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## Case Report

## A through-and-through abdominal gunshot wound without intra-abdominal damage: A case report

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## ABSTRACT

Abdominal gunshot trauma is the third leading cause of death and is responsible for more than 90% of deaths among people ages 15 to 24 years old. It can cause multi-system organ damage, shock, and infection. We present a case of a through-and-through abdominal bullet wound where laparotomy exploration has found nothing as damage inside the abdomen.

## Introduction

Incidence of abdominal gunshot wounds is increasing significantly in civilian population [1]. In the United States, there are more than 1.565 cases of violence and 645 gunshot-related deaths every week [2]. Abdominal gunshot wounds are considered as the third leading cause of death [2–4] and are responsible for more than 90% of deaths among young people ages 15 to 24 years old [2]. Due to high kinetic energy, bullets cause damage not only locally, but also in the surrounding tissues. Direct damage from bullets is called the permanent cavity effect, and their blast effect is called the temporary cavity effect [5]. Often, abdominal gunshot trauma leads to multi-system organ damage, shock, and infection [2,3]. Exploratory laparotomy is considered standard-of-care for diagnosis and treatment of patients with abdominal gunshot wounds. It is necessary to rule out possible intra-abdominal injuries caused by the projectile [6,7]. If the projectile penetrates the body, the damage is considered a penetrating trauma. If there is an exit wound in addition to the entry wound, it is considered a through-and-through abdominal wound [2]. We present a case of a through-and-through abdominal gunshot wound in which laparotomy exploration found no damage inside of the abdominal cavity.

## Case description

A 20-year-old man with a history of alcohol and tobacco use but otherwise no significant medical history was admitted to the State University Hospital of Haiti...s Emergency Surgery Department for an abdominal bullet wound 3 h after sustaining the trauma. Vital signs on admission depicted a stable patient with a blood pressure of 120/80 mm Hg, heart rate of 89 beats/min, temperature of 36.2 °C, and oxygen saturation of 94% on room air. He was administered two liters of 0.9% NaCl crystalloid, 16 mg of IV dexamethasone to reduce the risk of inflammation and swelling in case of a possible lesion of the spinal cord, and a pressure dressing over the wounds. Initial evaluation was remarkable only for his two wounds which were hemorrhaging. The entry wound was about 1 cm in

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length over the posterior axillary line at two finger spans to the right posterior superior iliac crest. The exit wound was 3 cm in length over the posterior axillary line, approximately 4 cm superior to the left posterior superior iliac crest.

Laboratory values were within normal limits with a hemoglobin level of 11.3 g/dL, white blood cell count of 7800 mm<sup>3</sup>, creatinine level of 1.1 mg/dL, urea of 30.6 mg, serum potassium of 3.5 mEq/L, and sodium of 137.4 mmol/L. Several hours later, the patient became diaphoretic, developed worsening abdominal pain, and had vital sign changes. He had a blood pressure of 157/78 mm Hg, and heart rate of 57 beats/min. He was administered 1 g of ceftriaxone, 75 mg of diclofenac, and 40 mg of IV omeprazole. This was followed by 1000 cm<sup>3</sup> of Lactate Ringer at 20 drops/min.

Due to his changing symptomatology, he was taken for an exploratory laparotomy. Approximately 100 cm<sup>3</sup> of blood was found in the abdominal cavity without any identifiable visceral damage. Systematic exploration revealed retroperitoneal hematomas in zone two (right and left). As a result, Toldt's fascia was detached and passed into retroperitoneal space, where a wound was found on the left posterior aspect of the psoas muscle, aligning with the trajectory of the exit wound. Bone splinters were also present adjacent to the entrance wound, indicating a fracture of the iliac bone. The pre-renal Gerota's fascia was opened to explore the kidneys, and both were intact. The entrance wound was closed with Vicryl 2.0 on a taper needle, and the exit wound was sutured internally. Peritoneal lavage was performed with normal saline. A fasciorrhaphy was then performed with a 1-0 Prolene on a taper needle, and the abdomen was closed. After 48 h of post-op observation, the patient was progressing appropriately and was discharged.

## Discussion

Abdominal gunshot wounds can cause significant damage in the abdominal cavity. However, due to the high kinetic energy of these 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, occurring in 50% and 40% of cases, respectively. The liver and intraabdominal vessels are injured in 40% and 30% of cases [2,4]. In this case, no intraabdominal injury was found during exploratory laparotomy despite the trajectory of the projectile which crossed the abdomen before travelling into the retroperitoneal space. Due to the risk of involvement of the spinal cord, IV dexamethasone was administered at presentation to prevent inflammation and edema.

The retroperitoneal space is located behind the peritoneal cavity and contains the visceral and vascular structures of the gastrointestinal, genitourinary, and musculoskeletal systems [9]. Sevilanov classified the peritoneal region into three zones: zone one known as the centromedial zone; zone two known as the perirenal or flank zone, and zone three known as the pelvic zone [10,11]. (See Fig. 1.)

The incidence of vascular involvement in the retroperitoneal zone due to penetrating gunshot wounds is estimated at 25% [9,12]; therefore, a systematic evaluation of all retroperitoneal zones is recommended if a retroperitoneal hematoma is identified [12].

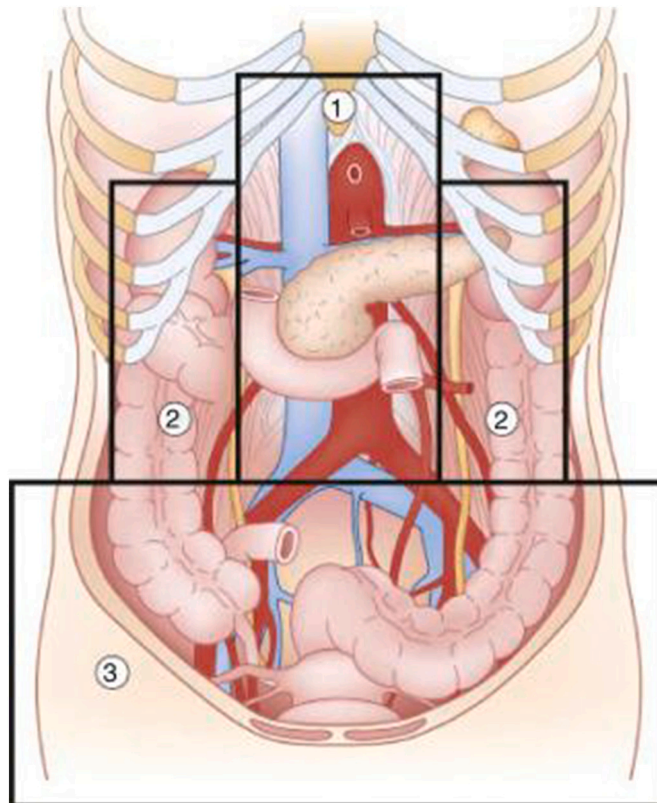


Fig. 1. Description of the main retroperitoneal zones and his structures [11].

Although the main causes of retroperitoneal hematomas 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 large vessels was found in our patient despite the path of the projectile. We only identified wounds of the psoas and iliac crest even though the projectile passed through zone two, which includes the kidneys.

## Conclusion

Little damage was identified via exploratory laparotomy despite the projectile's path across the abdomen. Ideally, imaging exams would be available to inform the decision whether to pursue operative management. Due to the lack of imaging equipment in the surgery department, this was not possible, and full evaluation of injuries required operative exploration. This suggests that due to the uncertain trajectory of projectiles in abdominal gunshot wounds, exploratory laparotomy has a role in evaluating even stable patients in settings where imaging technology is not readily available.

## Statement of ethics approval

This study has been approved for publication by the head of the Surgery of the State University Hospital of Haiti as it is a teaching hospital.

## Statement on participant consent

The patient consented to participate and publish the relevant information about the case, and information on identity was kept confidential.

## Declaration of competing interest

The authors report no conflicts of interest for this work.

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