

# TREATMENT OF ABDOMINAL SOLID ORGAN INJURIES IN CHILDREN

Alexandra Elena Popa<sup>1,2\*</sup>, C Tica<sup>2,3</sup>, FD Enache<sup>2,3</sup>

## Abstract

Trauma is the leading cause of death in pediatric patients between 1 and 18 years old. Abdominal lesions in children are mostly due to car accidents, falls from heights or sport-related injuries. In this study it is discussed the therapeutic management of abdominal parenchymal organ injuries in polytrauma in children. The material used for this 5 year retrospective statistical study represents two lots of polytrauma children who associate abdominal trauma and solid organ injuries, hospitalized in the Pediatric Surgery and Orthopedics Constanta County Hospital, one group treated surgically and the other group with conservative treatment. Conservative treatment methods are assessed and they prevailed before the surgical treatment.

**Key words:** children, trauma, conservative treatment, surgical treatment

## Introduction

Even today trauma represent the major cause of death in children [1]. Abdominal lesions due to car accidents, falls from heights or sport-related injuries cause a lot of damage and substantial mortality from injuries of the solid organs or hollow viscus [2,3].

Polytrauma is an emergency in Pediatric Surgery. The results are better if the lesion is determined faster and the therapeutic intervention is proper, but in order of priorities.

## Purpose

This study aimed the therapeutic management of abdominal parenchymal organ injuries in polytrauma in children. Conservative treatment methods are assessed and they prevailed before the surgical treatment.

## Material and method

The material used for this retrospective statistical study represents the two lots of polytrauma children who associate abdominal trauma, hospitalized in the Pediatric Surgery and Orthopedics Constanta County Hospital from January 2011 - December 2015. Of which:

- a group of 36 children who required abdominal surgery, of which only 27 had abdominal parenchymal organ injury;
- a group of 212 children remained under medical supervision for abdominal trauma and with the appropriate treatment of associated injuries.

## Results

Following the retrospective statistical study it was observed that out of 565 children with polytrauma between 2011-2015, only 248 associated abdominal trauma.

Concerning the total number of patients hospitalized in the Clinic of Pediatric Surgery during this time, the frequency of polytrauma who associates abdominal trauma is 1.19%.

The frequency is higher in urban than in rural areas (145 cases in urban areas, compared to 103 cases in rural areas) and in males.

As in adults, the first place in the etiology of trauma in children are road accidents, followed in frequency by falls from heights, play accidents or aggression [4].

Combined lesions amplifies the severity of the case (Fig. 1), thus associating a brain injury increases the risk of death of the child over 30% [5], and if the brain injury is accompanied by coma, risk increases to over 75%.

Studying the period in which occurred most polytrauma, we noticed that more than 50% of polytrauma occurred in during summer,

- when children are on holidays,
- when they are playing most of the time outside, without parent supervision.

In comparison, the distribution by age group showed the highest frequency was recorded equally in preschool and school age groups (11 cases), in the group treated surgically, but the dominant group was of school age (8-14 years) in the 212 children who were treated conservatively (93 cases).

The worst cases in terms of abdominal trauma, those who required surgery had a serious overall condition at admission in rate of 74.07%, and only 23.11% in those treated medically.

In both groups, the clinical picture was dominated by abdominal pain, diffuse or localized, but the association of meteorism and peritoneal inflammation was significantly lower in the case group treated medically.

Rectal exam, a compulsory examination in all the cases of abdominal trauma, showed a bulging and painful Douglas in all operated cases.

An important element of differentiation is also the present state of shock at admission, to varying degrees, as the state of coma (Table 1).

<sup>1</sup>Bucharest Emergency Clinical Hospital, UPU-SMURD Clinic

<sup>2</sup>“Ovidius” University Constanța – Faculty of Medicine, \*PhD Student

<sup>3</sup>Clinic of Pediatric and Orthopedic Surgery, „Sf. Apostol Andrei” Constanta Emergency County Clinical Hospital  
E-mail: alexandra\_elena1986@yahoo.com, tica.constantin@yahoo.com, dr.enache@chirurgiecopii.ro

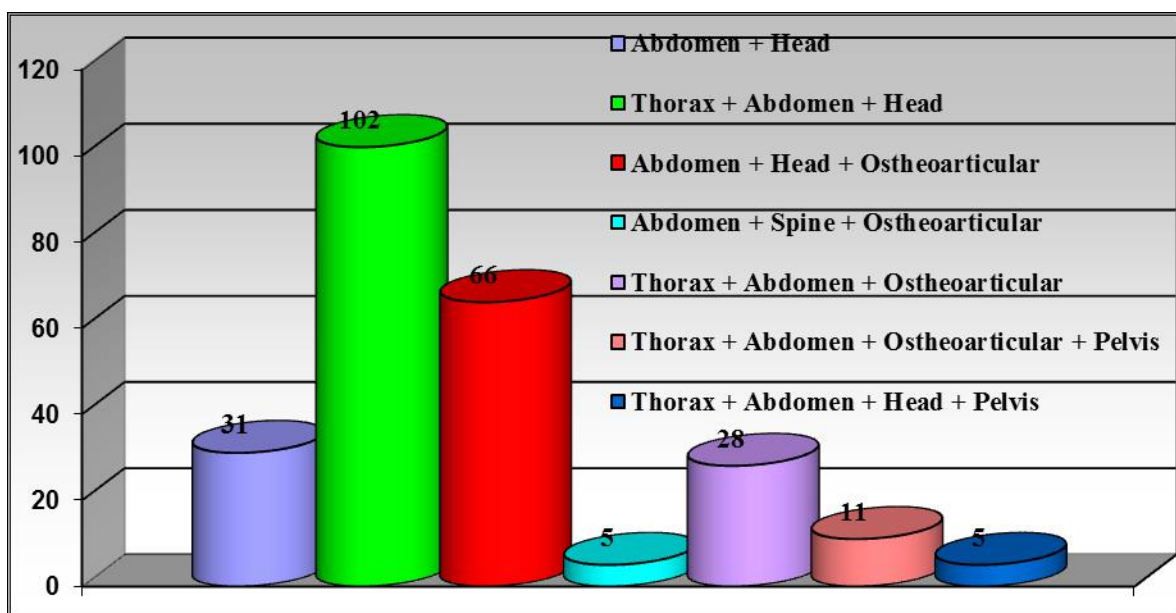


Figure 1 – Distribution of combined lesions in our study.

Table 1 – State of shock in our two groups of patients.

STUDY GROUP	SHOCK	COMA	TOTAL
Surgical	20	5	27
Conservative	45	19	212

The presence of hemodynamic instability was observed in 23 children in the operated group and in 45 children in the other group. This finding leads to the conclusion that the presence of hemorrhagic shock due to hemoperitoneum is a plus sign in guiding diagnosis and therapy for acute surgical abdomen.

However the presence of hypotension, tachycardia, tachypnoea was observed in different percentages in 212

children. Thus, we can think that the presence of associated fractures, the presence of chest and/or headtrauma lead to changes in vital signs, and any injury is an assault on the body.

As in literature, in this retrospective statistical study we found that the most common associations of abdominal injuries in polytrauma were head trauma, thoracic trauma and limb trauma (Fig. 2).

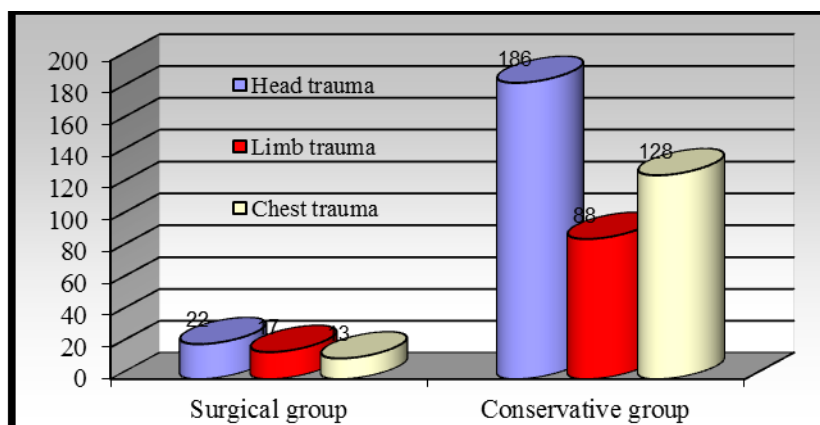


Figure 2 – Most common combined lesions in our study.

Thus it was found that chest trauma, although sometimes with fatal serious events was more frequent in children treated conservatively, outpacing limb trauma. Thoracic trauma, although several, have threatened life in just 20 cases, associating rib fractures, and requiring pleurotomy in 10 cases, with favorable outcome.

Diagnosis of acute surgical abdomen was difficult to assess in cases associated coma, especially two of them which had at clinical examination a normal abdomen. The stability of the patient is of paramount importance. Patients requiring transfusion of more than 40% of blood volume must be treated operatively [6].

For children receiving medical treatment, clinical picture was dominated by abdominal trauma in 90 cases by traumatic brain injury in 19 cases and trauma of the chest in 20 cases, and the other children was a combination of symptoms and clinical signs of multiple trauma, without a net dominance of any trauma.

On paraclinical state, although necessary for the evaluation of the lesions, we can say that surgical

emergencies were diagnosed with clinical and imaging (abdominal ultrasound, CT or MRI). CT has become the investigation of choice for the stable trauma patient [7]

Ein et al. said that non-operative management of haemoperitoneum depends on the results of CT scans. [8]. This investigation can discover specific organ injuries, and determine the severity of liver, spleen or kidney lesions, especially lacerations [9-12]. Indications for CT examinations include clinical suspicion of abdominal injury, unexplained blood loss, and unreliable physical examination (e.g. central nervous system damage or in very young children) [10-12].

Abdominal ultrasound, a higher indication in children than in adults, was conducted for the group treated medically, just to confirm parenchymal organ damage, and the confirmation was obtained by abdominal computed tomography. Ultrasonographic examination is used for detecting free fluid in the peritoneum [13,14].

Performed in emergency for all children: hemoglobin, hematocrit, white blood cell count, showed (Table 2):

Table 2 – Paraclinic exams in the study groups.

EXAM	CASES FOM SURGICAL GROUP	SURGICAL GROUP	CASES FROM CONSERVATIVE GROUP	CONSERVATIVE GROUP
Low hemoglobine	13	27	65	212
Low hematocrit	13	27	65	212
Leucocytosis	20	27	68	212

Particular importance was given to laboratory tests for the correct diagnosis of extra-abdominal associated lesions. Radiographs of those areas had priority in all cases.

In comatose children we've made cranio-cerebral tomography, for the etiological diagnosis of coma. We remind once again that the clinical abdominal picture is sometimes hidden by the comatose state.

Difficulties in diagnosis of abdominal trauma and injury of abdominal parenchymal organs in children, depends on body condition and severity of associated trauma.

Without being able to do comparison, analyzing the results of surgery, we found that there were dominated by splenic ruptures (15 cases), followed by liver lesions (8 cases), pancreatic lesions (8 cases) and ultimately renal lesions (6 cases).

Parenchymal organ injuries dominated, compared to the hollow viscus. Thus after surgery this state was found in 36 cases, and only 12 had injuries of the hollow viscus, of which 3 cases also associated parenchymal organ damage.

Rebalancing fluid, electrolyte and acid-base metabolism, although in general was performed in all patients equally, offered the following particular features:

- liver ruptures - requiring administration of protecting liver solutions Arginine, Aspatofort, Multiglutin.

- those who associate necrotic hemorrhagic pancreatitis - required a more intense metabolic rebalancing; 10% glucose solution, human albumin solution and Aminosteril, along with other crystalloid, colloid and electrolytes administered in much higher amounts.

Abdominal parenchymal organ ruptures prognosis associated to polytrauma, depends on several factors, among which are listed:

- multiple organ injuries;
- time elapsed from the accident;
- a lack of pre-hospital care or caregivers that don't come at the hospital with the child immediately after the accident [15];
- a lack of anesthetic-surgical comfort.

Evolution was generally favorable, demonstrating that an intensive treatment started as soon as possible, and properly administered and supervised, it has a key role in the prognosis of the case.

It is known that in children it is always preferred a conservative therapy initially, non interventional, hepatic and renal regeneration being proper.

As a result of the 27 cases in the group treated surgically, there were 3 deaths due to:

- association with other complications of abdominal and extra-abdominal injuries, being unable to rebalance the volume metabolism,

- a long period of time elapsed since the accident up to the treatment.

The percentage of deaths was 11.11%.

The prognosis depends on the same factors as in the group treated conservatively, but where there was no deaths.

Most were discharged in improved clinical status, being called to regular inspections required for preventing possible complications.

### Conclusions

Polytrauma child is in a very critical condition, shocked with complex pathophysiological disorders. Concerning the etiology of polytrauma which combines abdominal trauma in children, the first is road accidents, followed by falls from heights.

Removing the child from the accident site, delaying transport to a hospital with a minimized mobilization of the patient, the evaluation as soon as possible and providing first aid in order of priority, are vital for further prognosis of the child.

We always have tried conservative treatment, rebalancing vital functions and keeping them normal as possible, and we passed to surgery, when it appeared unstable hemodynamic signs of acute surgical abdomen even under correct intensive treatment.

Because traumatology is increasing compared to previous years, especially through increased traffic and hence the number of traffic accidents, aggression polytrauma on the body, also is increasing, we can say that although there has been notable progress in recent years in methods of diagnosis and therapy, multiple accidental trauma mortality is increasing.

### References

1. National Center for Injury Prevention and Control: Web-based Injury Statistics and Query System (WISQARS). Centers for Disease Control and Prevention. <http://www.cdc.gov/injury/wisqars>. [Accessed 21 December 2011]
2. Bixby SD, Callahan MJ, Taylor GA. Imaging in pediatric blunt abdominal trauma. *Semin Roentgenol* 2008; 43:72–82.
3. Gaines BA. Intra-abdominal solid organ injury in children: diagnosis and treatment. *J Trauma* 2009; 67:S135–S139.
4. Agram PF, Dunkle DE, Winn DG. Injuries to a sample of seatbelted children evaluated and treated in a hospital emergency room. *J. Trauma* 1987; 27: 58–64.
5. Du Priest RW Jr, Rodriguez A, Shatney CH. Peritoneal lavage in children and adolescents with blunt abdominal trauma. *Am. Surg.* 1982; 48: 460–2.
6. Umali E, Andrew HG, White JJ. Critical analysis of blood transfusion requirements in children with blunt abdominal trauma. *Am. Surgeon* 1992; 58: 736–9.
7. Rance CH, Bear JW. Computed tomography in the management of paediatric abdominal trauma. *Aust. N. Z. J. Surg.* 1980; 50: 506–12.
8. Ein SH, Shandling B, Simpson JS, Stephens CA. Non operative management of the traumatised spleen in children. *How Why? J. Pediatr. Surg.* 1978; 13: 117–9.
9. Kearney PA, Vahey T, Burney RF, Glaazer G. Computed tomography and diagnostic peritoneal lavage in blunt abdominal trauma: Their combined role. *Arch. Surg.* 1989; 124: 314–7.
10. Taylor FA, Fallat ME, Potter BM, Eichelberger MR. The role of computed tomography in blunt abdominal trauma in children. *J. Trauma* 1988; 28: 1660–4.
11. Taylor GA, Eichelberger MR. Abdominal CT in children with neurological impairment following blunt trauma. *Ann. Surg.* 1989; 210: 229–33.
12. Meredith JW, Trunkey DD. CT scanning in acute abdominal injuries. *Surg. Clin. North Am.* 1988; 68: 255–68.
13. Patrick DA, Bensard DD, Moore EE, Terry SJ, Karrer FM. Ultrasound is an effective triage tool to evaluate blunt abdominal trauma in the pediatric population. *J. Trauma* 1998; 45: 57–63.
14. Katz S, Lazar L, Rathus V, Erez I. Can ultrasound replace computed tomography in the initial assessment of children with blunt abdominal trauma. *J. Pediatr. Surg.* 1996; 31: 649–51.
15. Cooper A, Floyd T, Barlow B et al. Major blunt abdominal trauma due to child abuse. *J. Trauma* 1988; 28: 1483–7.

### Correspondence to:

Popa Alexandra Elena  
 Soseaua Stefan cel Mare Nr. 21  
 Bloc C2, Scara 1, Parter, Ap. 4  
 Sector 2, Bucuresti  
 Tel. 0720172615  
 E-mail: alexandra\_elena1986@yahoo.com