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Research Article

The Study of Blunt Abdominal Trauma in Children

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Abstract: Management of abdominal injuries in children has evolved considerably in recent years. Nonoperative treatment of children with blunt abdominal trauma is successful in more than 95% of appropriately selected cases if trauma care providers have a thorough knowledge of the anatomy and physiology of the growing child. A study of 30 cases of blunt abdominal trauma (BAT) in paediatric age group was carried out over a span of 3 years. All patients were subjected to various investigations except for 3 cases in which patients were unstable.7 patients underwent laparotomy and surgical decision was based on the clinical findings and CT grade of injury. The rest 23 cases were managed conservatively. The nonoperative management in BAT was successful in more than 70% and nonoperative management reduced the hospital stay and morbidity.
Keywords: Blunt abdominal trauma, Nonoperative management, Paediatric, Spleen injury, Liver injury

INTRODUCTION

The abdomen is the most common site of initially unrecognized fatal injury in traumatized children. Unique pediatric aspects of the anatomy and physiology of the abdomen contribute to the abdomen's biomechanical response to traumatic loads. The ribs are more flexible in the child, which makes them less likely to fracture. However, this increase in compliance makes them less effective at energy dissipation and therefore less effective at protecting the upper abdominal structures.

In the USA blunt trauma makes up 83% of all paediatric abdominal trauma [1], whereas in Australia it makes up 97%. Motor vehicle accidents are responsible for the majority of blunt abdominal injuries with slightly more occupant injuries (41%) than pedestrian (33%). Falls make up the next highest group (8%) followed by bicycle injuries (7%) [1]. Child abuse is unfortunately very common and is the leading cause of trauma death in infants.

METHODOLOGY

This work is based on study of 30 cases of blunt trauma abdomen in children [under 12 years of age] in 3 years span and all cases with h/o direct trauma to abdomen or cases with polytrauma were included. The maximum number of patients was in age group of 5-8yrs, the youngest being 1 year child and eldest patient was 12 year old with male to female ratio 3:2.

Vehicular accidents were the common mode of injury accounting to 60% of cases followed by fall (30%), sports injury (6.6%) and assault (3.3%). Most of the patients presented between 2 to 8 hours of injury (66.66%). Pain abdomen was the most common presenting symptom accounting for 90%. Haematuria was seen in 60% of genitourinary trauma cases.

On general physical examination tachycardia was present in almost all acute emergency cases, but blood pressure was considered as main parameter in clinical assessment.5 patients out of 30 cases were unstable at admission. Of which 1 patient died because of associated injuries. In other 4 unstable patients 2 cases were operated (1 case had multiple organ injury and other case had continuous unstable B.P).There were 16 extra abdominal injuries in this study of which the most common was chest injury (23.33%) and in 46.66% there were no associated injuries.

Erect X-ray abdomen and USG was done in all patients. X- Rays are not useful in blunt abdominal trauma unless there is free gas under diaphragm. But it helps in detecting fractures.

10 cases had haemoperitoneum and 10 had organ injury as significant USG findings (Fig. 1 & 2).

CT scan was done in haemodynamically stable patients, although few patients were resuscitated to their normal BP before getting CT scan.19 cases had organ injury as a significant CT finding of which 10 patients

also had haemoperitoneum (Fig. 3). In 3 cases CT scan was not done as 2 cases had pneumoperitoneum on X-ray and USG with severe peritonitis. One patient was haemodynamically unstable and needed emergency splenectomy.

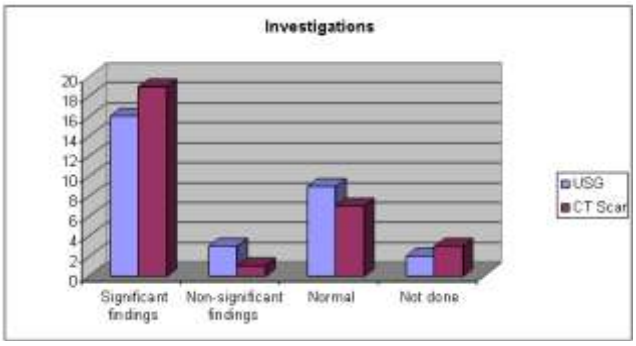

Fig. 1: USG and CT Scan Investigations

Fig. 2a: USG Showing Bladder rupture

Fig. 2b: USG showing haemoperitoneum

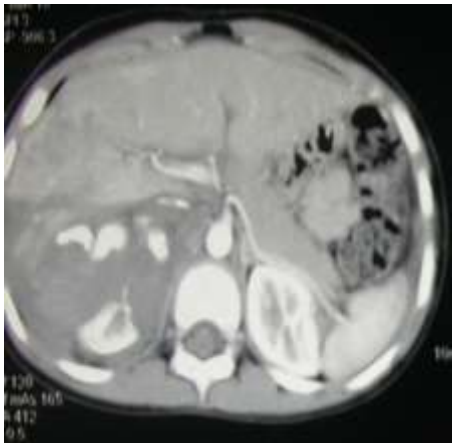

Fig. 3: CT scan showing liver and left renal injury

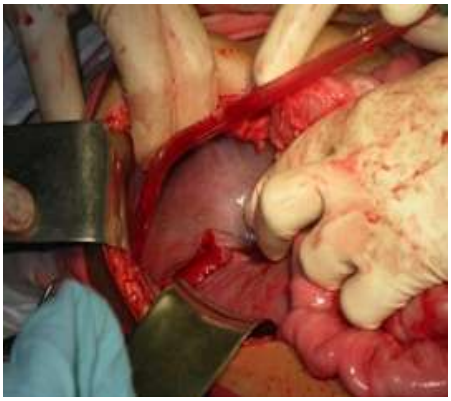

Fig. 4a: Liver laceration

Fig. 4b: Bladder rupture

There were 27 intra-abdominal injuries in 30 cases of which 5 cases had multiple organ injuries.

Most commonly involved organs were liver and spleen and the least common was bladder (Table-1).

Table 1: Organ injury

Organ injured	No. of patients	%
Liver	8	29.62
Spleen	8	29.62
Kidney	4	14.81
Pancreas	3	11.11
Intestine	2	7.40
Bladder	1	3.70
Retroperitoneal haematoma	1	3.70

Table 2: Management of the patients

	No. of patients	%
Conservative	23	76.66
Operated	6	20
Initially conserved	1	3.33

All the 30 cases were admitted and investigated. Mean while patient was resuscitated as per protocol. 23 patients (Table 2) were managed conservatively out of

which 2 cases needed ICD insertion in view of haemothorax.6 cases underwent exploratory laparotomy [splenectomy, liver suturing, bowel resection, bladder repair (Fig. 4), nephrectomy and cystogastrostomy for pancreatic pseudocyst].

Nonoperative management consisted of regular pulse and B.P monitoring, repeated clinical assessment, USG abdomen sos CT abdomen to know increase in haematoma or haemoperitoneum. The most common complication observed was fever and the average hospital stay was 8.7 days. The maximum length of stay was 30 days and minimum was 2 days. The hospital stay was less in nonoperated cases as compared to operated cases.

There was one mortality in this study which had associated fractures and head injury. One patient developed urethral stricture which was later repaired. A case of bladder injury with pelvic fracture needed prolonged bed rest. Out of 30 patient's one patient died and rest all were discharged. Off them 20 patients returned for follow up. Patient was followed up for a period of 2 months. None of the patients had any major complication in follow up except for dull aching pain.

RESULTS AND DISCUSSION

Blunt injury abdomen is a major diagnostic challenge, when patients are first seen in the emergency department. Management of BAT injuries has evolved over the past 25 years. Prior to that time, a diagnostic peritoneal lavage positive for blood was an indication for laparotomy. Stimulated by the success of nonoperative management of splenic and hepatic injuries in children, there has been a trend towards nonoperative. Currently, nonoperative management of isolated blunt hepatic and splenic injuries is considered the standard of care for haemodynamically stable children.

The maximum numbers of patients in our study were males accounting for 60% of cases and were in age group of 5-8 years. None of the patients were below 1 year. The most common mode of injury was vehicular accidents (60%) which were comparable to studies by Chirdan *et al*. [2] and Ameh *et al*. [3]. Children require immediate resuscitation and a systemic evaluation. In developing countries like India prehospital is an important factor in increasing mortality. In our study most cases presented within 2-8 hours of injury.

It is known that associated injuries can mask abdominal injuries and therefore it is very essential to have a high of index of suspicion in such cases. The type of injury, can in few cases give a fare idea of nature of abdominal injury. In present study chest injury was most common associated injury which was comparable with study by Chirdan *et al*. [2] although overall incidence of associated injuries is less (12.48% vs53.32%).Clinical examination is less reliable for some injuries, but routinely was part of the initial assessment. There were physical signs that indicated general or specific blunt trauma injuries. However, the examination was more reliable in fully conscious haemodynamically stable patients.

Regarding the diagnosis, imaging plays a key role in assessment. It is clear that emergency screening ultrasound is now a nationally accepted tool for the rapid assessment of the emergency patient bedside [4]. USG is very sensitive in detecting the free fluid. The presence of peritoneal fluid should raise suspicion that bleeding from an organ is present.USG is accurate in detecting haemoperitoneum, but poor in detecting organ injuries. The sensitivity and specificity in our study was 50% and 100% respectively for detecting organ injury which is comparable with other studies.

Table 3: Comparison of USG

USG	Present study	Thourani *et al.* [5]	Mutabagani *et al.* [6]
Sensitivity	50%	80%	30%
Specificity	100%	100%	100%

CT scan is therefore preferred method of evaluation of BAT [7, 8]. It is safe and noninvasive. The only contraindication is haemodynamically unstable cases. CT scan in our study could detect a missed 9 organ injuries by USG and exactly grade the organ injury which assisted in the management plan.

The most common organ injury in the present study was liver and spleen where as the most common organ involved was spleen in study by Amulya K [9] (27%) and 59.33% in study by Chirdan *et al*.[2]. In our study there were no duodenal or stomach injuries. In 18.50% of cases there was more than one organ injury where as it was 35% in study by George A Taylor *et al*. [10].

76% of the BAT cases were managed nonoperatively and was successful in all these cases (Table 4). Only one case of splenic injury which was managed conservatively ended with splenectomy [11]. 20% of the cases underwent laparotomy for various organ injuries. 3.9% of cases underwent laparotomy in study conducted at Pennsylvania by Rhodes. M. S *et al*. [12].

Laparotomy was indicated in a patient with blunt abdominal trauma when they have signs of peritonitis, uncontrolled shock or hemorrhage, clinical deterioration during observation, and hemoperitoneum findings. A midline incision is usually preferred. When the abdomen is opened, hemorrhage control is accomplished by removing blood and clots, packing all 4 quadrants, and clamping vascular structures [13]. Obvious hollow viscus injuries are sutured [14]. After intra-abdominal injuries have been repaired and hemorrhage has been controlled by packing, a thorough exploration of the abdomen is then performed to evaluate the entire contents of the abdomen.

Table 4: Comparision of present study and study by Hall *et al*. [15]

	Hall *et al*. [15] Spleen/liver	**Present study Spleen/liver**
Nonoperative	79% / 96%	75% / 87.5%
Operative	21% / 4%	25% / 12.5%

The mean hospital stay was 8.7 days in our study and 6.2 days in study Rhodes MS *et al*. [12].

There was one mortality in our study and the primary cause of death was hemorrhage.

CONCLUSION

The nonoperative management in BAT was successful in more than 90% and the management protocol was based on repeated clinical examination and investigations. Nonoperative management reduced the hospital stay, morbidity and mortality in children if timely intervened.

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