

# HOLLOW VISCUS INJURY IN CHILDREN – A PRACTICAL REVIEW

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## Abstract

Injuries in children have become a major cause of morbidity and mortality. The material used for this retrospective statistical study consists of a lot of 248 children, from whom 11 with hollow viscus lesions due to blunt abdominal trauma of different causes, hospitalized in the Clinic of Pediatric and Orthopedic Surgery of "St. Andrew" Emergency County Hospital of Constanta between 2011 and 2017. The methods of diagnosis and treatment were compared to those in the literature. We have studied over 150 articles from the literature using online search engines and PubMed, Med-Line, Clinical Key, Ovid databases.

Hollow viscus injuries are inconstant lesions after blunt abdominal trauma in children. A solitary lesion of an abdominal organ has a better prognosis than multiple injuries. The morbidity and mortality increase with more organ lesions. A severe prognosis is associated with brain injuries and coma.

**Keywords:** blunt abdominal trauma, abdominal injury, hollow viscus injury, children

## Introduction

Trauma is the main cause of morbidity and mortality in children [1]. Abdominal lesions represent 10% of the causes of death, the other 90% are due to road accidents, sports or child abuse [2]. Blunt abdominal trauma is the most frequent cause of injury in children due to traffic accidents [3]. Blunt trauma may be caused by direct blows, crushing lesions, blast and deceleration forces. Any abdominal organ may be affected without any superficial evidence of trauma [4]. Injury of the stomach, duodenum, small intestine, bowel or bladder are infrequent during blunt trauma of the abdomen. The interval of hollow viscus injury in children is between 1% to 8.5% [5,6]. In these cases there is always a delay in diagnosis which goes to an increase in morbidity and mortality, especially when a head trauma is associated [7].

## Purpose

A review of hollow viscus injury in children and a comparative study was carried out between the literature and the methods of therapeutic management used in the Clinic of

Pediatric and Orthopedic Surgery of "St. Apostol Andrei" Emergency Clinical County Hospital of Constanta. There were reviewed all cases of blunt and penetrating abdominal trauma with injury of hollow viscus like the stomach, duodenum, small intestine, bowel and urinary bladder.

## Material and methods

We have studied over 150 articles from the literature using online search engines and PubMed, Med-Line, Clinical Key, Ovid databases. Terms such as *abdominal trauma*, *blunt abdominal trauma*, *abdominal injury*, *hollow viscus injury* have been used. Scientific articles, controlled randomized trials, protocols, meta-analyses, and reviews have been checked. This review allowed us to make a synthesis of the methods of therapeutic management for hollow viscus injury in children used in the Clinic of Pediatric and Orthopedic Surgery of "St. Apostol Andrei" Emergency Clinical County Hospital of Constanta.

## Results

We've made a retrospective statistical study between 2011-2017 on a group of 248 cases of abdominal trauma in children between 0-18 years of age. From these cases, 11 of them had an associated hollow viscus injury.

The study was conducted using data from the observation sheets and the operator protocol attached to them.

The history, symptoms, and clinical signs of peritoneal irritation syndrome, and possibly internal bleeding (in case of lesional associations of parenchymal organs), are directed to the diagnosis. Abdominal pain, central symptom, muscle contracture, pathognomonic sign or the most prominent form of muscle contraction were reported in 11 patients, evoking peritoneal irritation syndrome.

The etiological spectrum of the cases investigated in this study can be summarized as follows:

- road accidents – 5 (45%);
- falls from heights – 4 (36%);
- direct blow – 2 (19%).

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As in adults, first place in the etiological causes of children trauma is occupied by road accidents, followed in frequency by falls from heights and direct blow (play accidents or aggression).

Given the fact that road traffic accidents have the highest share as the cause of trauma in general and abdominal injuries in particular, there was a predominance of urban patients. Globally, out of the 11 cases of hollow viscus injuries, 8 (73%) came from urban areas and 3 (27%) from rural areas. In this group 7 cases were boys and 4 cases were girls.

Distribution by age group shows that the most affected age groups are those of pre-school and school children when they are no longer under the direct supervision of parents, being more exposed to accidents of any kind (Table 1).

Of the 11 cases studied, 55% were solitary hollow viscus injury, and 45% of cases were associated with other lesions, abdominal or extra-abdominal. The distribution by age groups from this point of view is presented in Figure 1.

The frequency of associated lesions in the 11 cases studied is as follows (Table 2).

Table 1. Age group distribution of hollow viscus injuries.

Age group	1-3 years	4-6 years	7-10 years	Over 10 years
No. of Cases	1	2	8	0



Figure 1. Lesions by association and age group.

Table 2. Associated lesions.

Type of lesion	No. of cases
Cranio-cerebral	4
Facial	1
Pelvis fractures	2
Limb fractures	3
Solid organ injuries	5

Associated trauma increase the severity of the case, so the combination of a cranio-cerebral lesion increases the risk of death of the child to over 30%, and if the brain injury is accompanied by coma, the risk increases to over 75% [7].

Of the 11 children with abdominal trauma that had cavity organ injuries, 5 were hospitalized in a

haemorrhagic shock and two other with coma of varying degrees, the rest not having any of the above.

In abdominal trauma with hollow viscus involvement, the site of the lesions was as follows (Figure 2).

The treatment used in these 11 cases was mainly conservative, with local sutures, with only one segmentary colectomy.

Abdominal CT scan correlated with clinical signs and paraclinical tests oriented the diagnosis and so, the time elapsed until surgical abdominal exploration was as short as possible (Table 3).

Postoperative evolution was favorable for healing in most cases, except for 2 cases, with severe injury which went to exitus in spite of all treatment efforts.

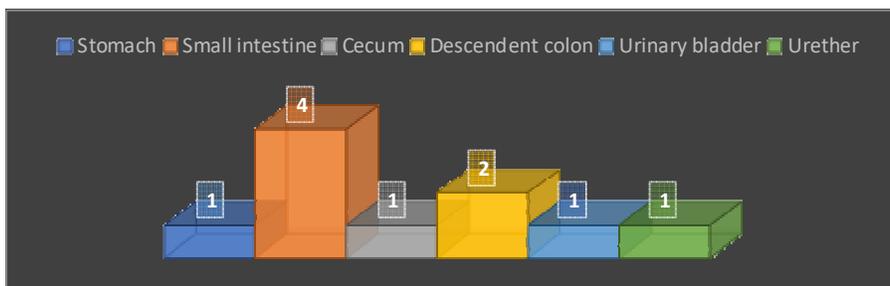


Figure 2. Hollow viscus injuries.

Table 3. Time elapsed until surgery.

Time	2 hours	3 hours	5 hours	6 hours	24 hours	48 hours
No. of cases	1	1	2	2	2	1

**Discussions**

Trauma represents the main cause of death among patients aged 12–45 years [8]. Injuries of hollow viscus organs after blunt abdominal trauma is an infrequent diagnosis [9].

There are three main mechanisms that can cause distinct type of lesion to hollow organs [10]:

- a crush injury that occurs as the stomach, jejunum, ileum, or transverse colon is compressed violently against the spine. After this type of injury may appear hematomas, lacerations, or partial or complete transections;
- shoulder-belt and seat-belt injuries are patterns of burst injury that occurs when rapid compressive forces are applied to a filled and distended hollow organ, without direct mechanical compression;
- Rapid acceleration–deceleration may cause shear injury of an organ that is tethered at one end, such as the ligament of Treitz, ileocecal region, or rectosigmoid junction.

In case of blunt abdominal trauma, lesions of solid organs are diagnosed quickly because of hemodynamic instability, but injuries of hollow viscus are not usually discovered unless there are clear signs like peritonitis and hemodynamic instability due to sepsis [11-13]. A delay in diagnosis and in treatment may increase morbidity and mortality [12].

*Stomach*

There was one stomach injury caused by car accident that also caused liver haematoma and spleen laceration. The patient needed laparotomy and suture of the perforation and packing of the spleen. Good prognosis.

*Small intestine*

There were 4 cases of perforation of the small bowel. All except one were on the anti-mesenteric border. All of them were victims of motor vehicle accidents as passengers. One of them was brought to the resuscitation room in coma with GCS 3, multiple organ failure and exitus in less than 24 hours after admission. The other three were treated by laparotomy and direct suture of hte lesions, good prognosis after surgery. Broad-spectrum antibiotics were administered postoperatively.

*Bowel*

There were three patients with lesions of the bowel, one of the cecum – a serosal haematoma, which was treated conservatively and two patients with lesions of the descendent colon, one was a serosal haematoma and the other a small lesion, under 1 cm which was sutured.

In colon injuries, particularly if there is a delay, for sure there is a significant fecal contamination. Colostomy is necessary with a defunctionalized distal mucous fistula or a Hartmann pouch. If isolated colon injuries occur and are repaired early, with irrigation of the colon, bowel anastomosis, and antibiotherapy, avoid the complications

after surgery [10]. Broad-spectrum antibiotics and Metronidazole for anaerobic germs were administered after surgery. Good prognosis after surgery.

*Urinary bladder and urether*

One patient had urinary bladder lesion and one patient a rupture of the urether. The urether was ruptured at about 4 cm down to the pelvis of the kidney, with associated kidney dilaceration. A nephrectomy was mandatory. Good prognosis after surgery. The patient with urinary bladder trauma had also liver and spleen laceration, with massive haemoperitoneum, brain injuries and multiple fractures of the limbs, GCS 3, with exitus within a few hours after admission,

**Conclusions**

Hollow viscus injuries are inconstant lesions after blunt abdominal trauma in children. For a good prognosis, the diagnosis and therapy must be quick in order to avoid the dissemination of bacetria in the peritoneal cavity and also the dissemination of urine in case of urinary tract lesions, which may go to uroperitoneum.

Ultrasonography and CT scan after abdominal injuries are the imagistic methods of choice. They must be correlated with clinical signs and paraclinic tests.

A solitary lesion of an abdominal organ has a better prognosis then multiple injuries. The morbidity and mortality increase with more organ lesions. A severe prognosis is associated with brain injuries and coma.

**References**

1. Pediatric Trauma. In Advanced Trauma Life Support for Doctors 6th edition. American College of Surgeons, Chicago; 1997:355-376.
2. Castellanos A, De Diego E, Fernández I, Trugeda M. Evaluación inicial y tratamiento del traumatismo abdominal infantil. Bol Pediatr 2001; 41: 106-114.
3. Cusher A, Giles G. R., Moosa A. R: Essential Surgical Practice; Butterworth International Fifth Ed. 1998:263-304.
4. Pervez A, Bashir A, Cheema MU, Rauf A. Blunt Trauma Abdomen - Incidence of abdominal visceral injuries. PJMHS vol.2, no.3 Jul – Sep 2008; 85-88.
5. Cauty TG, Cauty TG, Brown C: Injuries of the gastrointestinal tract from blunt abdominal injuries in children. J Trauma 1999, 46:234-40.
6. Albanes CT, Meza MP, Gardner J, Smith SD, Rowe MI, Lynch JM: Is computed Tomography a useful adjunct to the clinical examination examination for the diagnosis of paediatric gastrointestinal perforation from blunt abdominal trauma. J Trauma 1996, 403:417-21.
7. Holland AJA, Cass DT, Glasson MJ, Pitikin J: Small bowel injuries in children. J Paediatr Child Health 2000, 36:265-269.
8. TraumaRegisterDGU(®). 20years of trauma documentation in Germany- Actual trends and developments. Injury. 2014;45 Suppl 3:S14-9.
9. Fakhry SM, Brownstein M, Watts DD, Baker CC, Oller D. Relatively short diagnostic delays (<8 hours) produce morbidity and mortality in blunt small bowel injury: an analysis of time to operative intervention in 198 patients from a multicenter experience. J Trauma. 2000;48(3):408-14.
10. Coran AG, et al. Pediatric Surgery 7th Ed. 2012, vol. I, 20:305.
11. Swaid F, Peleg K, Alfici R, Matter I, Olsha O, Ashkenazi I, et al. Concomitant hollow viscus injuries in patients with blunt hepatic and splenic injuries: An analysis of a National Trauma Registry database. Injury. 2014;45(9):1409-12.
12. Pekkari P, Bylund PO, Lindgren H, Öman M. Abdominal injuries in a low trauma volume hospital--a descriptive study from northern Sweden. Scand J Trauma Resusc Emerg Med. 2014;22:48.
13. Arikanoglu Z, Turkoglu A, Taskesen F, Ulger BV, Uslukaya O, Basol O, et al. Factors affecting morbidity and mortality in hollow visceral injuries following blunt abdominal trauma. Clin Ter. 2014;165(1):23-6

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