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Interventional Radiologic Treatment of Pelvic Hemorrhage After Placement of Mesh for Reconstructive Pelvic Surgery

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BACKGROUND: We report two cases of vascular complications after reconstructive pelvic surgery successfully treated with pelvic artery embolization.

CASES: Two patients who underwent mesh placement complicated by postoperative pelvic hemorrhage were treated successfully with selective arterial embolization.

CONCLUSION: The widespread adoption of reconstructive pelvic surgery procedures with dissection in deep vascular spaces has brought with it the prospect of challenging vascular morbidity. A thorough understanding of pelvic anatomy is essential for management of vascular complications from reconstructive pelvic surgery.

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Vascular complications at the time of reconstructive pelvic surgery for pelvic organ prolapse or stress urinary incontinence are rare but clinically relevant. Despite being “minimally invasive,” all pelvic mesh placement procedures have the potential for serious sequelae. In a large registry of tension-free vaginal tape complications, the risk of bleeding requiring surgical management was 0.8%.¹ There have been case reports of vascular injury after placement of commercially available mesh delivery systems, sacrospinous ligament fixation, and retropubic procedures.²

Arterial bleeding after reconstructive pelvic surgery is a complex situation that requires swift management. A calm, stepwise approach will enable the gynecologist or urologist to manage this potentially lethal problem successfully. First-line options for hemorrhage control include reoperation with suture ligation, topical hemostatic agents, packing, and clipping of the involved artery. An alternative for treating a vascular complication is pelvic artery embolization. Pelvic artery embolization is a minimally invasive technique that is a safe and effective alternative compared with vaginal or abdominal exploration, laparoscopy, or laparotomy. Pelvic vessel embolization has been reported to be useful for angiographic control of hemorrhage after transvaginal mesh placement, for obstetric hemorrhage, and for uterine leiomyomas.^{3–5} We report two cases of mesh placement at the time of surgery for pelvic organ prolapse and stress urinary incontinence complicated by acute postoperative blood loss; both were managed successfully with selective artery embolization.

CASE 1

A 73-year-old para 4 woman presented with symptomatic stage II uterovaginal prolapse. She desired surgical correction with uterine conservation. Review of the patient's medical record revealed no clear risk factors for intraoperative hemorrhage, including medications, obesity, or family history of



bleeding disorders. Preoperatively, the patient denied taking any alternative medication supplements that can increase the risk of bleeding. After appropriate informed consent was received, the patient underwent a bilateral sacrospinous hysterocolpopexy with synthetic mesh implant using the Uphold Vaginal Support System (Boston Scientific), anterior colporrhaphy, and cystoscopy. The patient's preoperative hemoglobin was 13.3 g/dL. During the operation, the paravesical spaces were dissected easily, with the bladder mobilized away from the vagina, and the sacrospinous ligaments were accessed without difficulty. Estimated blood loss was 250 mL. Six hours after surgery, the patient developed lower abdominal pain, hypotension, tachycardia, and dizziness. She was pale, and her abdomen was firm and slightly distended. Her hemoglobin was 8.3 g/dL. It was felt that the hemorrhage was progressing rapidly based on the finding of a left-sided fluctuant vaginal mass that had not been present 6 hours earlier at the time of surgery. Interventional radiology was consulted for pelvic artery embolization. Pre-embolization angiogram demonstrated extravasation from the left inferior vesical artery (Fig. 1). The inferior vesical artery demonstrated an abnormally rounded course due to the underlying hematoma.

The interventional radiologist performed a superselective embolization of the inferior vesical artery supplying the pelvic

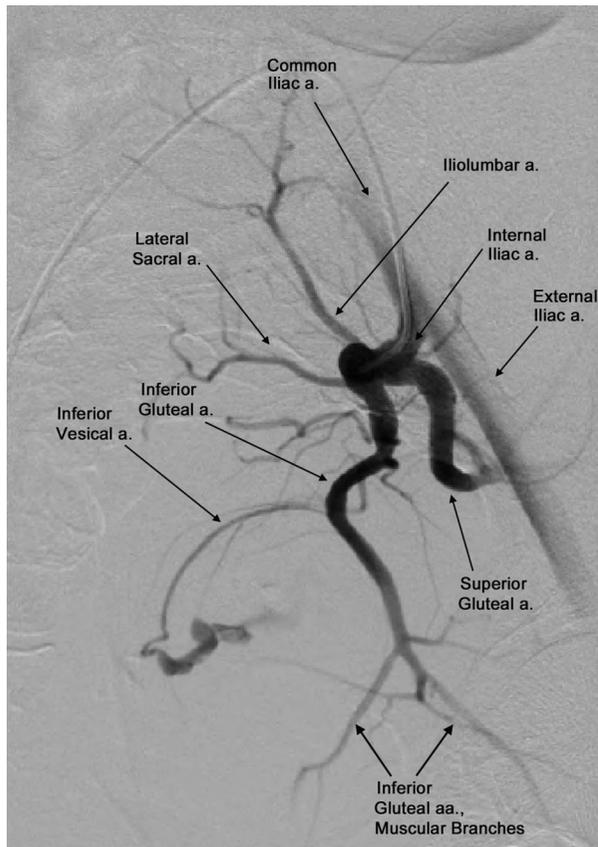


Fig. 1. Digitally subtracted internal iliac artery angiogram with extravasation from the left inferior vesical artery and mass effect due to hematoma. a., artery; aa, arteries.

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hematoma. A right transfemoral approach was taken, and, using a 5-French introducer sheath (Terumo), a 5-French C2 Cobra (Boston Scientific) angiographic catheter was used to cannulate the left internal iliac artery selectively. After gaining access to the left internal iliac artery, angiography confirmed the presence of contrast extravasation at the distal aspect of the inferior vesical artery (see Video 1, available online at <http://links.lww.com/AOG/A263>, or by scanning the QR Code [below] on your smartphone). The involved artery was superselectively catheterized by a 2.7 French Progreat microcatheter (Terumo) advanced through the angiographic catheter and embolized with several 2×3-mm platinum VortX vascular occlusion coils (Boston Scientific). The patient required a transfusion of two units of packed red blood cells during the procedure. After the procedure, she was clinically stable and serial blood counts confirmed a stable hemoglobin of 8.0 g/dL. At 7-week follow-up, the patient was feeling well, the vaginal mass had resolved, and she had no symptoms of anemia.

CASE 2

A 70-year-old para 2 woman presented with complaints of increased pelvic pressure and stress urinary incontinence and demonstrated stage II uterovaginal prolapse. Her preoperative hemoglobin was 12.5 g/dL, and she had no risk factors for hemorrhage. After appropriate informed consent was received, the patient underwent a total vaginal hysterectomy, uterosacral ligament colpopexy, anterior colporrhaphy, and transobturator midurethral sling using the TVT Obturator System (TVT-O; Gynecare). There were no recognized intraoperative complications, and estimated blood loss was 50 mL. On routine complete blood count 12 hours after the operation, a drop in hemoglobin from 12.5 g/dL to 6.1 g/dL was noted. The patient had a tender abdomen and complained of fatigue. She underwent a computed tomography scan of the pelvis with intravenous contrast, revealing a hematoma in the space of Retzius measuring 15×10×9 cm.

Subsequent angiogram demonstrated active extravasation from a branch of the right obturator artery. Successful superselective catheterization and embolization of this vessel was achieved with vascular occlusion coils (Fig. 2). Postembolization angiography showed that all other branches of the anterior division of the right internal iliac artery remained patent. The patient received four units of packed red blood cells during the embolization. She left the hospital 3 days later in good condition.

COMMENT

To treat patients with postoperative hemorrhage effectively, it is essential that the surgeon and radiologist



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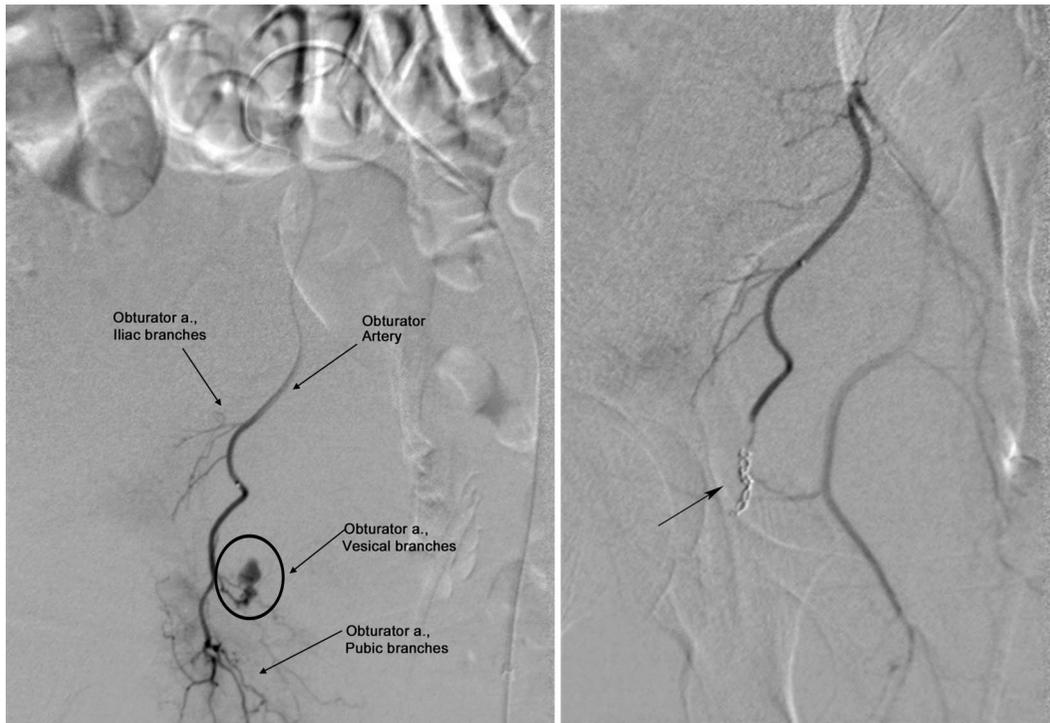


Fig. 2. Digitally subtracted angiogram of a branch of the right obturator artery. Left shows extravasation of contrast (*circle*), and right shows postcoil placement and a lack of contrast extravasation (*arrow*). a., artery.

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make a timely diagnosis, have a mastery of the pelvic blood supply, and are familiar with all therapeutic options. Vaginal surgery, including use of mesh kits and mid-urethral slings, involves dissection in extra-peritoneal spaces through small incisions, with vasculature that can be difficult to access by laparotomy or transvaginal surgical re-exploration. Embolization is minimally invasive and may be preferable because of the difficulty accessing these deep vessels. Trainees may have an unrealistic picture of the complications from pelvic dissections and training videos showing a bloodless dissection in avascular spaces. Even the most skilled gynecologic surgeon might defer to pelvic artery embolization in elderly women for correction of a vessel injury if the patient's condition will not allow more aggressive immediate surgical measures. In our patients, embolization of the inferior vesical artery and a branch of the obturator artery provided a valuable option for treatment of pelvic hemorrhage that proved to be safe and effective and eliminated the need for other invasive surgical interventions.

The goals of embolization include slowing blood loss to allow physiologic control of hemorrhage, limiting tissue ischemia to the smallest possible area, and performing the procedure expeditiously

and without exploratory surgery.⁶ Once the blood flow is slowed by the vascular coils, the vasospasm and clotting cascade can occlude the artery completely. Fortunately, complications from pelvic artery embolization are rare.⁷ Complications include transient fever, lower abdominal pain, and nontarget embolization. One example of a nontarget embolization would be gluteal ischemia from reflux of embolic material into the posterior division of the internal iliac artery. Postoperative care after pelvic artery embolization includes fluid and blood-product replacement, direct pressure with fingers or an external device to the femoral access site, avoidance of flexion and extension of the leg for several hours, and analgesia. Most patients are able to return to normal activities 48 hours after pelvic artery embolization. Sealant closure devices were used in these cases, which allows for faster ambulation and shorter recovery time.

Pelvic vessel embolization should be considered in obstetrics and gynecology patients with postoperative hemorrhage who are clinically stable. Obviously, surgical treatment should be employed in cases in which embolization proves impossible or ineffective or a significant delay before embolization is expected. Based on our experience, we suggest that endovascu-



lar embolization, if available, should be considered for management of postoperative hemorrhage after transvaginal mesh procedures and slings because it can provide an effective, minimally invasive alternative to surgical re-exploration.

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Robotic-Assisted Laparoscopic Transection and Repair of an Obturator Nerve During Pelvic Lymphadenectomy for Endometrial Cancer

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BACKGROUND: Obturator nerve injury may occur in gynecologic surgery, particularly in cases in which extensive pelvic sidewall retroperitoneal dissection is performed. The lack of tactile feedback from the robotic surgical system may contribute to obturator nerve injury. If surgical division occurs, microsurgical end-to-end anastomosis of the obturator nerve may be performed.

CASE: A 76-year-old woman with stage IA endometrial adenocarcinoma sustained a left obturator nerve transection during pelvic lymphadenectomy that was recognized immediately. Robotic-assisted laparoscopic repair was

performed successfully, with the patient experiencing no residual neuropathy 6 months postoperatively.

CONCLUSION: Robotic-assisted laparoscopic repair is feasible for the treatment of obturator nerve injury.

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Since the U.S. Food and Drug Administration approved the da Vinci Surgical System for use in performing hysterectomies in 2005, robotic-assisted technology has been incorporated more frequently into gynecologic surgeries. It has been used in gynecologic oncology for a variety of applications, including pelvic lymphadenectomy when staging and treating endometrial cancer.¹ Although robotic-assisted laparoscopy attempts to overcome the disadvantages of conventional laparoscopy by offering improved dexterity, coordination, and visualization, there are limitations to this technology.² The lack of tactile feedback, loss of peripheral vision, and substantial cost of the operating system have been recognized.

Obturator nerve injury is a rare complication of gynecologic surgery. It has been reported in patients with endometriosis, malignancy, acute hip flexion during prolonged surgery, and obstetric forceps injury.³⁻⁶ Gynecologic oncology patients undergoing surgery that requires extensive pelvic sidewall retroperitoneal dissection, particularly in the obturator fossa, are at increased risk. Surgical division of the nerve, neurotmesis, should be repaired in a microsurgical fashion.

We present the case of a robotic-assisted laparoscopic repair of a left obturator nerve transection during pelvic lymphadenectomy.

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