



Case Report

Penetrating abdominal aortic gunshot injury: successful surgical removal of an intravascular projectile

Lesión penetrante de aorta abdominal por proyectil de arma de fuego: manejo quirúrgico de un proyectil intravascular con resultado exitoso

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Abstract

Introduction: firearm trauma is a growing cause of morbimortality in our environment, especially in young population. Abdominal wounds by projectile represent a critical entity. Approximately 50 % of these injuries involve small intestine and colon; 30 and 40 %, liver and vascular structures, and up to 25 % involve retroperitoneal structures. Vascular injury is one of the most lethal, with mortality rates ranging from 90 to 100 %.

Case report: a 20-year-old male was admitted with a gunshot wound in the lumbar region. Computed tomography angiography revealed a bullet lodged in the infrarenal abdominal aorta, with partial thrombosis and retroperitoneal hematoma. Mid laparotomy was performed with drainage of zones I and II, and repair of the posterior aortic face. The projectile was removed in a controlled manner by arteriotomy under lightning. He required massive transfusion protocol and vasoactive support, with favorable evolution and early discharge.

Discussion: gunshot wounds are a challenge. In this context, it is essential to establish immediate behavior and adopt an approach oriented to damage control. The use of available imaging, as the patient's stability allows, can be decisive in the patient's survival.

Keywords:

Vascular system injuries. Wounds gunshot. abdominal aorta.

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Resumen

Introducción: el trauma por arma de fuego es una causa creciente de morbimortalidad en nuestro medio, especialmente entre la población joven. Las heridas abdominales por proyectil representan una entidad crítica. Aproximadamente el 50 % de estas lesiones comprometen al intestino delgado y al colon; un 30 y un 40 %, al hígado y a las estructuras vasculares y hasta en un 25 % están afectadas las estructuras del retroperitoneo. La herida vascular es de las más letales, con tasas de mortalidad que oscilan entre el 90 y el 100 %.

Caso clínico: varón de 20 años que ingresó por herida de bala en la región lumbar. La angiotomografía computarizada reveló un proyectil alojado en la aorta abdominal infrarrenal, con trombosis parcial y hematoma retroperitoneal. Se realizó laparotomía media con drenaje de zonas I y II y reparación de la cara posterior aórtica. El proyectil se retiró de forma controlada por arteriotomía bajo rayos. Requirió protocolo de transfusión masiva y soporte vasoactivo, con evolución favorable y alta precoz.

Discusión: las heridas por arma de fuego son un desafío. En este contexto, es fundamental establecer una conducta inmediata y adoptar un enfoque orientado al control de daños. El uso de imágenes disponibles a medida que la estabilidad del paciente lo permita puede ser determinante en la supervivencia del paciente.

Palabras clave:

Lesiones del sistema vascular. Herida por arma de fuego. Aorta abdominal.

INTRODUCTION

In the context of trauma, penetrating injuries to major vessels represent between 5 % and 25 % of cases treated in emergency departments. Penetrating abdominal aortic trauma caused by firearms is less common but carries a high mortality rate if immediate intervention is not performed (1). The most frequently injured vascular structures are those in the venous territory, while the highest-risk injuries involve the aorta and renal arteries, followed by the retrohepatic vena cava. Among these, the infrarenal location may, in certain cases, offer a therapeutic window for surgical control, with lower mortality rates vs suprarenal or renal injuries (92 % vs 66 %) (2).

The management of these patients represents a major challenge for the surgical team, as multiple factors directly influence prognosis, including age, physiologic status at presentation, initial systolic blood pressure, number of transfusions in the first 24 hours, and associated injuries. We present the case of a young patient with a penetrating infrarenal aortic injury caused by a firearm projectile, successfully treated surgically with an uneventful early discharge.

CASE REPORT

A 20-year-old man presented to the emergency department with a gunshot wound to the lumbar region. On arrival, he was alert, hypertensive, nor-

mocardic, and not requiring supplemental oxygen. An E-FAST ultrasound turned out negative for hemoperitoneum or free fluid. Abdominal computed tomographic angiography (CTA) revealed a metallic projectile lodged in the infrarenal abdominal aorta, with extensive endoluminal thrombus and a retroperitoneal hematoma without active extravasation, with a trajectory through the canal and L3-L4 disc (Fig. 1).

An emergency surgical intervention was undertaken. A supra- and infraumbilical midline laparotomy was performed with retroperitoneal exposure and drainage of a contained hematoma in bilateral zones I and II. Proximal control of the infrarenal aorta and distal control of both common iliac arteries were obtained using vascular loops. A posterior aortic wall injury involving approximately 30 % of the circumference was identified and repaired with primary 5-0 polypropylene suture, ensuring adequate inflow and backflow. Intraoperative radiography was used to localize the projectile, which was found within the aortic lumen. A controlled anterior aortotomy was performed for extraction, followed by closure with 5-0 polypropylene reinforced with 6-0 polypropylene. During dissection, ligation of the inferior mesenteric artery was required (Fig. 2). Surgical time lasted approximately 3 hours, with an estimated blood loss of 4 liters. Massive transfusion protocol activation, vasoactive support, and fluid resuscitation were necessary. Spine surgery evaluation determined that the vertebral injury was mechanically stable without surgical indication. The patient was transferred

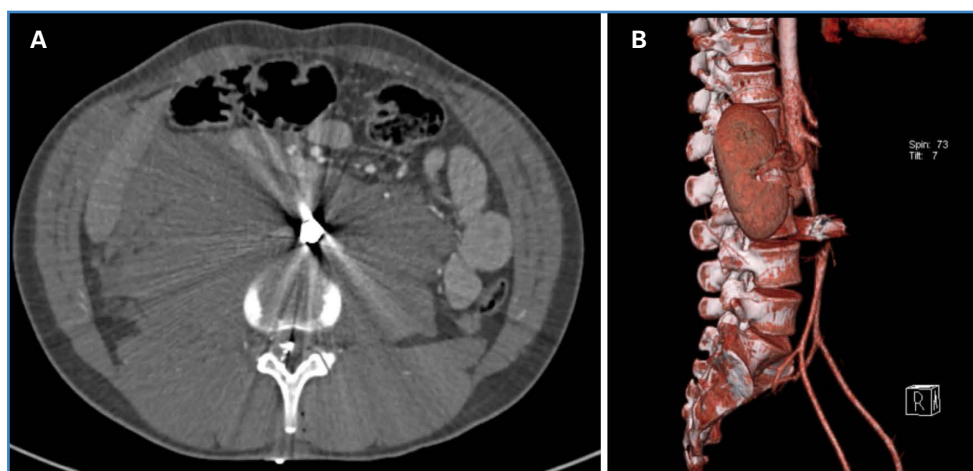


Figure 1. A. CTA showing the projectile lodged at the infrarenal aorta and bullet fragments in the canal and disc space. B. 3D reconstruction demonstrating adequate distal flow.

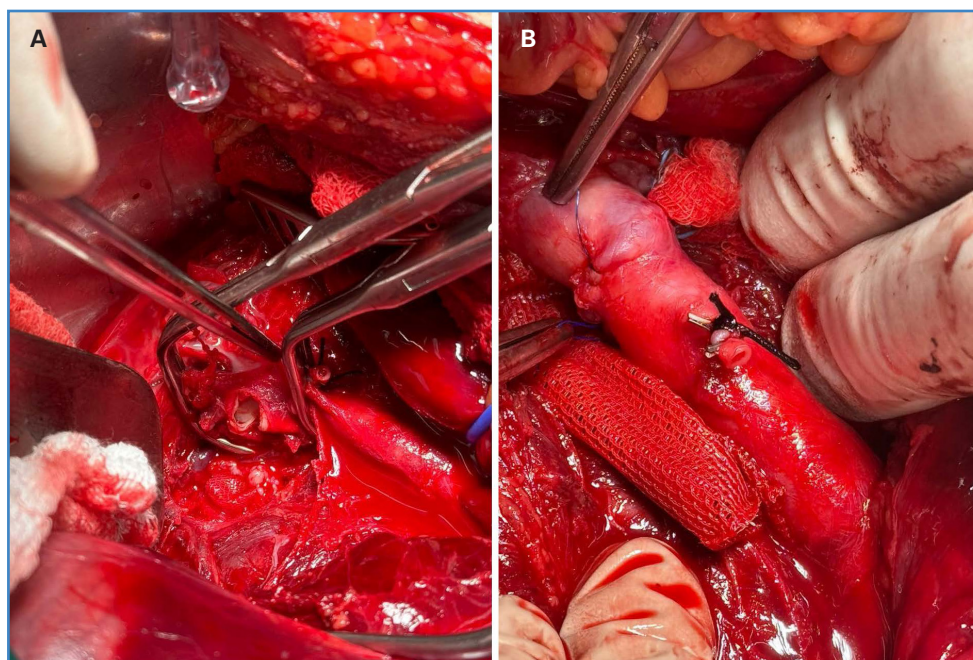


Figure 2. A. Posterior aortic wall injury. B. After posterior wall repair and inferior mesenteric artery ligation.

to the intensive care unit, where he progressed favorably, was extubated the next day, and discharged 4 days after surgery without major complications.

DISCUSSION

Penetrating abdominal aortic trauma is a highly complex surgical emergency with high associated mortality. Presentation may range from hemodynamic stability to profound hypovolemic shock.

Initial resuscitation significantly affects survival in patients with abdominal vascular injury. Aggressive crystalloid administration has been shown to be det-

rimental, whereas blood-product-based resuscitation is preferred. In this context, massive transfusion protocols—which may vary by institution—are defined as the administration of blood products in a 1:1:1 ratio (packed red blood cells, fresh frozen plasma, and platelets), exceeding 10 units of red blood cells within 24 hours or > 3 units within the first 3 hours after arrival. Their implementation has been shown to prevent the lethal triad of acidemia, hypothermia, and coagulopathy (3,4).

In this case, the patient's hemodynamic stability allowed CTA, which rapidly localized the projectile and characterized the vascular injury. Unlike imaging of solid or hollow organs, which demonstrates high

sensitivity and specificity, vascular injury is detected in only 10 %-20 % of cases. Such injuries generally appear as signs of transection or hematoma. Hematomas, although indirect signs, are more sensitive but less specific indicators of vascular trauma (5).

The location of the injury predicts mortality. Infrarenal aortic injuries have a reported mortality of 63 % vs 77 % for suprarenal injuries and 91 % for subdiaphragmatic injuries (6). In this case, the infrarenal location allowed anterior laparotomy with direct retroperitoneal exposure. The surgical strategy included proximal and distal vascular control, hematoma drainage, retroperitoneal exploration, and direct repair, followed by controlled extraction of the projectile with successful vascular stabilization.

Despite the severity of the injury, rapid intervention, appropriate resuscitation, and multidisciplinary management resulted in a favorable outcome in a young and previously healthy patient. This case illustrates the importance of timely decision-making and a damage-control-oriented surgical approach.

Penetrating abdominal aortic injuries can be successfully managed in centers equipped with advanced imaging, experienced surgical teams, and critical care support.

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