

Management Outcomes In Blunt Abdominal Trauma In Children: (A Prospective Study)

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ABSTRACT

Objective: Clinical pathways now highlight both observation and operation as acceptable initial therapeutic options for management of blunt abdominal trauma in children. The purpose of this study was to evaluate treatment trends and end results of blunt abdominal trauma in children.

Methods: Sixty child were admitted to trauma and emergency department of Sohag university hospital in the period from October 1998 To March 2000. The age ranged from 1 To 14 years old (42 male, 18 female).

According to clinical examination and radiological investigations, patients were classified into two groups :the first group (40 cases) was subjected to abdominal exploration and The second group (20 cases) was subjected to non-operative treatment.

Results: The first group: Splenectomy was done for 21 cases [15 cases of grade 5, 6 cases of grade 4 splenic injury]. Hepatic tear was found in 4 cases, where suturing was done in 2 cases while homeostatic agents were applied in 2 cases. Biliary injury was found in 2 cases and intestinal injury was found in 13 cases. The second group: the non-operative management was successful in 9 out of 12 cases with grade 1,2 and 3 of splenic trauma(75 % success rate) while it was successful in 6 out of 8 cases of hepatic trauma (75 % success rate).

Conclusion: The operative management was mandatory in blunt abdominal trauma in children if there was haemodynamic instability or positive diagnosis of haemoperitoneum by one of different methods of investigation. The conservative management was successful in splenic injuries using the criteria of AAST (American Association for the Surgery of Trauma) if there was haemodynamic stability plus absence of other associated abdominal injury .It was also successful in hepatic injuries in specific conditions.

INTRODUCTION

Blunt trauma to the abdomen is the most frequent mode of injury in children; multiple injuries are often present.

(Thourani et al, 1998)

Blunt trauma to the abdomen in children is a serious problem because it needs perfect clinical examination and rapid evaluation. In addition to clinical evaluation, The abdominal ultrasound in blunt

abdominal trauma can help the surgeon to determine immediate surgery or delayed management. (Katz et al, 1996)

The most common method of investigation for diagnosis of interabdominal injury and organ affection in blunt abdominal trauma in pediatric is abdominal ultrasonography which should be performed in the emergency surgical units. (Akgur et al, 1993)

Non-operative management of blunt abdominal trauma has been very successful in many conditions specially splenic and hepatic injuries. (Sjovall and Hirsch 1997)

Aim of the work: -

The aim of this work is to evaluate diagnosis, different treatment modalities and the end results of blunt abdominal trauma in children and to highlight on non-operative management in some cases.

Patients and Methods:

This study was conducted on 60 child who were admitted to trauma and emergency Department at SOHAG University Hospital from October 1998 to March 2000.

All patients were presented with blunt trauma to the abdomen due to falling from height, motor car accidents and falling during animal riding. Children with extra abdominal injuries (head, neck, chest and extremities) were excluded for this study.

The majority of the children 45 (70%) were admitted directly immediately after trauma and 15 (30%) cases were referred from other hospitals within 24 hours after trauma. Forty two were males and 18 were females.

Our patients were subjected to complete physical examination and routine laboratory investigations.

All selected cases were subjected to abdominal standing plain X rays and ultrasound abdominal examination. Abdominal CT scan was done in 8 cases where the ultrasound could not detect signs of trauma to abdominal organ in spite of instability of the child. Diagnostic peritoneal lavage (D.P.L.) was done in 5 cases.

According to data obtained by physical examination and different investigations, the patients were divided into two main groups based on standard clinical criteria, haemodynamic stability of the patient. The two groups are:

- * The first group of patients was subjected to immediate surgery (40 cases) 66.6 %
- * The second group of the patients was subjected to conservative management and follow up. (20 cases) 33.3 %.

As regard to the first group, the indications for the operative management were: -

- 1) The child was haemodynamic v stable (pulse rate more than 120, systolic blood Pressure less than 90).(Thomas et al, 1997)
- 2) The Abdomen was rigid, tender or marked rebound tenderness all over the Abdomen is present.
- 3) Presence of peritoneal collection (Blood, bile, or intestinal contents) was proved by aspiration under ultrasound or Diagnostic Peritoneal Lavage. [D.P.L.].
- 4) Grade 4 or 5-spleen injuries according to (A.A.S.T) as shown in table (1). (Smith et al, 1992)

As regard to the second group:

Non-operative management was indicated in the following conditions: -

- (1) The child was stable haemodynamically. (Pulse rate less than 120, systolic blood pressure more than 90. (Thomas et al, 1997)
- (2) The abdominal examination revealed that: The abdomen was lax, with no rigidity or rebound tenderness.
- (3) There was minimal collection of blood detected by ultrasound (haemoperitoneum < 250 c.c.) (Pachter et al, 1998)
- (4) Grade 1, 2 or 3 spleen injuries according to modified scale of (A.A.S.T.) . (Smith et al, 1992)

Table 1: Showed (A.A.S.T.)

Grade	Anatomic basis
0	Normal spleen
I	Haematoma < 10% Laceration < 1 cm.
II	Haematoma 10 → 20% spleen volume Laceration 1 → 3 cm. Depth.
III	Haematoma 20 → 50% volume Laceration > 3 cm.
IV	Haematoma > 50% spleen volume Laceration > 3 cm. Or > 50% Devascularization
V	Shattered spleen, only fragment remaining.

(Organ injury scale)

Organ injury scaling committee of the American Association for the surgery of trauma (A.A.S.T.) modified for ease of ultrasound grading. (Pachter et al, 1998)

The management:

- 1- The first group was subjected to abdominal exploration and dealing with underlying pathology. (table 7)
- 2- The second group was subjected to non-operative management in form of conservative treatment:
 - a) resuscitation of the patient, blood transfusion 16ml /kg, I.V. fluid and mild analgesic.
 - b) Monitoring the child clinical data every 6 hours.
 - c) Follow up of the child by plain Xray and abdominal ultrasound if needed.

All patients were followed up for one month after discharge.

RESULTS:

This study consists of 60 patients presented by blunt trauma to the abdomen, their ages ranged from 1 to 14 years. The ages were classified into three groups (mean age was 3.75 in the first group, 8.67 in the second group and 12.92 in the third group) as detected in table (3). Forty two were boys and 18 were girls.

Table 2: Showed the dominating mechanism of injury:

Mechanism of injury	Number of cases	Percentage
Falling from height	30	50%
Motor car accident	20	30%
Falling during animal riding	10	20%

Table 3: Showed number of cases, percent and the mean age in each group.

age group	1 → 5	6 → 11	12 → 14
Number	12	42	6
Percentage	20%	70%	10%
mean age	3.75	8.67	12.92

Table 4: Showed different signs and percents of total cases(60):

Clinical signs	Number	Percent
rigidity	30	50%
Tenderness	40	66%
rebound tenderness	25	41.6%
Shifting dullness	20	33.3%
Positive rectal examination	3	5%
Nothing of the above signs	20	33.3%

Table 5: Showed different signs and their percents in cases of splenic trauma: (21 cases).

Clinical signs	Number	Percent
rigidity	18	85%
Tenderness in left upper quadrant	20	95.1%
rebound tenderness	10	48%
Kehr's sign	5	25.5%
Balance's sign	7	33.3%
Positive rectal examination	3	15.2%

Table 6: Showed indications of operative management in 40 cases of the first group:

Indications	number	Percent
Peritonitis (clinically)	10	25%
Peritoneal collection (ultrasound)	11	27.5%
Haemoperitoneum by D.P.L.	5	12.5%
Hepatic injury (6) Splenic injury (2) by (CTscan)	8	20%
Gas under diaphragm by plain X ray erect	6	15%
Total	40	100%

Table 7: Showed different surgical procedures in 40 cases of the first group.

Surgical procedure	Number	Percent
Splenectomy	21	52.5%
Hepatic repair	2	5%
Hepatic homeostasis using homeostatic agent	2	5%
Hepatic resection	-	-
T.tube drainage	1	2.5%
Cholecystectomy	1	2.5%
Simple intestinal closure of single perforation	7	17.5%
Resection anastomosis of small intestine	4	10%
Resection colonic anastomosis and colostomy	2	5%
Total	40	100%

According to final Diagnosis after evaluation of patients by clinical examination and Different methods of investigations [ultrasound, plain Xray, erect position, D.P.L.) they are classified into 4 main groups. Splenic, hepatic, Biliary system and gastrointestinal injuries. As shown in Table8.

Table 8: Showed number of patients and their percent according to final diagnosis of main abdominal injury.

Main injury	Number of patients	Percentage
1) Spleen injury	33	55 %
2) Hepatic injury	12	20 %
3) Biliary system injury	2	3.6 %
4) Gastrointestinal injury	13	21.6 %
5) Vascular, mesenteric injury	-	-

Table 9 showed numbers and different percentages of each group:

	First group		Second group	
	Number	Percentage	Number	Percentage
Spleen	21	35 %	12	20 %
Liver	4	6.6%	8	13.4 %
Biliary	2	3.6%		
Gastrointestinal	13	21.6%		
Total	40	66.6%	20	33.4%

Splenic injury: - operative treatment:

Twenty-one patients had isolated splenic injuries, (15 cases of grade 5 and 6 cases of grade 4). In each of them, Splenectomy was done.

• Splenic injury : Non-operative management : -

Twelve cases of splenic injury were subjected to conservative management

• by abdominal ultrasound: -

- 1) Small tear less than 3 cm in diameters in 4 cases, there is minimal collection in 2 child and no collection in 2 child.
- 2) Subcapsular haematoma in 8 cases of different sizes [grade 1, 2 or 3].

After 2 days, one case of splenic tear became unstable and developed increased collection, exploration, splenorrhaphy was done. But the patient still unstable in the fifth day, where splenectomy was done.

The second case of splenic tear was female, 13 years old, motor car accident. She was haemodynamically stable at the day of admission, the abdominal examination was normal, the abdominal sonography showed minimal pelvic collection. At the third day, the abdomen is rigid slightly tender in spite of haemodynamic stability, the sonographic picture was the same. Exploration had showed splenic tear (grade 2) at lower pole where Splenorrhaphy was done. She had improved clinically and sonographically. The third and fourth patient had improved under conservative management, this was detected by ultra sound which documented healing of splenic tear.

- In others 8 cases of subcapsular haematoma, One female child 4 years old developed sever abdominal pain in the third day with increased pallor. Ultrasound had showed increased collection. Exploration and splenectomy was done due to rupture of subcapsular haematoma. Seven out of eight cases had improved clinically detected by daily ultrasonography with complete resolution of haematoma within 10 days. Successful rate of non-operative management was 9 out of 12 cases (75 %).

Hepatic injury (operative management)

Four patients underwent surgery, three of them immediately after admission due to unstability of the child. One patient was operated on 6 hours After Admission.

In 2 cases, suture of liver tear of anterior surface of right lobe was done. In other 2 cases, one had one tear in superior surface with minimal Bleeding and homeostatic agent (Gel foam) was applied. The other case had laceration in posterior surface and homeostatic agent (Gel foam) was applied. One child developed biliary peritonitis after suture of tear in the sixth postoperative day and explored and drainage was done.

Hepatic injury (non-operative management)

Eight children with liver trauma were subjected to conservative management due to superficial liver tear or small haematoma. Six cases of liver laceration had improved clinically and radiological with complete healing within 7 days. One case developed hypotension, increased collection and explored where suture of hepatic tear was done. Other patient developed fever, tachycardia and was explored. Drainage of collection and homeostatic agent was applied. Non-operative management of hepatic injury was successful in 6 out of 8 cases, (successful rate was 75 %).

Biliary system injury (operative management)

There were 2 cases: The first child had suffered from old blunt trauma to abdomen 10 days before and admitted to Blianah general hospital where splenectomy was done. After 7 days he developed acute peritonitis and was referred to our emergency department. Aspiration under sonar had showed biliary nature, exploration was done where missed injury of supradoudenal part of common Bile duct appeared, Repair with T tube drainage was done. The child had improved. The other child was female 6 years old falling from height reaching to our hospital 24 hours later when sever pain in right hypochondrium with abdominal rigidity developed. Exploration had showed perforated gall bladder, cholecystectomy was done. No postoperative complications were detected.

Gastrointestinal injury (operative management)

Intestinal injury was detected in 13 child. All of them were subjected to immediate surgery: seven cases had single perforation of small intestine(4 in jejunum, 3 in ileum) where simple closure was done. Four cases had multiple perforation of distal jejunum and proximal ileum where resection anastomosis was done. Two cases had unsuspected colon injury: first one was male 7 years old, had received trauma to the left iliac fossa in motor car accident. Exploration was done where perforation of sigmoid colon more than 50% circumference of the bowel was detected, resection anastomosis and diverting transverse colostomy were done. The second case, male 8 years old with bicycle accident, exploration showed single small perforation of sigmoid colon, resection anastomosis of segment of sigmoid colon with diverting transverse colostomy was done.

In our study, there were 3 cases of postoperative complications.

The first one was male child underwent splenectomy complicated with left subphrenic collection which necessitate reexploration and drainage.

The second one was girl 5 years suffered from biliary peritonitis after repair of liver tear.

The third case was operated on for multiple perforation of small intestine where resection anastomosis and simple closure of jejunal perforation was done and complicated by high intestinal fistula.

Incidence of postoperative complications was 3 from 60 (5%) with no mortality.

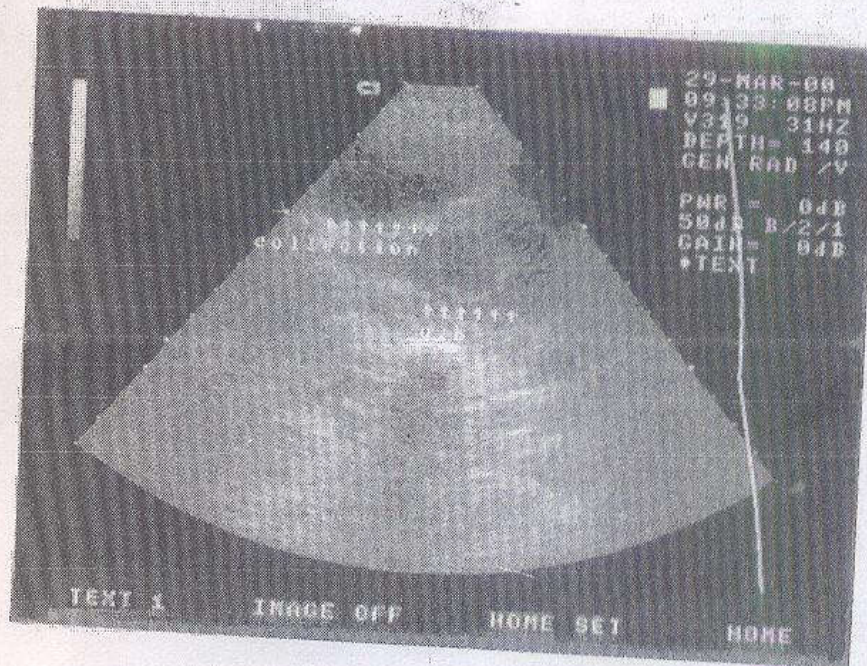


Fig. 1: Abdominal ultrasound showed minimal pelvic collection in a female child 13 years old with plant abdominal

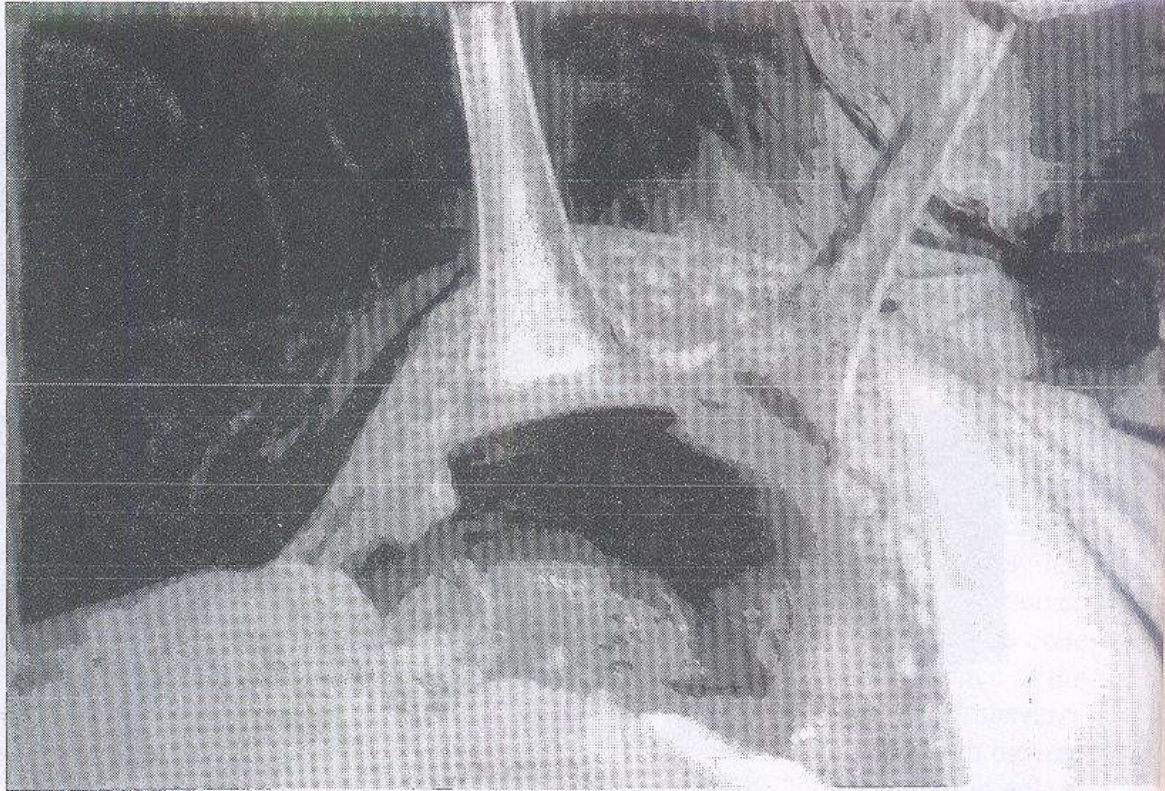


Fig. 2: Photographic picture for the same child at theatre showed splenic tear grade II with subcapsular haematoma at the lower pole.