Goyal M et al.[5] reported 57% incidence of motor vehicular accidents in blunt abdominal trauma. These are slightly lower than that of reports of Denver General Hospital[7] 1990 which states that motor vehicle accidents accounts for 75% of cases. In their study also they have found out RTA being the most common mode of injury.

Single organ injuries are crucial especially when the management options and outcomes are taken into account. In our study, the liver was the most frequently injured region followed by the spleen. It has been suggested that higher organ injury severity grades are associated with adverse patient outcomes. The liver and spleen injuries in our study is suggestive of severe injuries as 50% grade V injuries. Although relatively higher, a similar pattern of injury grades was also seen in patients with splenic injury. In contrast, Al-Qahtani et al.[8] reported a higher proportion of patients with grade IV splenic injuries (62%) from Saudi Arabia in comparison with only 10.8% in the present study.One hundred and eight patients were haemodynamically unstable and shock was evident on admission. In Huber-Wagner S et al.[9] study 94 of patients were in unstable at the time of admission.

In our cohort, single SOI patients were treated more frequently with NOM (73.3%). Similarly, Jeremitsky et al.[10] and El-Menyar A et al.[11]showed that 80% and 79.8% respectively of the blunt trauma patients had successful NOM, but it was more likely to fail in patients with higher injury grades. The majority of our single splenic injury patients who underwent NOM had lower grade of injuries. Blunt hepatic trauma patients were more likely to be stable, and therefore, NOM may significantly improve the outcomes when compared to the OM.[12]

Evidence suggests that hemothorax and bone fractures are crucial factors for the decision of OM and its outcomes. This is also evident from our study as OM was performed more frequently in patients with multiple SOIs, associated hemothorax as well as the need for bone fracture. In addition, these patients were more likely to develop complications such as cardiopulmonary and surgical site infection and had prolonged hospital stay than the single SOI patients which corroborates with the findings of earlier studies.

The overall mortality in our study is 4.4% which is almost similar to Malhotra et al.[12] study but lower than that of Jeremitsky E et al.[10] from India (5.6%). However, with respect to the multiple SOIs, the mortality in our cohort (26.3%) in comparison with the previous study by Malhotra et al. (23%). 11.4 percent of our cohort had hemothorax injury, whereas Malhotra et al[12] did not comment on such associated injuries.Furthermore, mortality estimated in hepatic trauma patients from multiple studies was 10–19% which could be attributed to the injury grade, associated injuries and physiological characteristics of the patients, whereas the mortality estimated from blunt splenic trauma ranged between 2 and 18%.

Interestingly, our study showed that single pancreatic SOI was associated with greater proportion of bowel injuries, operative intervention, development of sepsis and mortality (even in the absence of traumatic brain injury) in comparison with the other single SOIs. However, pancreatic injury was the least injured solid organ in our study. The pancreas is estimated to be the 10th most injured organ. The isolated type of pancreatic injury may occur in 0.6% of all abdominal injuries whereas it represents 21% of all the pancreatic injuries.

Conclusion

Authors found that Blunt trauma patients with concomitant injury to liver and spleen have higher injury, mortality, length of stay, and transfusion requirements. Liver with different injury grades is the most frequently injured organ; however, the mortality was greater in patients with pancreatic injury.In this study, multiple solid organ injury is more severe with prognostically poor outcomes than single solid organ injury.

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