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Intra- abdominal Solid Organ Injuries in Blunt Injury Abdomen in Tertiary Care Medical College Hospital, Madurai: A Prospective study

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Abstract: *Blunt abdominal trauma is most commonly caused by road traffic accidents (RTA). It also occurs as a result of fall from height, assault with blunt objects , industrial mishaps , sports injuries,bombblast.Investigative modality can only supplement the clinical evaluation and cannot replace it in the diagnosis of blunt abdominal trauma. In spite of the best techniques and advances in diagnostic and supportive care , the morbidity and mortality remain at large. The purpose of this study is to estimate the frequency of various intra abdominal solid organs involved,to assess the various mode of blunt abdominal trauma and clinical presentation and various available investigations,treatment and complications.This is a prospective study conducted in a tertiary grade medical college hospital among patients presenting to the casualty and general surgery out patient with a sample of 70. Blunt injury abdomen with solid organ injury forms a considerable load of patients in our society and is usually less obvious. Early diagnosis repeated clinical examination and use of appropriate investigations forms the key role in management.*

Keywords: *blunt injury, contrast- enhanced computed tomography, hollow organ injury, Road traffic accidents, Solid organ injury, splenectomy.*

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I. Introduction

In the age of speed, civil violence , armed conflicts , crimes of passion and traffic accidents, the incidence of blunt injury to the abdomen is on the increase. Blunt abdominal trauma is most commonly caused by road traffic accidents(RTA)[1] . The rapid increase in a number of motor vehicles and its aftermath has caused rapid increase in the number of victims to blunt abdominal trauma. Motor vehicle accidents account for 75-80% of blunt abdominal trauma[2] . Blunt injury of abdomen also occurs as a result of fall from height,assault with blunt objects,industrialmishaps,sportsinjuries,bomb blast and fall from riding a bicycle.[2] Blunt abdominal trauma is not usually obvious.

Hence often it is missed ,unless repeatedly looked for. Due to delay in diagnosis and inadequate treatment of the abdominal injuries , most of the cases are fatal. Investigative modality can only supplement the clinical evaluation and cannot replace it in the diagnosis of blunt abdominal trauma.In spite of the best techniques and advances in diagnostic and supportive care,the morbidity and mortality remain at large.

The reason for this could be due to the interval between trauma and hospitalization,inadequate and lack of appropriate surgical treatment , delay in diagnosis, post-operative complications and associated trauma especially to head and thorax .With the advent of high- resolution ultrasonography (focussed assessment with sonography for trauma[FAST]), Diagnostic peritoneallavage(DPL),four quadrant aspiration(FQA) investigations are becoming less opted. Because of the rapid increase in incidence of solid organ injury in blunt abdominal injuries, the topic is chosen for the case study.

II. Methods Of Collection Of Data :

After admission, data were collected by:

1. Direct interview with the patient or patient relatives accompanying the patient and obtaining a detailed history.
2. Thorough clinical examination
3. Clinical findings and relevant diagnostic investigations performed over the patient.

After initial resuscitation of the patients, thorough assessment for injuries was carried out in all the patients. Documentation of patients , which included ,identification,history, clinical findings,diagnostictest,operative findings ,operative procedures ,complications during the stay in the hospital and during the subsequent follow up period ,were all recorded on a proforma specially prepared . Demographic data collected included the age,sex,occupation and nature and time of accident leading to the injury.

After initial resuscitation and hemodynamic stability, all patients were subjected to careful examination ,depending on the clinical findings;the decision was taken for further investigations such as FQA,DPL,X-ray abdomen and FAST.

The decision for operative or non operative management depended on the outcome of the clinical examination,hemodynamic stability and contrast enhanced computed tomography(CECT) abdomen. Patients selected for non operative or conservative management were placed on strict bed rest, were subjected to a serial clinical examination which included hourly pulse rate, blood pressure,respiratory rate and repeated examination of abdomen and other systems. Appropriate diagnostic tests especially ultrasound of abdomen was repeated as and when required.

In those who are operated, the operative findings and methods of management are recorded. Cases are followed up until their discharge from the hospital. If the patient expired post mortem findings were noted. Post-operative morbidity and duration of hospital stay were recorded. The above facts are recorded in a proforma prepared for this study.

III. Results

Majority of the solid organ injury comprises of persons among the age group 21-30 years age group(n=19,28.33%) with a mean age of 35.90 years(Table 1). The association between the study groups and age distribution is considered to be not statistically significant since P> 0.05 as per two tail unpaired t-test.

Table 1: distribution according to age :

Age distribution (years)	**Solid organ injury**	**%**
≤20	15	21.67
21-30	19	28.33
31-40	9	13.33
41-50	9	13.33
51-60	13	16.67
>60	5	6.67
Total	70	100

Table 2: Gender distribution :

Gender distribution	**Solid organ injury**	**%**
Male	51	73.33
Female	19	26.67
Total	70	100

Majority of the solid organ injury group comprised of males (n=51,73.33)(Table 2). The association between the study groups and age distribution is considered to be not statistically significant since P> 0.05 as per two tail unpaired t-test.

Majority of the solid organ injury group patients belonged to the 1-3 h time delay group (n=29,40%) with a mean delay of 2.54h(Table 3).The association between the study groups and age distribution is considered to be not statistically significant since P> 0.05 as per two tail unpaired t-test.

Table 3: Time delay :

Time delay (h)	**Solid organ injury**	**%**
≤1	27	38.33
1-3	29	40.00
3-6	12	18.33
6-9	1	1.67
9-12	1	1.67
Total	70	100

Majority of the solid organ injury group patients had a splenic injury (n=38,60%) followed by liver (n=23,38.33).(Table 4)

Table 4: solid organ injured:

Solid organ injured(n=70)	**n(%)**
Spleen	38(60.00)
Liver	23(38.33)
Pancreas	3(5.00)
Kidney	5(6.67)
Mesentery	1(1.67)

Majority of the solid organ injury group patients belonged to the RTA class interval (n=49,70%) followed by fall from height class interval (n=13,18.33)(Tables 5 and 6). The increased incidence of RTA and fall from height as a mode of injury in solid organ injury group is statistically significant as the P<0.05 .

Table 5: Mode of injury

Mode of injury	**Solid organ injury**	**%**
RTA	49	70.00
Fall from height	13	18.33
Bull gore injury	1	1.67
Assault	5	6.67
Industrial accident	2	3.33
Total	70	100

Majority of the solid organ injury group patients exhibited abdominal pain as clinical presentation (n=66,95%) followed by abdominal distension(n=29, 41.67%)(Table 7). The increased incidence of abdominal pain was meaningfully more significant in solid organ injury .

Table 6: Clinical Presentation

Clinical presentation	**Solid organ injury (n=70)**	**%**
Abdominal pain	66	95.00
Abdominal Distension	29	41.67
Hematuria	5	6.67
Guarding	26	38.33
Shock	24	35.00
Rigidity	22	31.67

Majority of the solid organ injury group patients exhibited thoracic injury as associated injury (n=29,41.67)followed by head and neck injuries.(n=18,26.67) (Table 8).

Table 7 : Associated injuries

Associated injury	**Solid organ injury (n=70)**	**%**
Head and neck injury	18	26.67
Thorax injury	29	41.67
Orthopaedic injury	5	6.67
Soft tissue injury	8	11.67
Retroperitoneal haematoma	1	1.67
Combination	3	5.00

Majority of the solid organ injury group patients had operative treatment (n= 46,66.67). Theassociation between the study groups and treatment status is considered to be not statistically significant since P>0.05 as per Fischer's exact test.

Table 8: Treatment status distribution

Treatment status	**Solid organ injury**	**%**
Conservative	24	33.33
Operative	46	66.67
Total	70	100.00

Majority of the solid organ injury group patients had splenectomy surgical procedure (n=36,40%)(Table 11).Theassociation between the study groups and type of surgery is considered to be not statistically significant since P>0.05 as per Fischer's exact test.

Table 9: Type of surgery

Type of surgery	**Solid organ injury**	**%**
Spleenorraphy	1	1.67
Splenectomy	36	40.00
Hepatorrhaphy	5	6.67
Gel foam over liver laceration	13	18.33
Nephrectomy	2	3.33

Majority of the solid organ injury group patients had wound infection as post operative complication (n=30,41.67%)(table 12).Theassociation between the study groups and post operative complications is considered to be not statistically significant since P>0.05 as per Fischer's exact test.

Table 11: Post-operative complications distribution :

Post operative complications	**Solid organ injury**	**%**
Wound infection	30	41.67
Septicaemia	13	18.33
Atelectasis	18	26.67
Renal failure	8	11.67
Hepatic failure	1	1.67

Majority of the solid organ injury group patients survived at the end of study period (n=57,81.67%).Theassociation between the study groups and death status is considered to be not statistically significant since P>0.05 as per Fischer's exact test.

Table 12: Distribution of death :

Survival / death	**Solid organ injury**	**%**
Dead	13	18.33
Survived	57	81.67
Total	70	100.00

IV. Discussion

4.1 Spleen:

It is the commonest visceral organ to rupture following blunt trauma. It is usually avulsion from the pedicles, multiple fissure fractures,an enlarged spleen splitting on its outer aspect to produce either a tear or subcapsular haematoma. Less usually is a small tear in the anterior aspect of hilum.[2]The three possible scenarios, a patient with splenic injury can present are :

- The patient may succumb rapidly to trauma , without recovering from shock
- Initial shock followed by recovery with signs of rupture
- Delayed rupture after few days.

Proper management of patients with blunt injury spleen begins with resuscitative regimes. FAST has emerged as a useful diagnostic test in the initial evaluation.[8]Once the decision has been made to proceed with the operation , the surgeon should carefully consider the need for each of the following: Additional intravenous access, perioperative monitoring(i.e central venous catheter, arterial catheter), perioperative antibiotics and blood transfusion. The decision to perform splenectomy or splenorrhaphy is based on the condition of the patient and condition of spleen. Because attempts at splenorrhaphy can prolong the operation,splenectomy is strongly considered in patients with medical contraindications to prolonged surgery, such as coagulopathy,hypothermia and cardiopulmonary or hepatic disease.

4.2 Liver:

Liver is the second most common injured organ in all patients with blunt abdominal trauma. Incidence being 35% - 45%of patients: blunt injuries results from direct blows, compression between the lower ribs on the right, and the spine or shearing at fixed points secondary to deceleration. Major hepatic injuries are usually easy to detect because of the location of trauma, profound hypotension temporarily responsive to the infusion of blood and fluids and marked abdominal distension. Core management of hepatic injuries includes resuscitation to prevent hypovolemia. Explorative laparotomy is indicated in hemodynamically unstable patients. Various techniques of liver injury management includes :

- Manual compression
- Portal triad occlusion
- Perihepatic packs
- Direct clamping of liver parenchyma[3,4]
- Direct suture of liver
- Application of liver tourniquet.

Post operative nutritional support is important in all cases of liver injury.[5]

4.3 Pancreas :

The incidence of pancreatic injury in severe abdominal trauma patients is about 3-12% with blunt trauma. Blunt pancreatic injuries occur when high- energy crushing force is applied to the upper abdomen. The majority of blunt pancreatic injuries result from motor vehicle accidents. Most patients with injuroes to the retroperitoneal pancreas will have minimal clinical symptoms and signs when seen first after trauma;the reason for this is the retroperitoneal location of the organ which masks the early development of peritonitis.A management plan based on these principles requires that the surgeon ascertain the following :

- The presence or absence of associated organ injuries, particularly the duodenum
- The degree of pancreatic parenchymal disruption
- The integrity of main pancreatic duct and ampulla

4.4. Kidney and Adrenal gland:

- The most common sign in patients with traumatic injury to the genito urinary tract is hematuria. However , majority of renal injuries is minor and is treated conservatively. The adrenal glands are injured frequently by blunt trauma. In most patients the haematoma will be reabsorbed,but occasionally it will persist as a seroma. Hemoperitoneum causes the small bowel to shift towards the centre producing a ground glass appearance. [7] however if bilateral adrenal haematomas occur, the potential for developing addison's disease must be considered[6]. The pendulum of the conception of ideal management of renal injury veers from early surgery(except in contusion) to ultra-conservatism,where only pedicle injury is considered indication for surgery. For,blunt injury the problem og early surgery is that on opening the gerota's fascia often there is massive hemorrhage that necessitates nephrectomy.

V. Conclusion

Blunt injury abdomen with solid organ injury forms considerable load of patiets in our society. Most common age group involved is 21-30 years. Predominantly males are affected in large proportions. Road traffic accident forms the most common mode of injury. So efforts should be made to bring road traffic regulations into strict actions and traffic norms regulated. Well established trauma care centres should be established at every Taluk hospitals. Measures for early transport of the patients from the accident site to trauma centres should be undertaken. Significant number of cases will have associated injuries with blunt injury abdomen like head injury, thoracic injury, extremity fractures. Clinical presentation is varied, sometimes confusing.

Blunt injury abdomen is usually less obvious. Hence , repeated examination by multispecialty personnel in a specialized trauma centre is required. Erect abdomen X ray is a useful investigation to identify any associated hollow viscus injury. Falling tires in serial hematocrit value indicates ongoing bleeding.

With the advent of high resolution ultrasonography(FAST), DPL,FQA investigations are less opted.CECT forms the core investigations of choice in dealing with blunt injury abdomen patients and becomes more important in deciding operative versus conservative management. Early diagnosis and repeated clinical examination and appropriate use of investigations forms the key in managing BIA injuries. Associated extra abdominal injuries like head,thoracic and orthopaedic injuries influenced the morbidity and mortality of the patients in blunt injury abdomen.

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