

This section features outstanding photographs of clinical materials selected for their educational value or message, or possibly their rarity. The images are accompanied by brief case reports (limit 2 typed pages, 4 references). Our readers are invited to submit items for consideration.

Penetrating injury to the inferior vena cava

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A 21-YEAR-OLD MALE PATIENT was admitted to the emergency department after a gunshot wound entering the right flank. The patient was in shock, with a blood pressure of 80/40 mmHg, 130 bpm heart rate, and a Glasgow Coma Scale of 10. We calculated an Injury Severity Score of 25 and Revised Trauma Score of 6,171. His breath sounds were normal. His initial base deficit was -12.4 . No exit wound was visualized. The patient was taken to the operating room and underwent laparotomy, with a midline incision made. At celiotomy, a moderate amount of free intraperitoneal blood was evacuated. At this time, a large, expanding zone I retroperitoneal hematoma was found; exploration was performed after medial rotation of the right colon and duodenum. A large amount of blood was again evacuated. The bullet caused a large laceration in the infrarenal segment of the inferior vena cava (IVC; Fig); vascular control (distal and proximal) was obtained with the use of Satinsky clamps. Surprisingly, no other injuries were observed. Because the patient was critically ill,

and primary repair was not amenable (because of the large gap), ligation of the IVC was performed. Fluid resuscitation and blood transfusion after surgery occurred in the intensive care unit. The patient died 20 hours later from the effects of prolonged shock and coagulopathy.

DISCUSSION

Injuries to the IVC are one of the most challenging injuries encountered by trauma surgeons and are mostly caused by penetrating trauma. Fortunately, it is rare because of its protection by several intra-abdominal organs and musculoskeletal structures, and is found in less than 4% of all trauma laparotomies.^{1,2} Despite this, rates of mortality have been described as high as 59%.^{1,3,4} These rates have not improved over the past years, even with advances in prehospital trauma support and surgical therapy.^{2,4} A possible explanation for this is that these patients who would have died at the trauma scene now end up accounting for hospital deaths because they get to trauma centers moribund. Uncontrollable hemorrhage and/or associated abdominal injuries and the “triad of death” are considered responsible for mortality.^{1,2}

Ligation and primary suture are the most common surgical therapies applied. Grafts are rarely used and should be avoided. The optimal treatment is primary suture repair, but this is not always possible due to the patient’s critical condition or complex injuries.² This is demonstrated in a recent study in which patients requiring ligation were

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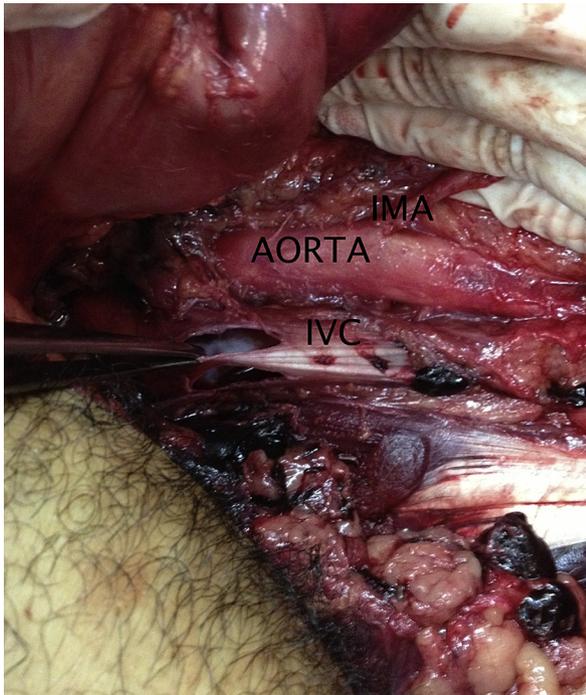


Fig. Penetrating injury to the Inferior Vena Cava (gunshot wound). IVC: Inferior Vena Cava; IMA: Inferior Mesenteric Artery.

much sicker at admission (greater Injury Severity Score, increased transfusion requirements, and lower systolic blood pressure) and had a greater overall mortality rate compared with the repair group.³ The authors state that the procedure itself cannot be held responsible for the deaths but rather it is the patient's conditions that lead to the decision to ligate the IVC. Navsaria et al¹ did not find a substantial difference in the outcome of survivors and nonsurvivors in regard to surgical management. In their study, 63% of the patients were submitted to ligation. Similarly, Sullivan et al³ did not find differences in the outcome of patients who underwent infrarenal IVC ligation; 43% of their patients were treated by this modality.

Patients treated by ligation may experience lower-limb swelling, which is usually self-limited and responds well to the use of elastic stockings and leg elevation.¹ Fasciotomies should be

considered after ligation of the IVC when high compartment pressures are obtained or clinically incompressible compartments are identified.³ Patients can be monitored, and delayed fasciotomies should be performed in an on-demand basis, with close follow-up.^{1,3} Prophylactic fasciotomies are not necessary. A study of infrarenal IVC ligation with an average 42-month follow-up did not demonstrate lower-extremity edema or dysfunction in these patients.³ Primary suture in injuries to the suprarenal IVC is preferred, although ligation is a life-saving and acceptable modality.^{1,3} Sullivan et al³ described a survivor who presented with transient hemodialysis-dependent renal dysfunction at 1 month and needed bilateral lower-extremity fasciotomies. At discharge and at 18 months follow-up, he had normal renal function and no limb edema.

Retrohepatic IVC injuries are the most challenging to treat because of their anatomical position. This also explains the greater rates of mortality associated with it (compared with the other sections of the IVC), because exposure is difficult. Primary repair should be attempted. In cases in which this is not amenable, an atricaval shunt can be used.¹⁻³

Several factors have been related to deaths in IVC injuries. Mortality is greater in patients admitted with shock, initial base deficit, and coagulopathy.¹⁻⁴ The association of shock and base deficit can lead to a mortality rate of more than 80%.⁴

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