Successful damage control of complex vascular and urological gunshot injuries

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Damage control options for complex vascular injuries are limited to either vessel ligation or temporary intravascular shunting. Although most vessels may arguably be ligated, associated morbidity can be significant. Temporizing intravascular shunt insertion is therefore preferable if a delayed repair is possible.

Case report

An otherwise healthy 26-year-old man presented with hemodynamic instability after sustaining 4 automatic handgun bullet wounds. At emergent laparotomy, he was noted to have 2 L of intraperitoneal blood, as well as a large left-sided, zone 2/3 retroperitoneal hematoma. After achieving global vascular control via mobilization of the ligament of Treitz and clamping of the infrarenal aorta, the retroperitoneal hematoma was opened. Injuries included a 6-cm long 85% transection of the left external iliac artery (just proximal to the inguinal ligament), a complete transection of the left ureter, and anterior and posterior lacerations of the intraperitoneal rectum with minimal contamination. Although proximal and distal control of the external iliac injury was achieved early via selective clamping, the patient continued to be intermittently unstable. Transfusion requirements included 12 units of packed red blood cells and 4 units of platelets. The patient was also coagulopathic (international normalized ratio = 1.9), hypothermic (35.1°C) and acidotic (pH = 7.14). Based on these extensive physiological derangements, as well as the complex nature of his injuries, damage control principles were employed.

The external iliac artery injury was temporized by intravascular insertion of a 16F silastic tube. A second silastic tube was inserted into the proximal ureter and exteriorized as a ureterostomy through a separate skin incision. The rectal lacerations were repaired primarily, and the abdominal skin was sutured as a temporary closure. The patient had good peripheral limb pulses on Doppler ultrasound. He returned to the operating room after 24 hours of physiological optimization in the intensive care unit (ICU). Definitive repairs included insertion of a synthetic interposition graft in the external iliac artery, reimplantation of the ureter into the bladder (ureterneocystostomy), insertion of a suprapubic catheter, fasciotomies of the lower limb and complete closure of the abdominal wall. Transfusion requirements totalled 18 units of packed red blood cells and 6 units each of platelets and fresh frozen plasma. The patient was transferred out of the ICU on postoperative day 4. His hospital stay totalled 25 days, when he was discharged to a long-term care facility for ongoing rehabilitation. Although the vascular status of his limb was excellent, the leg's motor function was still improving secondary to a concurrent femoral nerve injury.

Discussion

Damage control surgery employs temporary measures to address traumatic injuries in patients with extreme metabolic derangements.[1] The primary aim is to create a stable anatomic environment that will permit definitive repair to be postponed until more survivable physiological conditions can be achieved.[2] For vascular injuries, damage control options include vessel ligation and intravascular shunting.[3] In this patient, immediate definitive repair of both the vascular and ureteric injuries would not have been feasible in the setting of prolonged hemorrhagic shock with severe coagulopathy, hypothermia, acidosis and intestinal spillage. Further, ligation of the external iliac artery would have resulted in limb ischemia and possibly limb loss. Intravascular shunt insertion has been previously reported, however, it is more commonly described in the femoral vessels[4,5] and never with concurrent urological damage control procedures. Although the use of shunts for 24 hours or more has been reported,[4] shunts should ideally be removed as soon as the patient is physiologically optimized and able to tolerate a formal vascular repair. Concurrent intravenous heparinization is optional because most shunts remain patent in high-flow vessels. This case

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illustrates that multiple damage control manoeuvres can be lifesaving.

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Barogenic esophageal rupture: Boerhaave syndrome

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Case report

A 70-year-old man presented with nausea and a single episode of violent vomiting, followed by intense left pleuritic chest pain and epigastric pain. On admission, he was mildly agitated, tachycardic and hypotensive. Physical examination showed a tender epigastrium without guarding and with normal bowel sounds. In addition, subcutaneous emphysema was detected over the left lower chest wall, and auscultation revealed a Hamman's crunch, suggestive of pneumomediastinum. An erect chest radiograph showed a left apical pneumothorax, pneumomediastinum and small left pleural effusion (Fig. 1a). The insertion of a chest drain yielded 180 mL of bloodstained effusion. The blood results reported leucocytosis of $17.2 \times 10^9/L$ and elevated C-reactive protein level but were otherwise unremarkable. An urgent contrasted CT scan confirmed the chest radiograph findings (Fig. 1b) and also revealed significant left cervical emphysema. Esophageal perforation was confirmed after the contrast esophagram demonstrated leakage from the lower esophagus (near the esophageal gastric junction) into the left pleural space (Fig. 2). Emergency exploration through the left thoracotomy revealed a small tear in the lower esophagus, which was successfully repaired with prolene sutures and re-

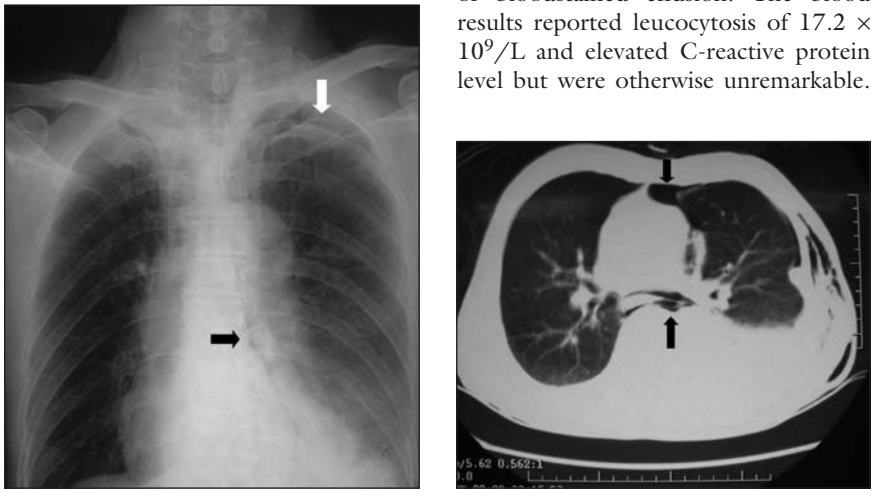

FIG. 1. Chest radiograph showed pneumomediastinum, left apical pneumothorax and pleural effusion (left). CT thorax confirms pneumomediastinum and detected left chest wall subcutaneous emphysema (right).

FIG. 2. Contrast esophagram demonstrated leakage from the lower esophagus (near the esophageal gastric junction) into the left pleural space.

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