

Balloon occlusion technique for embolization of unselectable hemorrhaging pelvic arteries in the setting of traumatic pelvic fractures

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ABSTRACT

Though hemorrhaging pelvic arteries can be treated with transcatheter arterial embolization, difficulty in selection of injured arteries can lead to increased morbidity and mortality due to embolization of untargeted vasculature and prolonged time to hemostasis, resulting in unnecessary ischemic injury and prolonged hemorrhage. This report describes a balloon occlusion technique utilized in the setting of an unselectable hemorrhaging obturator artery.

KEYWORDS Balloon occlusion; hemorrhage; pelvic fracture; transcatheter arterial embolization

emostasis of hemorrhaging pelvic arteries via transcatheter arterial embolization is an established technique within the setting of pelvic fractures. 1,2 Ideally, the traumatically injured and hemorrhaging pelvic vasculature would be selected during transcatheter arterial embolization; however, instances of unfavorable anatomy for such selection frequently occur, resulting in difficulty for the interventionalist and morbidity for the patient due to nonselective branch embolization.³ A technique has been described in particle embolization therapy for liver cancers for which selective embolization was unobtainable by standard means alone. 4-7 This technique involves temporary occlusion of distal vessels with a microcatheter balloon for protection of nontarget vessels and embolization of target vessels through a proximally positioned microcatheter. The vessels distal to the microcatheter and proximal to the occlusion balloon are embolized while the vessels beyond the balloon are spared. Following embolization, the balloon is deflated, restoring normal blood flow to the nontarget vessels. Here we describe use of this technique in a woman with an unselectable hemorrhaging obturator artery.

CASE REPORT

An 80-year-old woman on warfarin for atrial fibrillation presented to the emergency department after a fall from

standing. Contrast-enhanced computed tomography of the abdomen and pelvis demonstrated multiple right-sided pelvic fractures with an associated intrapelvic hematoma and active contrast extravasation, compatible with hemorrhage secondary to traumatic lacerations (Figure 1a). The patient was hemodynamically unstable with a noted drop in her hemoglobin/hematocrit from known baseline. She was referred to interventional radiology for endovascular intervention.

Access was obtained with a 25-cm-long 5 French sheath in the left common femoral artery. A Cobra catheter was passed into the contralateral right internal iliac artery, where digital subtraction angiography (DSA) demonstrated two areas of active contrast extravasation from the presumed internal pudendal and obturator arteries, compatible with hemorrhage secondary to traumatic lacerations (Figure 1b). From here, a microcatheter (Pro-Great, Terumo, Somerset, NJ) was advanced coaxially through the base catheter with initial selection of the internal pudendal artery. Position was confirmed within the pudendal artery with injected contrast. A gelatin embolization (Gelfoam, Pfizer, New York, NY) slurry was injected until slowed flow and pruning of the distal vessels was observed. The following DSA confirmed satisfactory embolization.

Subsequently, multiple attempts to access the hemorrhaging right obturator artery were unsuccessful due to abrupt angulation of its origin. The Cobra base catheter was

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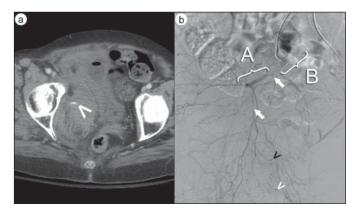


Figure 1. (a) Contrast-enhanced axial computed tomography image demonstrates right-sided intrapelvic hematoma with active contrast extravasation (white arrow). (b) Digital subtraction angiography of the right internal iliac artery demonstrates a few foci of active contrast extravasation from the presumed internal pudendal artery (open white arrowheads) and obturator artery (open black arrowheads), compatible with hemorrhage secondary to traumatic laceration. Distal right internal iliac artery (bracket A), unselectable, hemorrhaging right obturator artery (white arrows), and proximal right internal iliac artery (bracket B).

exchanged over an exchange-length Rosen wire for a 5 French guiding catheter (Envoy, Cordis/Johnson and Johnson, Miami, FL). The Rosen wire was then removed and replaced with a microwire (Transcend, Stryker, Natick, MA). A 3-mm (nominal balloon diameter) Occlusion Balloon Catheter



Figure 2. Digital subtraction angiography demonstrates a 3-mm occlusion balloon catheter (white arrowhead) advanced and inflated just distal to the obturator artery (white arrow) with contrast injection through the guiding catheter (black arrow) to ensure complete arterial occlusion of the untargeted distal internal iliac and indirect selection of the targeted obturator artery.

(Transform, Stryker, Natick, MA) was advanced and inflated just distal to the obturator artery origin, temporarily occluding the distal internal iliac artery. Contrast was injected through the guiding catheter to ensure complete occlusion (Figure 2). From here, gelatin embolization slurry was injected until there was slowed flow and pruning of the indirectly selected obturator artery. The vessel was flushed with normal saline, helping to advance the remaining slurry within the catheter into the target vessel. The following DSA confirmed satisfactory embolization. The occlusion balloon was then deflated, with a subsequent DSA demonstrating reestablished flow distal to the level of the occlusion balloon without distal embolization or arterial injury. The patient's hemodynamic status and hemoglobin/hematocrit gradually stabilized and improved following the procedure.

DISCUSSION

In this case, we were able to utilize this balloon occlusion technique to embolize an unselectable obturator artery in the setting of pelvic trauma. This extrapolation of the previously described balloon occlusion technique combined with microcatheterization appears valuable for the embolization of injured and unselectable hemorrhaging pelvic arteries. It is proposed that this technique be considered when selective embolization of a branch vessel is not possible and the patient is relatively hemodynamically stable to tolerate the potential additional procedure time necessary for this technique, as opposed to untargeted internal iliac embolization. In unstable trauma patients, nonselective embolization remains a viable and often necessary option. Ideally, manufacturers would supply a catheter with balloon occlusion at the tip and a proximal side hole, which may be advanced over an exchange wire, obviating the need for placing the guiding catheter into the region.

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