

Transfixing abdominal gunshot wound without intra-abdominal lesions: A case report

Axler Jean Paul (✉ jeanpaulaxler@hotmail.com)

Hospital of the State University of Haiti <https://orcid.org/0000-0003-1490-605X>

Nelle-Ange Mele

Quisqueya University

Ricardo Arens Jean Medeus

Hospital of the State University of Haiti

Weber Erne Shooles Raphael

Hospital of the State University of Haiti

Novensky Aurelien

Hospital of the State University of Haiti

Case Report

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Abstract

Background Abdominal gunshot trauma is considered the third leading cause of death in the USA and is responsible for more than 90% of deaths among young people aged 15 to 24. It leads to multi-systemic organ damage, shock, and infection.

Case presentation A 20-year-old male alcohol and tobacco user with no relevant health history was admitted at Hôpital de l'Université d'Etat d'Haïti, in the emergency Surgery Department for an abdominal bullet wound. The initial clinical examination was unremarkable except for the presence of hemorrhagic lesions. A few hours later, the patient became diaphoretic, complained of abdominal pain. In view of his rapidly developing condition, he was prepared for the operating room. An exploratory laparotomy was performed, in which 100 cc of blood was found effusing into the abdominal cavity, without any intraperitoneal visceral damage. Systematic exploration showed retroperitoneal hematomas in zone II, where a wound in the psoas muscle was found on the posterior left, in the path of the exit wound of the projectile. Bone splinters were also present on the right in the path of the entrance wound, indicating a fracture of the iliac bone.

Conclusion This case reminds us about the uncertain trajectory of projectiles in abdominal gunshot wounds and the possible lesions to which one is exposed, and that despite the apparent hemodynamic stability exploratory laparotomy still has its place where medical imaging technology is not available.

Background

Nowadays, the incidence of abdominal gunshot wounds is increasing significantly in the civilian population (1). In the United States, every week there are more than 1,565 cases of violence and 645 cases of gunshot death (2). Abdominal gunshot wounds is the third leading cause of death (2–4) and are responsible for more than 90% of deaths among young people aged 15 to 24 (2). Due to their effects, mainly those related to their high kinetic energy, bullets cause damage not only locally but also in the surrounding tissues, depending on their trajectories in the abdomen (permanent cavity effect) and their blast effect (temporary cavity effect) (5). Generally, abdominal gunshot trauma leads to multi-systemic organ damage, shock, and infection (2,3). Exploratory laparotomy is traditionally considered mandatory for the diagnosis and treatment of patients with gunshot wounds to the abdomen. It is necessary to exclude intra-abdominal injuries possibly caused by the projectile (6,7). If the projectile penetrates the body, the damage is considered a penetrating injury. If there is an exit wound that accompanies the entry wound, it can be considered a transfixing abdominal wound (2). We present a case of a transfixing abdominal gunshot wound where the laparotomy strangely found no damage inside the abdominal cavity.

Case Presentation

A 20-year-old male, alcohol and tobacco user with no relevant health history was admitted at the Hospital of the State University of Haiti (HUEH), in the emergency Surgery Department for an abdominal bullet wound 3 hours after the event. Vital signs upon admission indicated a stable patient with a blood pressure of 120/80 mm Hg, a heart rate of 89 beats/min, a temperature of 36.2 degrees Celsius, and an oxygen saturation of 94% on room air. He was given 2 liters of crystalloid, 0.9% NaCl, 16 mg of slow IV dexamethasone, and then a pressure dressing on the bleeding lesions. The initial clinical examination was unremarkable except for the presence of hemorrhagic lesions, one about 1 cm on the posterior axillary line at two finger spans of the right posterior superior iliac crest, considered to be the entry wound of the projectile, and another hemorrhagic lesion of 3 cm on the posterior axillary line 4 cm above the left posterior superior iliac crest, the exit wound. The patient's blood workup was normal, with a hemoglobin level of 11.3 g/dl, a white blood cell count of 7,800 mm³, a creatinine level of 1.1 mg/dl, a urea level of 30.6 mg, a serum potassium level of 3.5 mEq/L, and a sodium level of 137.4 mmol/L.

A few hours later, the patient became diaphoretic, complained of abdominal pain, and showed new vital signs: a blood pressure of 157/78 mm Hg, a heart rate of 57 beats/min, a respiratory rate of 20 cycles/min, a temperature of 37 degrees Celsius, and an oxygen saturation of 98% on ambient air. He was then administered 1 g of ceftriaxone, 75 mg of diclofenac, and 40 mg of IV omeprazole, followed by 1,000 cc of lactated Ringer at 20 drops/min. In view of his rapidly developing condition, he was prepared for the operating room. An exploratory laparotomy was performed, in which 100 cc of blood was found effusing into the abdominal cavity, without any intraperitoneal visceral damage. Systematic exploration showed retroperitoneal hematomas in zone II (right and left). As a result, the Told's fascia was detached, then passed into the retroperitoneal zone, where a wound in the psoas muscle was found on the posterior left, on the path of the exit wound of the projectile. Bone splinters were also present on the right in the path of the entrance wound, indicating a fracture of the iliac bone. The pre-renal Gerota fascia was opened to explore the kidneys; both were intact. The wound was sutured with a Vicryl 2.0 taper, and the bullet exit wound was sutured internally. Peritoneal lavage was performed with NaCl solution 0.9%, followed by fasciorrhaphy with a Prolene 1.0 taper, and finally the abdomen was closed. After 48 hours of post-op observation, the patient had a good evolution, which justified his exeat.

Discussion

Typically, abdominal gunshot wounds cause significant damage to the abdominal cavity. However, due to the high intensity kinetic energy of the projectiles, the trajectory is often unpredictable, and internal organs may be affected (2,8). The organs most likely to be affected are the small intestine and large intestine at rates of 50% and 40%, respectively; the liver and intra-abdominal vessels are often also injured at rates of 40% and 30%, respectively (2,4). During exploration by laparotomy, no intra-abdominal injury was found; despite the trajectory of the projectile horizontally crossing the abdomen, the projectile then passed retroperitoneally. Let us remind that the retroperitoneal space is located behind the peritoneal cavity and contains visceral and vascular structures of the gastrointestinal, genitourinary, and musculoskeletal systems (9). Sevilanov classified the peritoneal region into 3 zones: zone 1 or the centromedial zone; zone 2 or the perirenal or flank zone, and zone 3 or the pelvic zone (10,11) (Figure 1).

The incidence of vascular lesions in the retroperitoneal zone in bullet wounds is estimated at 25% (9,12); therefore, a retroperitoneal evaluation of all zones is systematically recommended in cases of retroperitoneal hematoma (12). Although the main causes of retroperitoneal hematoma are damage to the large vessels of the abdomen—such as the aorta, inferior vena cava, celiac axis, and the superior or inferior mesenteric arteries (13)—no damage to the large vessels was found in our patient, despite the path of the projectile. This may explain the patient’s hemodynamic stability upon admission. Only wounds of the psoas and iliac crest were identified, despite the fact that the projectile passed through zone 2, where both kidneys are exposed; no renal lesions were found.

Conclusion

It is difficult to find an explanation for the minimal degree of damage observed in this patient when the projectile crossed the entire abdomen horizontally. Imaging exams should guide clinical management even before the exploratory laparotomy; unfortunately, this was not the case due to the lack of infrastructure in the surgery department. However, this case tells us about the uncertain trajectory of projectiles in abdominal gunshot wounds and the possible lesions to which one is exposed, and that despite the apparent hemodynamic stability exploratory laparotomy still has its place where medical imaging technology is not available.

Abbreviations

HUEH: Hospital of the State University of Haiti.

IV: intra vascular.

Declarations

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None

Authors’ contributions

Axler Jean Paul: design, drafting, review of literature, Novensky Aurelien: collection of data; Nelle-Ange Mele, Ricardo Arens Jean Medeus, Weber Erne Shooles Raphael: critical revision. All authors read and approved the final manuscript.

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All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate

We got approval from the Surgery staff in the teaching Hospital of the State University of Haiti.

Consent for publication

Participants signed informed consents prior to the study case report.

Competing interests

All authors declare that they have no competing interest.

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Figures

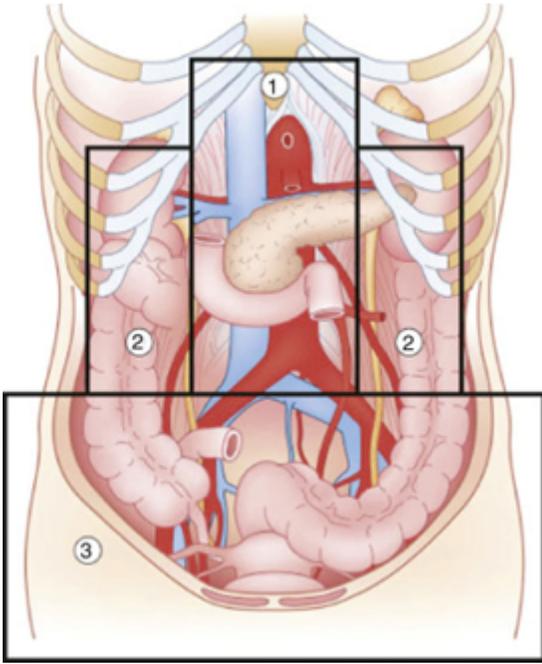


Figure 1

Main zones of the retroperitoneal space (11)