



Observations on Blunt Injury to Abdominal Solid Organs with a view to Contribute towards Development of a Departmental Protocol of Management

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Introduction

One of the most baffling problems of surgery can be a patient suspected of having blunt injury of abdominal solid organs that requires surgical intervention as a life saving measure. Currently there are a few published data on pattern of solid organ injury of abdomen by blunt trauma, abdominal solid organ are liver, spleen, kidney, pancreas.

There is a good case to believe that in emergency situations the radiologists⁽¹⁵⁾ performance may profit from a systematic approach using established scoring systems. Score systems as the organ injury scale drawn up by the American Association for the Surgery of Trauma (AAST) are a valuable guidance for objective trauma assessment. When isolated organ injuries were examined, there were statistically significant increases ($p < \text{or} = 0.05$) in all outcomes variables corresponding with increasing OIS grade.⁽¹⁶⁾

In Indian set up very poor people come to hospital. Every patient is not affordable for CT

scan and CT scan not available at peripheral centers for blunt trauma abdomen. So in our study we have compared USG and CT abdomen finding in abdominal trauma patients. So as to decide whether USG alone (clinically stable patients) is equivalent to CT abdomen in low resource setting.

Material & Methods

All solid organ injury of abdomen of above 14 yr age group by blunt trauma admitted in routine & emergency hours in general surgery in M.Y. Hospital, Indore, in duration January 2016- July 2017 were included. The diagnostic methods used in the study are USG abdomen, CECT abdomen, X-RAY ABDOMEN ERECT, X ray chest etc.

Results

The present study included 100 cases of blunt abdominal trauma admitted to Emergency surgery & Trauma unit, Department of Surgery, M.Y. Hospital Indore from 1/1/2016 to 1/1/2017.

- Maximum number of cases in our study

were in the third decade(21-30 years) i.e. 37% (Table 1)

- .In our study mean age was 31.54+11.29. Male comprised 85% of cases in our study (Table 2).
- In all blunt abdominal trauma 61 % of cases accounted for RTA(Table 3).
- Most common extra-abdominal injuries were chest injury (12%) .
- Localised tenderness was the most common presentation found in 75% of cases. Out of 26 cases those were operated (grade4,5 solid organ injury) haemoperitoneum was found 22 cases i.e.22% cases
- In abdomen solid organ injury there was maximum incidence of liver injury 57%, followed by spleen injury. 47%, followed

by renal injury 16% and followed by pancreatic injury cases 10% involved in BAT.

- Most solid organ injuries (grade1,2,3 solid organ injury) were managed conservatively i.e.74 % of cases.
- In our study USG finding were almost equivalent to CT finding for isolated abdominal solid organs. In Indian set up serial CT not possible and so we recommended serial USG for those patient who managed conservatively for assessment.In our set up every patient not affordable for CT scan so we can manage patient USG finding and clinical examination and routine blood investigation basis.

Demographic Distribution of Cases

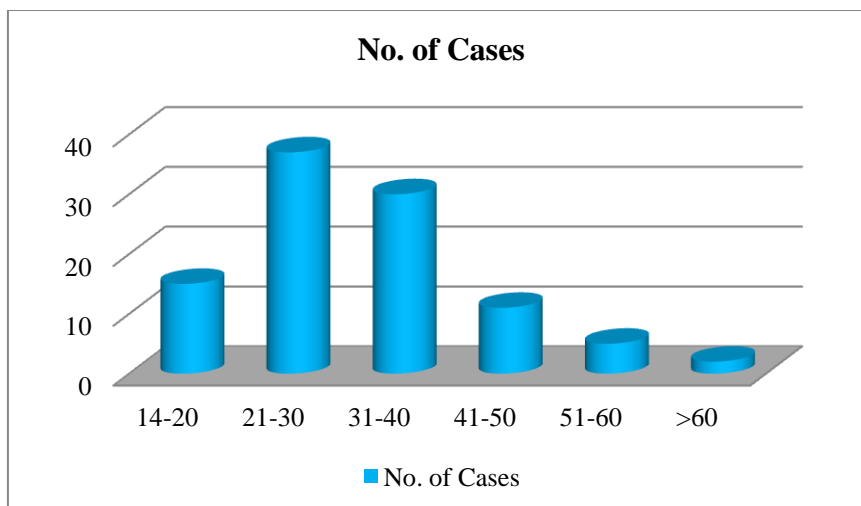


Fig. 1: Age Incidence

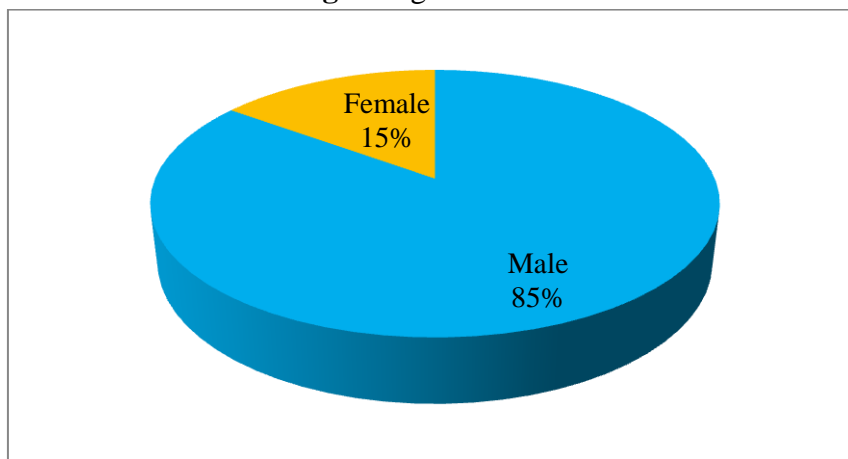


Fig 2: Incidence Male to Female

Table 1 Relative Incidence of Mode of Trauma and Mortality

Mode of Trauma	No of Cases	Mortality
RTA	61	6
Assault	27	2
Fall from height	5	2
Falling blunt object over body	2	-
Other	5	1
TOTAL	100	11

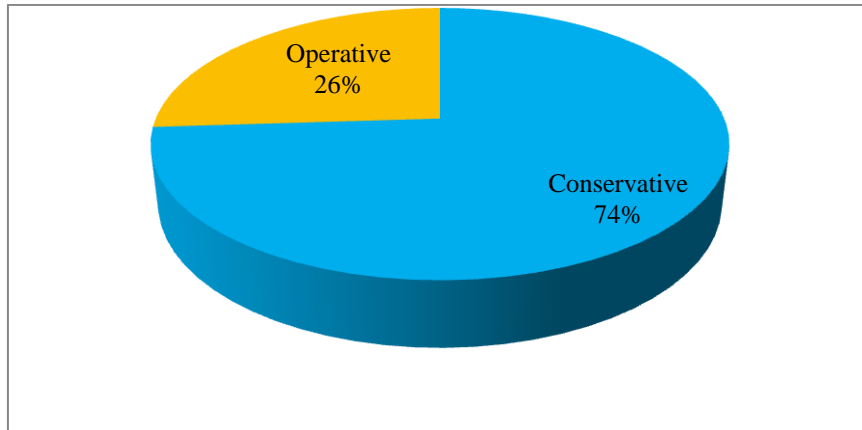


Fig 3: Incidence of Conservative and Operative Treatment

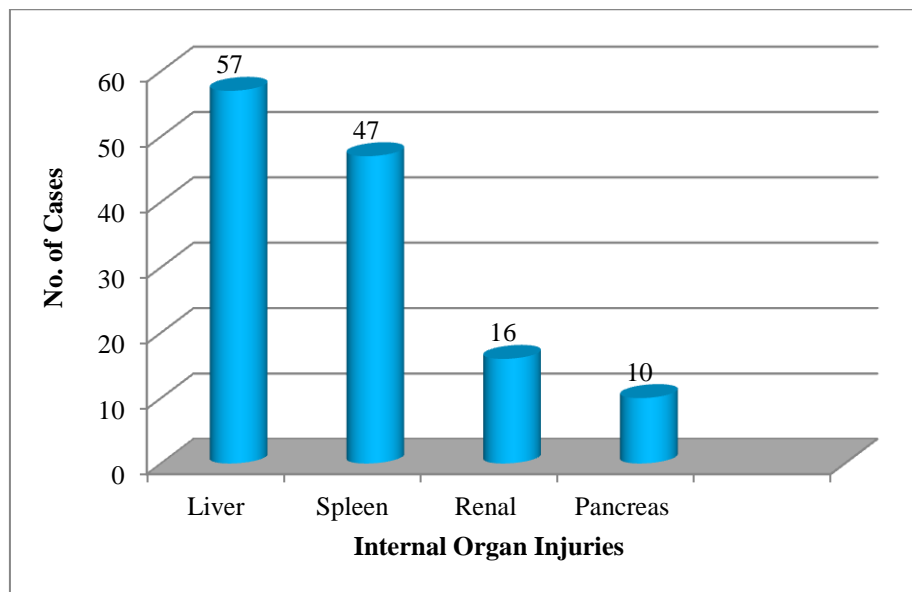


Fig 4 : Incidence of Internal Organ Injuries

Table 2 Management of Abdominal Solid Organ Injury According American Association for the Surgery of Trauma (AAST grading)

Abdominal Solid Organ Injury	No. of Cases	Management		Outcome		AAST	
		conservative	operative	Improved	Not Improved	Followed	Not Followed
Liver							
I	6	6	0	6	-	6	-
II	25	23	2	25	-	23	2
III	20	16	4	17	3	16	4
IV	6	1	5	4	2	5	1-
V	-	-	-	-	-	-	-
VI	-	-	-	-	-	-	-
Chi square		19.288, df = 3		8.473, df = 3		2.479, df = 3	

P value		0.000		0.037		0.4791	
Spleen							
I	4	4	0	4	-	4	-
II	17	12	5	15	2	12	5
III	12	11	1	11	1	11	1
IV	6	0	6	5	1	6	-
V	5	0	5	4	1	5	-
Chi square		25.247, df = 4		1.163, df = 4		6.247, df = 4	
P value		0.000		0.884		0.181	
Pancreases							
I	4	4	0	4	-	4	-
II	2	1	1	1	1	1	1
III	3	1	2	3	-	3	1
IV	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-
Chi square		4.792, df = 2		4.444, df = 2		4.792, df = 2	
P value		0.091		0.108		0.091	
Kidney							
I	3	3	0	3	-	3	-
II	3	0	3	3	-	-	3
III	5	4	1	1	4	-5	1
IV	0	-	-	-	-	-	-
V	5	0	-5	-	5	5	-
Chi square		12.749, df = 3		12.749, df = 3		11.733 df = 3	
P value		0.005		0.005		0.084	

Table 3 Comparison between USG and CT findings for isolated abdominal solid organs

Abdominal Solid Organ Injury	USG finding	CT findings	Management as per AAST Guidelines	P value
Liver				
I	2	4	Conservative	0.467, NS
II	15	17	Conservative	0.949, NS
III	14	13	Conservative	0.552, NS
IV	4	5	Operative	0.854, NS
V				
VI				
Spleen				
I	0	1	Conservative	0.307, NS
II	7	9	Conservative	0.987, NS
III	8	9	Conservative	0.732, NS
IV	2	3	Operative	0.850, NS
V	1	1	Operative	0.861, NS
Pancreases				
I	0	2		0.014, S
II				
III	1	1	Operative	0.014, S
IV				
V				
Kidney				
I				
II				
III	1	1	Conservative	1.00, NS
IV			Operative	
V				

Discussion

The study from 01/01/2016 to 30/7/2017 is a prospective observational study. In our study blunt injury of isolated abdominal solid organs cases accounted for total 100 cases i.e. (0.656%) total admission (15233) on surgical side.

In our study highest number of cases (37) in the third decade (21-30 yrs) i.e. 37%. Minimum number of patient is after 6th decade i.e. cases (6), 2%. In our study 100 patients admitted with mean age of 31.54+11.29 years. In comparison to study by Arikanoğlu Z et al 2013 Fifty-six patients formed the study group, with median age of 37.5 ± 17,0 (range, 16-78) years. 2000 and 2011 at the Dicle University Medical School.⁽¹⁷⁾

There were over all 85 males (85%) and 15 female (15%). In comparison to study by Jones et al 2014 in which Majority were male (194 patients, 68%)⁽³⁾. In comparison to study by Mehta N et al in which Most of the patients were an M:F ratio of 3.7:1⁽²⁾ and In our study most of patients were an M:F ratio of 5.66:1.

Our study shows that majority of the blunt injury of abdomen were accidental in nature comprising 61 cases i.e. 61 %. Second common injury are assault comprises 27 cases i.e. 27 % and least common are falling hard and blunt object over body comprises 2 cases i.e. 2 %. Fall from height comprising 5 cases i.e. 5%, others comprising 5 cases i.e. 5% .

In comparison to study by Howes N et al in which the mechanisms of injury were motor vehicle accident (MVA) (27), pedestrian vehicle accident (PVA) (21), assault (5), fall from a height (3), bicycle accident (6), quad bike accident (1) and tractor-related accident (2).⁽⁴⁾

Maximum numbers of patients (75) were presented with pain in abdomen and localised tenderness at site of BAT i.e 75%. 8 patients out of 100 patients i.e 8 % presented with head injury and with neurological sign and symptoms like unconsciousness, unequal pupil, vomiting etc. There only 8 patients i.e 8 % which are presented with respiratory distress as associated complaints. 25 patients i.e 25 % of BAT presented per abdomen

guarding and rigidity on clinical examination. This shows blunt injury of abdomen and complaints lead difficulty in to assess the internal injury. In comparison to study by Haulik et al 2001 five of the six patients (83.3%) complained of severe abdominal pain on admission and had bloody returns from subsequent peritoneal lavages.⁽⁶⁾

In patient of blunt abdominal solid organ trauma treated conservatively was, 74% (grade 1,2,3 solid organ injury) out of 100. In patient of BAT treated operatively 26% (most of them grade 4,5 solid organ injury) out of 100.

10 cases 10% required emergency inter-coastal drainage (ICD).

All case initially diagnosed by USG and confirmed by CT scan. 35 case of liver injury USG finding same as CT finding out of 39 case. 18 case of splenic injury USG finding same as CT findings out of 23 cases. 1 case of pancreatic injury USG finding same as CT finding out of 2 case. 1 case of renal injury same as CT finding out of 1 case. All USG diagnosis confirmed by CT scan. On comparison USG finding with CT finding for all grade of liver, spleen, kidney and pancreas injury. p value were no significant that means USG finding almost equivalent to CT finding. In Indian set up where low socio economic status people belong USG affordable. Sensitivity and specificity of USG for abdominal solid organ good. On comparison USG and CT finding of all different abdominal solid organ injury we found that for liver injury USG sensitivity 86.21 %, specificity 100%, PPV 100%, NPV 84.00% for splenic injury USG sensitivity 82.98, specificity 100%, PPV 100% , NPV 86.88 % for renal USG sensitivity 81.25 %, specificity 100%, PPV 100% , NPV 96.55 % for pancreatic injury USG sensitivity 30.00 %, specificity 100%, PPV 100% , NPV 92.78%. In comparison to study by Kshitish Mallik et al 2000 in which Thirty three consecutive and positive patients of abdominal trauma were evaluated with both ultrasonography (US) and computed tomography (CT). In 25 patients, either US or CT would have been

sufficient for arriving at a management decision. In comparison to study by Mehmet Selim Nural et al 2005 Ultrasonography results were compared with findings of CT. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of US in detecting intraabdominal injury were 86.5%, 95.4%, 62.7%, 98.7% and 94.7%, respectively⁽²⁰⁾. In comparison to study by Liu, Ming MD et al⁽²³⁾ Fifty-five patients were studied, The sensitivity, specificity, and accuracy were 91.7%, 94.7%, and 92.7% for US scanning.

In comparison to study by Arslan el et al in which 52 patients managed for liver injuries due to blunt abdominal trauma between January 2005-2010 retrospectively,. Liver injuries were grade I in 6 patients (12%), grade II in 14 (28%), grade III in 22 (43%), grade IV in 9 (17%), and grade V in 1 (2%). Forty-five patients (87%) were managed conservatively in this series of liver injury, whereas seven patients (13%) who had unstable vital signs underwent surgery.⁽¹⁸⁾ In our study liver injury were grade I (6) cases, grade II (25) cases, grade III (20) cases and grade IV 6 cases in which 11 cases operated out of 57 cases of liver injury (Table 2).

In comparison to study by Fernandes TM et al Twenty-six (27.6%) met the inclusion criteria for NOM. NOM failed in two patients (7.7%), operated on due to worsening of abdominal pain and hypovolemic shock. [Article in English, Portuguese]⁽⁷⁾ In our study 6 case of grade 4 found and all managed operatively. In comparison to study by Cirocchi et al NOM is the treatment of choice for grade I, II and III blunt splenic injuries. Splenectomy technique in patients who met exclusion criteria for NOM, as well as for patients with grade IV and V injury.⁽¹³⁾ In our study 6 case out of 33 grade 1,2,3, splenic injury operated and 11 out 11 operated in grade 4 & 5 splenic injury.

In comparison to study by Onder A el et al Retrospective study included four pancreatic patients who were operated on due to isolated injury caused by blunt abdominal trauma at our department between January 2004 and October 2010, One of them was in stage IV and the rest

were in stage III. All underwent pancreaticojejunostomy, distal pancreatectomy, distal pancreatectomy + splenectomy and drainage, respectively.⁽⁵⁾ In our study 4 out of 10 case of pancreatic injury managed operatively. 3 isolated case of pancreatic injury found in which 1 case was operated.

In comparison to study by Balcioglu ME et al Retrospectively at Department of Pediatric Surgery hospitalized for renal injury due to blunt abdominal trauma between 2000 and 2012. Forty-one patients were hospitalized. All patients were initially treated conservatively. Three patients underwent acute surgical exploration for life-threatening renal bleeding (grade 4-5 injury). Nephrectomy was performed in 3 patients due to injury to the pedicle. [Article in Turkish]⁽¹⁰⁾ In our study 5 out 16 case of renal injury nephrectomy performed.

In our study indication of emergency laparotomy (26) in blunt injury of abdomen with P/A Guarding, tenderness of patients (25) i.e 25% is most common indication of laparotomy.

In our series wound infection was the most common complication. 7 cases out of 100 patient's i.e. 7% have wound infection. Other significant complication were septicemia 5 patients out of 100 cases i.e. 5%, burst abdomen 1 patients out of 100 cases i.e. 1%.

Maximum incidence of mortality occur in year 2013, 13 patient i.e. 26% of cases and minimum incidence of mortality occur in year 2009, 3 patient i.e. 8.57% of cases. Of all patient in 2016 NTDB, 11.72% sustained abdominal injuries associated with an overall mortality rate of 12.87%⁽¹⁾.

In comparison to study by Howes N et al the mortality rate was 26% (18 patients). There were 6 deaths from massive bleeding, all within 6 hours of operation, and 3 deaths from renal failure; the remaining 9 patients died of multiple organ failure.⁽⁴⁾ In our study the mortality rate was 11% (11 patients). There were 4 death due to massive bleeding and 3 due to acute renal failure

due to shock and remaining died due to multi organ failure.

In comparison to study by Govender et al Specific complications had 1 (2.8%) patient, while 14 (29.9%) patients have had non-specific complications. Total mortality has been 33.3%. [Article in Serbian]⁽²⁴⁾ In our study specific complication have 13 patient while 4 patients have non specific complication. In comparison to study by Prichayudh S et. Overall MR was 17.4%, the, MR was significantly higher in OM than in NOM.⁽¹⁴⁾ In our study overall mortality was 11%, the MR high in operative management (10 case) than in NOM (1 case).

Conclusion

Patients of blunt injury to abdomen coming to hospital are young male. Most blunt abdominal trauma occur due to RTA. In Indian setup very poor people come to government hospital. USG is initial diagnostic modality and CT gold standard for diagnosis of blunt injury to abdominal solid organs. We followed Abdominal solid organ injury grading and management according to AAST guideline (based on CT finding). But in our study we tried to develop the management protocol for patients with clinical examination and USG findings. We found in our study that sensitivity and specificity of USG are almost equivalent to CT scan for liver, spleen and kidney injury. UsG is not very sensitive for pancreatic injury. Accurate and vigilant repeated examination is most valuable. In our study non-operative management of solid organ injury have high success rate for low grade injuries by blunt abdominal trauma.

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