Case Report

# Conservative Management of Duodenal Trauma Caused by a Firearm Projectile in a 24-year-old-man: a Case Report.

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## ABSTRACT

Duodenal trauma caused by a firearm projectile is rare but is associated with high morbidity and mortality. Traditional management suggests referral or resection; however, in selected patients, preservation is feasible. We present a case of a complex duodenal injury managed with primary repair in a 24-year-old male who was admitted in hypovolemic shock due to a gunshot wound to the right hemiabdomen. Upon admission, he was in poor general condition, drowsy, and disoriented (Glasgow Coma Scale 10/15). Vital signs: BP 90/60 mmHg, HR 110 bpm, RR 22 bpm, $SpO_2$ 92%, weight 54 kg (BMI 18.6 kg/m²). Following ATLS stabilization, an emergency laparotomy was performed, revealing 1,000 cc of hemoperitoneum, a laceration in the fourth portion of the duodenum (compromising 50% of the circumference), and gastric and intestinal injuries. Primary duodenal repair was performed in two stages, including resection and jejuno-jejunal anastomosis, gastric suturing, and drainage, without pancreaticobiliary diversion. The postoperative course was uneventful, with no leaks, dehiscences, or infections. The patient began oral intake at 48 hours and was discharged on the sixth day. At the 7-month follow-up, the patient remains asymptomatic. This aligns with the current “less is more” trend in duodenal trauma, prioritizing primary repair over complex procedures. Primary repair of Grade III injuries, After damage control in stable patients, it is safe and effective. This case highlights the importance of careful patient selection and meticulous technique to prevent morbidity and mortality. The results support the current approach of surgical simplicity, avoiding procedures such as pyloric exclusion or duodenojejunostomies, whose benefits are unclear and which increase morbidity.

**Keywords:** Duodenum, general surgery, weapons, wounds and Injuries.

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# Introduction

Penetrating abdominal trauma caused by gunshot wounds represents a major cause of morbidity and mortality among young patients. According to data from the Pan American Health Organization (PAHO), 14,427 deaths among young people resulting from firearm-related assaults were reported in Latin America in 2014, corresponding to a rate of 14.3 deaths per 100,000 young people. Of these, 80% of all homicides among individuals aged 10–19 years in the region were committed with firearms, predominantly affecting males, whose mortality rate reached 26.5 per 100,000. Among females, however, the possibility that most of these deaths involved femicide cannot be ruled out.

Furthermore, 1,828 firearm-related deaths of undetermined intent were recorded, particularly among victims from Venezuela and Argentina, along with 284 firearm-related deaths during legal interventions, highlighting the disproportionate lethality of police actions involving young people. After adjustment, the mortality rate increased to 16.4 deaths per 100,000 young people resulting from firearm-related violence perpetrated by third parties in Latin America. These findings underscore the need for gun control and disarmament policies, as well as initiatives aimed at reducing stigma and promoting youth development programs to address the structural conditions that perpetuate and render invisible the phenomenon known as "armed youth homicide" in the region [1].

Although the colon and small intestine are the most frequently affected abdominal organs, duodenal injuries are uncommon, accounting for less than 5% of penetrating abdominal trauma cases [2,3].

Their retroperitoneal location and close anatomical relationship with the pancreas and biliary tree make their management a surgical challenge, with reported mortality rates ranging from 10% to 30% [2,4].

The management of these injuries has evolved toward strategies aimed at minimizing anastomotic leakage and mortality, including damage control surgery and gastrointestinal diversion. Nevertheless, primary repair, although controversial in complex injuries, has been demonstrated to be a safe and effective option in hemodynamically stable patients with localized injuries [5,6]. Accordingly, we present the case of a patient with a Grade III duodenal injury who was successfully managed with primary repair, highlighting the factors that contributed to a favorable outcome.

# Case presentation

This is a 24-year-old Venezuelan male patient, born and residing in Palo Gordo, employed as a machinery operator. He had no relevant medical, surgical, or allergy history, but reported tobacco use (one pack per day) and occasional alcohol consumption. He also referred weight loss of 10 kg over the preceding six months. His relatives reported marijuana use, although this was not confirmed. The patient presented with a gunshot wound to the right flank and right iliac fossa. On admission, physical examination revealed poor general condition, somnolence, and disorientation (Glasgow Coma Scale score: 10/15). Vital signs were: blood pressure (BP) 90/60 mmHg; heart rate (HR) 110 beats/min; respiratory rate (RR) 22 breaths/min; oxygen saturation ($SpO_2$) 92%; and body weight 54 kg (body mass index [BMI] 18.6 kg/m²). The skin was pale and diaphoretic. The abdomen was flat with a 1-cm puncture wound in the right flank and right iliac fossa, painful to general palpation, and decreased bowel sounds.

The patient was managed according to Advanced Trauma Life Support (ATLS) protocols [7]. Persistent hemodynamic instability indicated the need for emergency exploratory laparotomy.

The initial clinical assessment suggested penetrating abdominal trauma caused by a gunshot wound. Exploratory laparotomy revealed the following findings: 1,000 mL of hemoperitoneum; a nonpulsatile, nonexpanding Zone I retroperitoneal hematoma; a 1-cm perforation of the posterior gastric wall with active bleeding (Grade II); two small bowel perforations and a laceration involving more than 50% of the bowel circumference (Grade III); and a critical duodenal injury consisting of two 0.2-cm perforations in the fourth portion of the duodenum, with leakage of intestinal contents (Grade III according to the American Association for the Surgery of Trauma [AAST] classification) [8].

Following the hemoperitoneum aspiration and the nature of the localized duodenal injury, subsequent hemodynamic stabilization of the patient supported a damage control approach prioritizing repair over derivation, in accordance with current guideline recommendations [4,9]. The surgical procedures performed were: exploratory laparotomy (supraumbilical and infraumbilical midline incision, followed by systematic exploration of the abdominal cavity, which confirmed the aforementioned findings. The gastric injury was managed with primary two-layer closure using 2-0 polyglactin 910 sutures. The affected small bowel segment was resected, followed by an end-to-end jejunojejunal anastomosis using 3-0 polyglactin 910 sutures **(Fig. 1)** [1]. Regarding the duodenal injury, primary repair of both perforations in the fourth portion of the duodenum was performed using a two-layer suture technique with 3-0 polyglactin 910 sutures, consisting of full-thickness Connell-Mayo stitches followed by an outer inverting Lembert layer **(Fig. 2)** [2]. The descending colon injury was managed with primary repair. The procedure was completed with partial omentectomy, copious peritoneal irrigation, placement of two surgical drains (one in the right paracolic gutter and the other in the left iliac fossa) and a nasogastric tube. Broad-spectrum antibiotic therapy was initiated according to institutional protocols. Analgesia, intravenous fluid therapy, and initial parenteral nutritional support were provided.

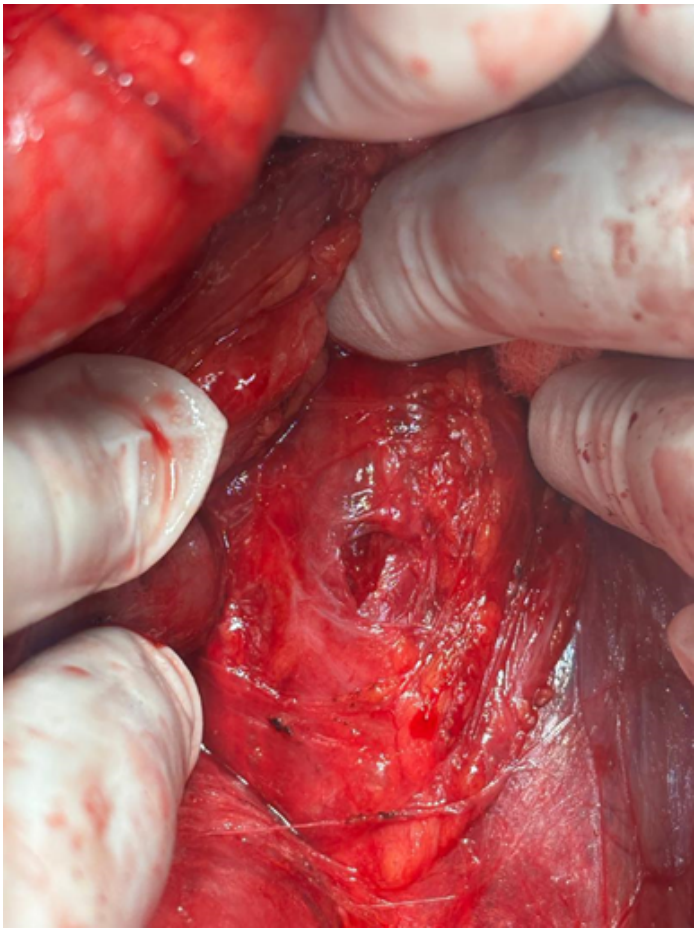
**Figure 1: Resected surgical specimen.**



*It shows the segment of the small intestine affected following intestinal resection. Significant ischemic changes are evident in the tissue, indicative of severe vascular trauma. The specimen includes the corresponding mesentery and the hemostatic clamp used during the procedure.*

During the immediate postoperative period, the patient was admitted to the intensive care unit (ICU) for the first 48 hours for hemodynamic and respiratory monitoring. The nasogastric tube and surgical drains remained in place and functional. His clinical course was favorable, with no infectious complications or clinical or laboratory evidence of wound dehiscence or anastomotic leakage. The nasogastric tube was removed after 48 hours, and oral intake was initiated with clear liquids, subsequently progressing to a regular diet, in accordance with clinical nutrition and enhanced recovery recommendations [10,11].

**Figure 2: Detail of duodenal injury.**



*Intraoperative view of the fourth portion of the duodenum following thorough exploration of the abdominal cavity. One of the two parietal perforations caused by the firearm projectile is clearly visible. The surgeon's surgical gloves gently manipulate the surrounding tissues to expose the injury prior to primary repair.*

The patient was discharged on postoperative day 6 in good general condition, following hematological assessment. His surgical wounds were healing appropriately, and he was tolerating oral intake without difficulty. At discharge, the patient expressed satisfaction with his rapid recovery and resumed his daily activities without limitations. At the seven-month follow-up, he reported being asymptomatic and having achieved adequate weight gain.

# Discussion and conclusions

This case illustrates the successful management of complex duodenal trauma using a conservative surgical approach.

The decision to perform primary repair of a duodenal injury involving 50% of the circumference (Grade III according to the AAST classification) [8] remains controversial, as traditional literature has advocated more complex procedures, such as duodenal diversion (pyloric exclusion) or duodenojejunostomy, to minimize the risk of anastomotic leakage [2,4]. However, recent studies, particularly those addressing damage control surgery, have demonstrated that primary repair is feasible and safe in selected patients [5,6]. The key factors that supported this approach in our patient were: 1) hemodynamic stabilization following hemorrhage control; 2) the absence of pancreatic contusion or common bile duct injury; and 3) the presence of well-vascularized, viable duodenal wound edges [5,6]. Current trauma management generally incorporates Focused Assessment with Sonography for Trauma (FAST) to identify free intraperitoneal fluid. Diagnostic peritoneal lavage (DPL) remains an alternative diagnostic method; however, its use has largely been superseded by the widespread adoption of FAST [12].

The application of the damage control concept in this case, involving rapid and effective repair of the injuries to achieve hemorrhage control and limit contamination, was fundamental to the favorable outcome [9]. The decision to avoid biliopancreatic diversion in a young patient without comorbidities likely contributed to reduced postoperative morbidity by preventing complications associated with these procedures, such as anastomotic ulcers and dumping syndrome [13]. The favorable postoperative course, characterized by early initiation of oral intake and hospital discharge on day 6, supports the effectiveness of this strategy. Our findings are consistent with case series reporting low leakage rates (less than 5%) when primary repair is performed by experienced surgeons under optimal conditions [14]. In this case, surgical drain placement represented an additional precautionary measure, allowing for the evacuation of any potential postoperative fluid collections.

This approach is consistent with the contemporary surgical philosophy of favoring simplicity whenever feasible, often summarized in the literature as "less is more" [6,15]. This trend, supported by international guidelines such as those issued by the World Society of Emergency Surgery (WSES) [4], suggests that primary repair, even in intermediate-grade injuries, should be considered the preferred approach whenever local tissue conditions and the patient's systemic status allow it. This report has the inherent limitations of a clinical case. The management decision was individualized and cannot be generalized to all duodenal injuries. Nevertheless, it highlights the importance of meticulous intraoperative assessment and the application of updated surgical principles. Primary repair of a Grade III duodenal injury may be a successful management strategy in hemodynamically stable patients without significant associated pancreatic or biliary injuries. This case contributes to the evidence supporting conservative surgical management of duodenal trauma, provided that proper patient selection and meticulous surgical technique are performed. These findings support the application of the "less is more" approach in the management of complex duodenal trauma.

## Ethical Considerations

The authors declare that all procedures involving human participants in this study were conducted in accordance with the ethical standards of the institutional Research Committee and the 1964 Declaration of Helsinki and its subsequent amendments. Written informed consent was obtained from the patient for publication of this case report, ensuring the anonymization of personal data and the protection of the patient's identity throughout the documentation process.

## Conflict of interest

The authors declare the absence of conflict of interest.

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