Multidisciplinary Care for Severe Pelvic Trauma

Providing collaborative and streamlined care for critically ill patients.

BY RAVI R. RAJANI, MD, AND JAIME BENARROCH-GAMPEL, MD

Pelvic fracture following blunt trauma is often complicated by life-threatening hemorrhage due to disruption of the extensive arteriovenous vasculature by surrounding bony and ligamentous deformation. Historically, hemorrhagic shock from pelvic trauma was associated with a high rate of mortality and poor options for bleeding control. Open hypogastric artery ligation was often unsuccessful due to continued bleeding from collateral arterial pathways and concomitant venous injury. Military antishock trousers have fallen out of use due to an inability to provide a demonstrable benefit. However, three major ideologic advancements over the last several decades have significantly improved outcomes after severe pelvic trauma. First, prompt control of bleeding using transcatheter embolization has become the standard of care and is associated with a reduction in early mortality. Second, resuscitative endovascular balloon occlusion of the aorta (REBOA) is also being used more commonly—particularly in severely hypotensive patients as an alternative to resuscitative thoracotomy. And finally, preperitoneal packing in the operating room is often used as a stopgap measure to stabilize the patient for angioembolization of bleeding vessels.

Contemporary management of these critically ill patients relies on a multidisciplinary team of physicians, each working in concert. The previously mentioned ideologic advancements have created the need for an available, capable endovascular specialist to facilitate hemorrhage control and support in these critically ill patients. At our urban, level 1 trauma center, care for these patients relies on longstanding, collaborative relationships between trauma surgeons, emergency physicians, orthopedic surgeons, interventional radiologists, and vascular surgeons. We continue to refine best practices for care pathways, incorporating these advancements into our management strategy.

OVERVIEW OF OUR MANAGEMENT PATHWAY

Upon arrival, all victims of severe blunt trauma are immediately evaluated by the trauma service and the emergency department. Grossly unstable patients with obvious pelvic trauma undergo prompt placement of a bedside sheath, through which a REBOA balloon is inserted to support the patient's blood pressure. In addition, external compression of the pelvis is obtained using either a commercial binder or a standard bedsheet wrapped around the upper thighs. Stable patients are almost universally evaluated with contrast-enhanced CT of the pelvis to evaluate for possible vascular injury. Regardless of stability, victims of severe pelvic trauma are initially treated in the operating room in most cases. If a fixed-imaging hybrid room is not available, the patient is placed on a fluoroscopy-compatible bed to allow for use of a mobile C-arm.

If laparotomy is indicated, the trauma surgeons proceed with management of intra-abdominal injuries. If not, consideration is given to preperitoneal packing, based on the patient's hemodynamic status. Care must be taken to orient the pelvic packs out of the field of view for planned embolization. The previously placed REBOA sheath can be used to facilitate angiography, or a fresh femoral access can be used. The bedsheet or binder may need to be cut to offer proper visualization of the groin. Extensive hematoma and surrounding tissue edema may complicate percutaneous transfemoral access, and we recommend ultrasound be routinely used to facilitate efficient hemorrhage control. If CT imaging is available for review, access should be performed on whichever side allows for more prompt access to the bleeding vessel.

We generally begin with routine, nonselective aortography, followed by selective angiography of the more

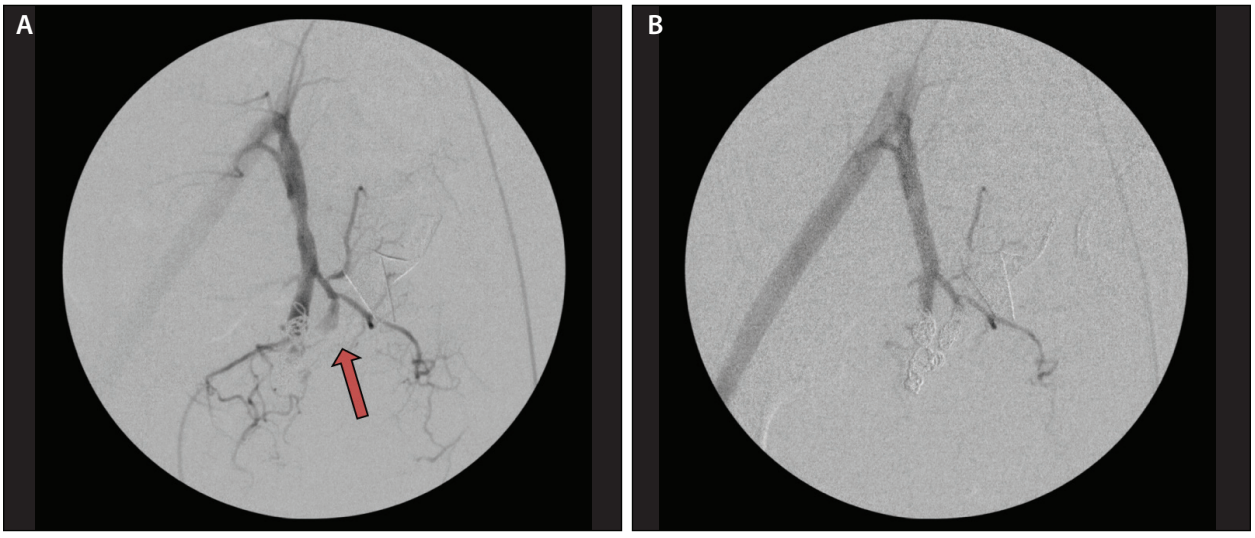

Figure 1. Pre- (A) and postembolization (B) angiograms of severe internal iliac artery injury.

worrisome internal iliac artery. Angiography in grossly unstable patients who require either REBOA occlusion or standard aortic clamping is obviously challenging. Saline may be required as a "carrier" agent to properly visualize potential sites of bleeding. Although every reasonable attempt to perform selective embolization should be made, nonselective internal iliac embolization may be required for severely injured patients. We use coils for more stable patients with a discrete bleed (Figure 1) and reserve a thrombin/Gelfoam (Pfizer, Inc.) "shotgun" approach for unstable patients with diffuse sites of injury. In order to minimize the need for additional devices, we keep a stock of 0.035-inch-compatible coils in a variety of sizes. The addition of a microcatheter to the system may be an unnecessary delay when managing a critically ill patient. We have used both pushable and controlled-release coils, depending on the anatomic pattern of a specific injury.

When possible, coils should obviously be deployed distal to the injury as well, in order to prevent continued bleeding through collateral pathways. The most important guiding principle, however, is efficiency. These patients are critically ill and need to be moved out of the operating room as soon as possible. This is not the same as treating an endoleak—the completion angiogram does not have to be perfectly hemostatic. Rather, the goal is to remove the pressure head from obvious life-threatening hemorrhage. Significant small vessel thrombosis will naturally occur following bony realignment and reversal of the patient's coagulopathy.

Following angiography, the orthopedic surgery department may elect to place an external fixator. Again, unstable patients are usually temporized with more rudimentary bony stabilization until their hemodynamic and acid-base status improves. After the patient further stabilizes, the REBOA sheath is removed, with either a percutaneous closure device or direct cutdown.

CONCLUSION

The endovascular specialist continues to be an important part of teamwork-based management of victims of severe pelvic trauma. Furthermore, a hybrid operating room has become the best environment to provide contemporary vascular trauma care due to the ability to simultaneously treat multiple different areas of injury. The creation of collaborative care pathways has allowed for significantly improved patient outcomes for an otherwise mortal condition. ■

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