

Kenneth L. Mattox, MD, Houston, TX

Penetrating, blunt, and iatrogenic injury to the great vessels of the abdomen continue to challenge the vascular surgeon, with mortality rates in excess of 50% for the inferior vena cava (IVC) and 60% for the abdominal aorta still being reported in the trauma literature. Unfortunately, the patient with such complex, advanced injury most often presents in extremis during the night and weekend hours, often when the most qualified personnel may not be immediately available.

Several key principles aid in increasing the ability to control, expose and reconstruct upper abdominal aortic, vena cava and branch injuries.

1. These patients are pale, tachycardic, apprehensive, and in extremis. They should receive none to limited crystalloid fluid in the ambulance and emergency room and spend only enough time in the ER to direct them to the OR. Rapid skin preparation is concomitant with rapid intubation, securing a large intravenous portal, and accomplishing immediate long midline laparotomy.
2. The surgeon reaches into the opened abdomen and grasps the aorta at the hiatus as assistants pack off obvious bleeding from solid organs, clamp mesenteric bleeding points, and clamp open ends of bowel to prevent spillage. The hand remains on the aorta until brisk pulsations are felt and the anesthesiologist is allowed to "catch up" on blood loss. Entering the hematoma too early will result in tremendous blood loss, acidosis, hypothermia, and coagulopathy.
3. The incision is extended, the viscera evacuated, and the site of maximum hematoma is assessed. Bleeding from the IVC, portal vein or mesentery is achieved with vascular clamps. The surgeon must decide whether to approach the upper-, mid-, or lower-abdominal vascular injury and whether it appears to be arterial or venous. Five different approaches exist, and each should be optimized. The surgeon should still refrain from entering the hematoma until a plan has been made, appropriate assistants are in the room, autotransfusion has been assembled, and all members of the team are ready for the "exposure."
4. For upper-midline vascular injury, a medial rotation of the viscera (Mattox maneuver), going lateral to the left colon, spleen, tail of pancreas, and behind the kidney, will expose the abdominal aorta from the esophageal hiatus to the external iliac arteries, allowing the precise placement of controlling vascular clamps. Anterior approaches to exposure are impossible to achieve.
5. The aorta in the mid-abdomen, with maximum hematoma beneath the root of the transverse mesentery, can be approached from the midline at the root of the transverse mesentery.
6. For right lateral venous appearing injuries, a Kocher maneuver, followed by a Cattell/Braasch maneuver will expose the IVC from the external iliac veins to just above the renal vein location. Precise placement of side-biting vascular clamps is then possible.
7. A suprarenal IVC hematoma that is not freely bleeding into the abdomen should NOT be disturbed. Even if bleeding, control achieved by packing and containment is the preferable approach.
8. New intravascular concepts of vascular control combined with an open exposure might be applicable to aortic and caval injury. A hybrid approach using such open laparotomy, digital control at the aorta, or digital pressure on an aortic or vena caval injury could be possible, combined with a second team cannulating the groin with a catheter based endograft or balloon. Using digital control, a graft or balloon can be deployed at a precise injury location.
9. Once control is achieved, the surgeon is faced with determining the most optimal technique for revascularization, often in the face of enteric contamination and a patient who requires damage control tactics because of coagulopathy, hypothermia, and acidosis.

References

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