

MANAGEMENT OF ABDOMINAL GUNSHOT WOUNDS IN CHILDREN - CASE REPORT

Dumitru Marius Danila^{1,2}, Cristina Chelmu-Voda², Liliana Baroiu^{3,4}, Costin Silvia Aura⁵, Cristina Mihaela Marin⁶, Sergiu Chirila⁷, Ioana Anca Stefanopol^{1,2}

¹ Clinical Surgical Department, Faculty of Medicine and Pharmacy, "Dunărea de Jos" University of Galati, Romania

² Department of Pediatric Surgery, "Sfantul Ioan" Clinical Emergency Hospital for Children, Galati, Romania

³ Clinical Medical Department, Faculty of Medicine and Pharmacy, "Dunărea de Jos" University, Galati, Romania;

⁴ Infectious Diseases Department, "Sf. Cuvioasa Parascheva" Clinical Hospital of Infectious Diseases, Galati, Romania;

⁵ "Sfantul Ioan" Clinical Emergency Hospital for Children, Galati, Romania

⁶ Emergency Department, "Sfantul Ioan" Clinical Emergency Hospital for Children, Galati, Romania

⁷ Faculty of Medicine, University "Ovidius" of Constanta

Ioana Anca Stefanopol

email: ancaflorea1969@yahoo.com

ABSTRACT

Introduction: One of the causes of mortality in pediatric population is penetrating abdominal injuries, which can affect several organs. Among all types of abdominal trauma, in gunshot wounds a good prognostic requires prompt diagnosis and treatment.

In Romania, there is no specific database on gunshot injuries in the pediatric population, but from various sources, it was found that there are 3 cases (1 case of abdominal injury caused by gunshot in rural area and 2 cases of head and cervical spine injury due to gunshot that took place in urban area).

Case presentation: A 13-year-old boy is brought to the emergency care unit with a penetrating gunshot wound by ricochet in the left lower abdominal quadrant. Abdominal computed tomography revealed abdominal wall discontinuity in the left iliac fossa with oblique and posterior trajectory and a foreign body in the peritoneal cavity measuring 19/7 mm. Intraoperatively, the projectile was found in the sigmoid colon.

Conclusion: Penetrating gunshot wounds in pediatric population need adequate investigation and prompt diagnosis despite hemodynamic stability at presentation. Successful management of such a patient depends on the accuracy of the surgical intervention as well as the existence of a multidisciplinary medical team, which helps to prevent significant complications, including death.

Keywords: abdominal injuries, gunshot, management

Introduction

Gun violence places high-income countries (USA) in first place in terms of death rates from this cause (1). In Romania, there is no specific database on gunshot injuries in the pediatric population, but from various sources, it was found that there are 3 cases, 1 case of abdominal injury caused by gunshot in a rural zone and 2 cases of head and cervical spine injury due to gunshot that took place in front of a high school in Ploiesti city. In all of 3 cases the injuries were not fatal and were accidental (2).

The pediatric population, with a 20% mortality rate, contributes significantly to the

health care burden, even though the majority of gunshot wound victims are adults. One cause of mortality in pediatric patients is penetrating abdominal gunshot injuries, which can affect multiple organ systems (3-5). The mortality rate increases with age. Shooting violence ranks 3rd and 4th for the most expensive etiology and hospitalization, having an important economic impact (6).

We present the case of a 13-year-old boy accidentally injured by a ricochet gunshot. The projectile was found in the sigmoid colon.

Case report

A 13-year-old boy struck by a ricochet bullet was brought to the emergency care unit

of the Clinical Emergency Hospital for Children “Sf Ioan” Galati. The patient was a collateral victim of an altercation between law enforcement agents and offenders. At presentation, Glasgow Coma Scale 15, heart rate 107 beats per minute, blood pressure 116/72mmHg and 100% oxygen saturation. The gunshot wound was in the left lower abdominal quadrant, measuring 2 cm/1,5 cm, with irregular burned margins, and minimal bleeding. Palpatory, the abdomen was tender in the left iliac fossa, without peritoneal irritation. An uretral catheter was placed, and normal urine was observed.



Figure 1. Abdominal CT

The abdominal CT scan without contrast showed a continuity solution at the level of the anterior abdominal wall in the left iliac region at the lateral edge of the rectus abdominis, with an oblique trajectory towards the posterior (Figure 1, Figure 2). A 19/7 mm metallic foreign body was located intraperitoneally, posterior to rectus abdominis, and anterior to the sigmoid wall. Lung bases and the abdominal and retroperitoneal organs had normal CT appearance, as well as the main abdominal vessels. There was no free fluid in the peritoneal cavity.

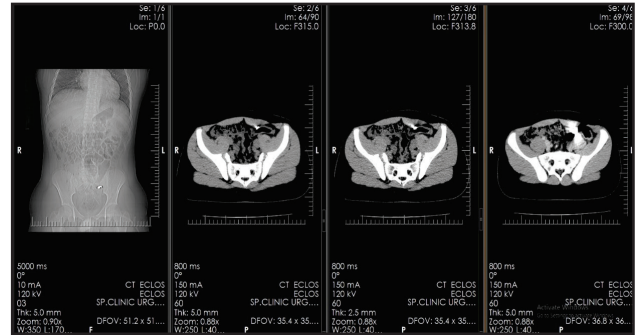


Figure 2 CT appearance

He was transferred to the operating unit, and under spine anesthesia it could be seen an oval wound in the left iliac fossa with tissue destruction of the entire abdominal wall, with ragged edges, circular marginal thermal burn lesions, and black millimetric foreign bodies spread in all the abdominal wall layers. The incision circumscribed the entry opening and was extended cranio-caudally. Colonic content was present in minimal quantity, and the sigmoid colon exploration discovered a 2.5/1 cm perforation in the mesocolic region of the middle sigmoid with anfractuous margins (Figure 3).

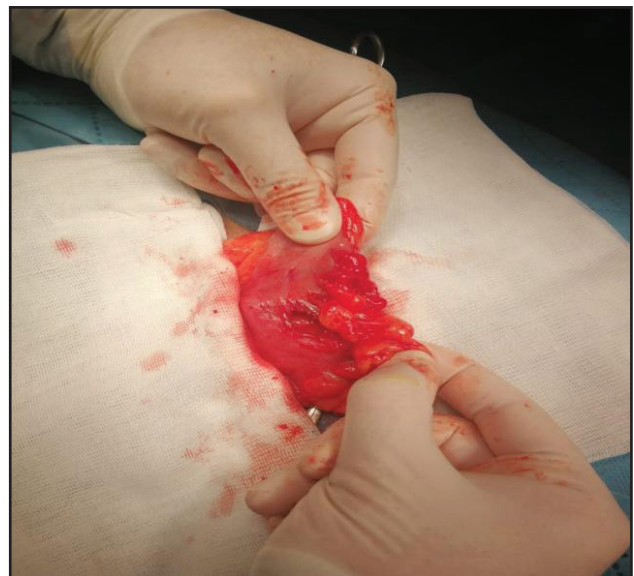


Figure 3 Intraoperative image – sigmoid colon exploration

Digital and instrumental exploration of the sigmoid colon found at about 10 cm from the gunshot opening towards the rectum (Figure 4), a 9 mm caliber bullet with no missing component elements (Figure 5).

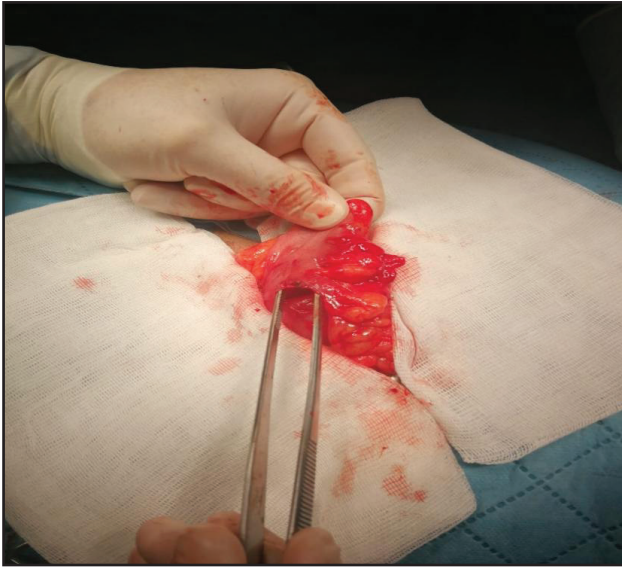


Figure 4 Instrumental exploration of the sigmoid colon



Figure 5 Bulle fragment

After exploring the contents of the peritoneal cavity, we proceeded to the excision of the ischemic anfractuous margins, and we performed a 2-layer transverse colo-colic anastomosis, peritoneal cavity lavage and the Douglas pouch drainage. We excised the injured tissues of all abdominal wall layers and placed a supra- and sub-aponeurotic parietal drain (Figure 6).



Figure 6 Drainage tubes

Postoperatively, the evolution was uneventful, good clinical and paraclinical parameters and resumption of intestinal transit after 24 hours. Intra-abdominal drainage tube was suppressed 5 days postoperatively, and in the 10th postoperative day the patient was discharged.

Discussion

There are 2 types of firearm injuries, high-velocity and low-velocity injuries. Low-velocity firearm injuries are usually attributed to civilians (caused by handguns) and do not exceed 600 meters per second. On the other hand, injuries caused by hunting or military weapons, exceed 600 meters per second and are much more serious than the former. The tissue destruction is directly proportional to the size of the projectile. In the case of the liver or bone wounds, that lack elasticity, the tissues remain destroyed compared to the skin, skeletal muscles, and blood vessels, which return to their original shape, although they are pushed sideways by the projectile (7).

The degree of energy transfer influences the severity of tissue trauma (8) and depends on factors, such as the projectile speed at the impact, the characteristics of the affected tissue, the caliber of the projectile, the entry profile and the distance inside the body (9). Bullets with soft hollow points usually stop in a tissue or leave the body with low kinetic energy (10) and are usually used by police officers.

Although in the past laparotomy was performed for every patient with abdominal wound, complications due to unnecessary

laparotomy led to the a more conservative management (11, 12). For hemodynamically stable patients, FAST and/or CT scan may be used for diagnosis (13), although these should not exclude exploratory laparotomy (14). In hemodynamically unstable patients or those showing signs of evisceration or peritonitis, there is a general consensus that laparotomy is mandatory (13).

Minimal soft tissue injury present a minimal risk of infection and can be treated with superficial excisional debridement, sterile dressings, with or without antibiotics (15). Severe soft tissue injuries require more aggressive care, with excisional debridement, excision of wound edges to healthy tissue, removal of foreign bodies (clothing, gunpowder), and even second-look surgery (16). Primary wound closure is not recommended in both cases.

Several studies showed that antibiotics, either orally or intravenously, did not influence the rate of wound infection by low-energy shooting (17). The only risk factors that influenced healing were delay or lack of an appropriate treatment (18). On the other hand, intestinal injuries or injuries with moderate or severe soft tissue destruction require intravenous antibiotherapy (19, 20). Broad-spectrum prophylactic antibiotics are recommended in a single dose preoperatively for patients with penetrating abdominal wounds (21). For lesions with moderate tissue destruction, may be used a first-generation cephalosporin, or penicillin in case of gross contamination; gentamicin may be added for severe lesions (22). In the case of our patient, who had a lesion with intestinal communication, the recommended antibiotherapy included Meropenem 500 mg/8h and Vancomycin 1 g/12h for 9 days associated with Metronidazole 500 mg/8h for 5 days.

Conclusion

Penetrating gunshot wounds in pediatric population need adequate investigation and prompt diagnosis despite hemodynamic stability at presentation. Successful management of such a patient depends on the accuracy of the surgical intervention as well as the existence of

a multidisciplinary medical team, which helps to prevent significant complications, including death.

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