

Percutaneous Endovascular AAA Repair

Percutaneous EVAR can be performed with a high degree of success.

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Endovascular aortic aneurysm repair (EVAR) is increasingly popular as a durable option for aortic aneurysm repair given appropriate anatomy. Vascular access for EVAR is typically performed with bilateral femoral artery exposure. Complications for femoral artery exposure in the setting of EVAR are not uncommon and include hematoma, infection, and seroma. The evolution and development of techniques used in the performance of EVAR have continued throughout its development. Currently, we repair approximately 70% to 80% of aneurysm patients with EVAR using a variety of devices. The diagnostic imaging workup utilizes a single CT scan followed by Preview 3-D reconstruction (Medical Metrx Systems [MMS], Lebanon, NH). As a result of our experience with suture-based closure devices in other percutaneous procedures, we initiated a percutaneous closure algorithm for EVAR patients. With adequate attention to femoral anatomy and precise positioning of point of access in the femoral artery, percutaneous closure of sheath sizes up to 24 F (outer diameter) have been achieved routinely, resulting in essentially no postoperative pain.

METHODS

Patients referred to the Georgetown University Hospital, Washington, District of Columbia, with an abdominal aortic aneurysm (AAA) greater than 5 cm were evaluated with CT scanning and Preview 3-D reconstruction (Figure 1). In addition to the pertinent anatomic data relating to the endovascular device, this imaging allowed a detailed evaluation

of the common femoral artery to its bifurcation for size, calcium, and atheroma/thrombus. Our intention was to exclude any patients with heavily diseased or partially occluded femoral arteries, but none were excluded in this series.

At the time of the procedure, initial access was obtained with the micropuncture technique (21-g needle, 4-F outer-diameter catheter) in both femoral arteries. An ipsilateral oblique arteriogram of the femoral confirmed access in the mid common femoral artery (Figure 2). If the catheter were higher than the epigastric/circumflex vessels or in the distal portion of the common femoral or distal vessels, the catheter was removed, and the patient was reaccessed on that side. Reaccess was easily performed using the micropuncture set because it was easy to reposition the access if needed, and the small size of the catheter allowed unequivocal assessment of location of access in the common femoral artery. After

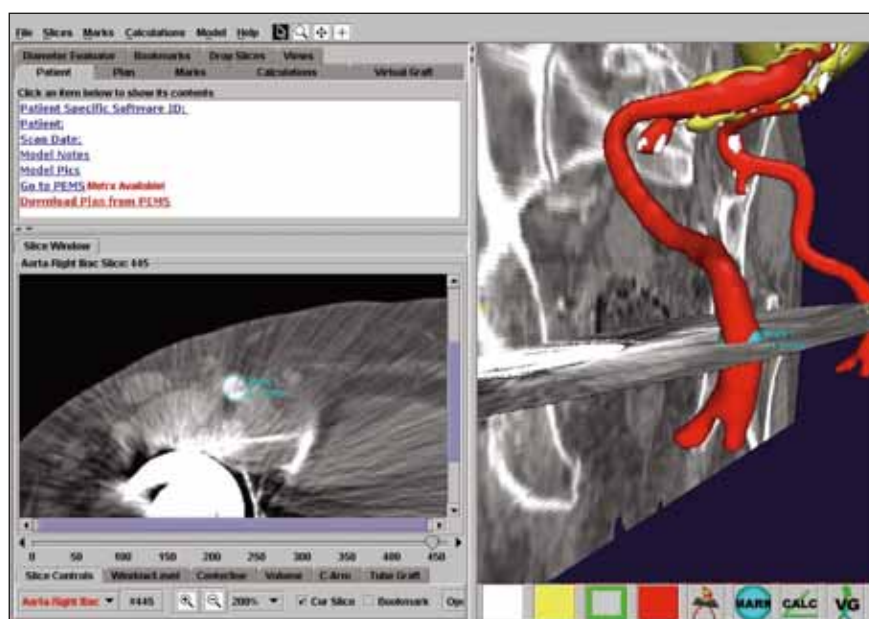


Figure 1. An MMS reconstruction of a CT scan.

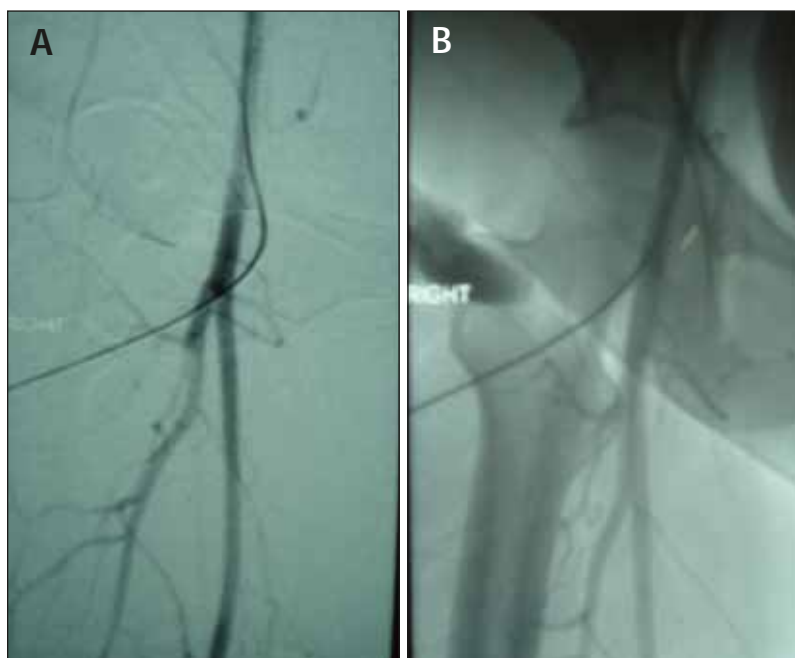


Figure 2. Local arteriogram of the access site using the micropuncture technique (A and B).

successful access positioning, 8-F sheaths were placed initially.

After access, wires were advanced into the thoracic aorta, and the 8-F sheaths were exchanged for a 10-F Prostar XL vascular closure device (Perclose, Abbott Vascular Devices, Redwood City, CA) (Figure 3). A single Prostar XL device was employed for each femoral artery. The sutures of the Prostar XL device would then be deployed, and EVAR would then be carried out in the standard fashion. The femoral arteries then had sheaths ranging from 12 F to 24 F placed through the access sites.

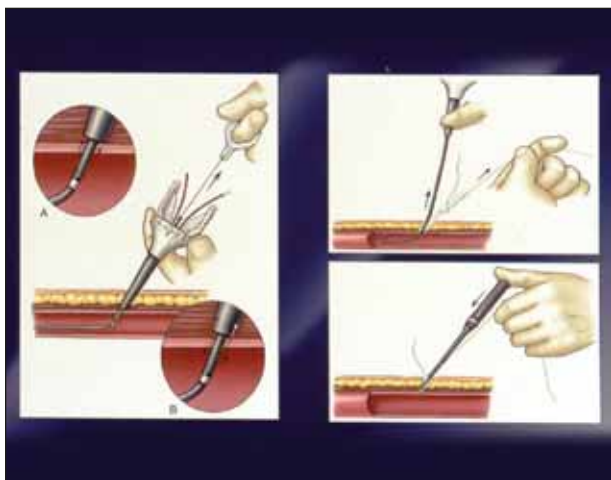


Figure 3. The Prostar XL closure device.

At the conclusion of the case, the sutures were tied and advanced down the tract with a knot pusher with the wire still in place. If there was good hemostasis, the wire was removed and the final tension to the sutures was applied. The sutures were then cut, and the skin was closed with one or two interrupted monofilament subcuticular sutures.

RESULTS

The algorithm for percutaneous EVAR began in September 2004. Since that time, 15 consecutive patients over 5 months were treated in this manner. There were no patients excluded based on CT/MMS evaluation of the femoral arteries. In addition, initial angiography via the micropuncture catheter did not reveal any contraindications to percutaneous repair. On two occasions, the micropuncture needle was repositioned after initial access demonstrated

an inappropriate femoral artery location initially.

The average age of the patients was 73 years old (12 men and three women). The average size of the AAA was 5.9 cm (range, 5-7 cm). The devices employed were the Zenith device (Cook Incorporated, Bloomington, IN) in three patients; the Excluder device (W. L. Gore & Associates, Flagstaff, AZ) in nine patients, and the Enovus device (Trivascular, Santa Rosa, CA) in three patients.

Percutaneous femoral artery closure was successful bilaterally in all patients for a total of 30 femoral artery closures. There were no complications requiring further

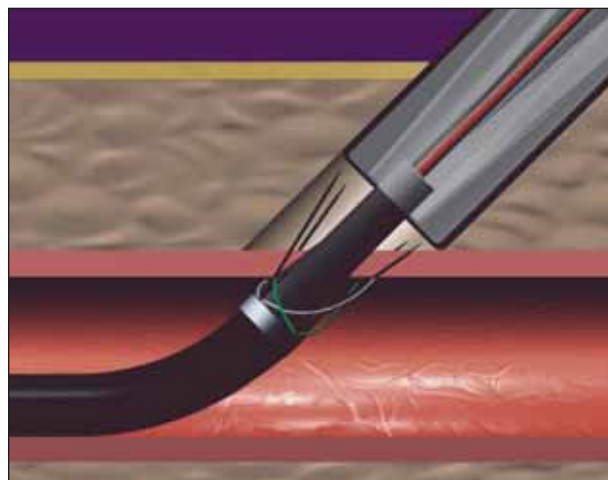


Figure 4. Suture deployment of the Prostar XL device.



Figure 5. Percutaneous EVAR in a hostile abdomen.

measures for hemostasis or other complications requiring further therapy. All patients had successful exclusion of the AAA. The mean operative time was 194 minutes (range, 140-215 minutes). The mean blood loss was 169 mL (range, 100-300 mL) and the average length of stay was 1.375 days (range, 1-2 days). There were no reported complications in these patients.

DISCUSSION

Our initial results demonstrate that percutaneous AAA repair is feasible if the patient has been adequately evaluated preoperatively. Our protocol stresses two critical factors: (1) careful preoperative imaging of the femoral arteries, and (2) precise positioning of the access using a micropuncture technique.

A single CT scan with MMS reconstruction provides evaluation of the femoral arteries for calcification, lumen caliber, and other morphologic details. The local arteri-



Figure 6. Percutaneous EVAR in an obese patient.



Figure 7. The condition of the patient on postoperative day 1.

ogram provides a validation of the CT imaging and allows optimal location of the point of femoral access, duplicating the open surgical choice of femoral arteriotomy site and avoiding the complications associated with inadvertent suprainguinal or branch vessel access.

Others have evaluated percutaneous AAA repair with various device sizes and demonstrated similar success. Haas et al performed 13 procedures with 100% success using the percutaneous technique with devices ranging from 16 F to 22 F.¹ Torsello et al performed a randomized prospective study evaluating percutaneous EVAR to femoral artery exposure and noted the length of stay and time to ambulation was significantly shorter in the percutaneous group.² More recently, Morasch et al evaluated percutaneous AAA repair versus AAA repair and femoral artery exposure. His study included 47 patients who had undergone percutaneous AAA repair and 35 patients who had undergone FAC EVAR. The Gore Excluder device was used in all patients for EVAR, and they were able to successfully complete a percutaneous repair in 93%. Average blood loss in their percutaneous group was 459 mL, and the average length of stay was 1.49 days.³ Our initial results were comparable to those of Morasch et al, and we have used three different devices for EVAR. Krajcer et al have performed percutaneous AAA repair for years and have performed the procedure under local anesthesia and conscious sedation.⁴

In contrast to many of the studies cited, a single Prostar XL device was used bilaterally in this series. Others have used two devices oriented 90° to each other for closure of the larger device side.⁴ Our experience lends credence to the concept that only a single device is required as long as meticulous attention to access site

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and suture management and tying is employed. The sutures are deployed in a crossing manner (Figure 4), and careful orientation of the sutures is critical to achieving knot security.

Percutaneous AAA repair is an attractive option in patients with hostile abdomens (Figure 5) in which even femoral artery exposure can be quite difficult and fraught with high complication rates (Figure 6). This technique also makes the EVAR procedure more amenable to performance under conscious sedation because the amount of local anesthesia needed is small and there is essentially no postoperative pain. Postoperatively, these small stab incisions are the only wounds that need to be closed, and in our experience, all of the patients were without discomfort on postoperative day 1 (Figure 7).

CONCLUSION

Our initial experience with a total percutaneous approach to EVAR using the Prostar XL closure device indicates that a high degree of success can be achieved with a single device in each femoral artery. We believe that the attention to appropriate femoral anatomy and precise access positioning are critical to achieving these results. ■

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The Society of Interventional Radiology's (SIR) 30th annual scientific meeting held in New Orleans, March 31 to April 4, 2005, was the largest meeting of medical professionals devoted to the clinical and technical management of patients through the use of interventional radiology. The week-long meeting was built on years of tradition of the society providing training fundamentals, advances in research, exposure to new devices, and world-renowned presenters to help advance the specialty.

Although the meeting content and themes change annually, the event always reflects the society's top initiatives. This year, the meeting reflected the SIR's commitment to excellent patient care by combining emerging minimally invasive technology with strong clinical care.

SIR has identified several major areas of procedural growth and emerging technology in interventional radiology, such as oncology, carotid artery stenting, peripheral arterial disease (PAD), and research, which were explored at the meeting through symposia, plenaries, categorical courses, scientific sessions, workshops, and simulators. In addition to courses at the annual meeting, SIR is addressing these areas of interest through year-round initiatives.

ONCOLOGY

Oncology is a major growth area for interventional radiologists. There are many tumors that are inoperable, or for which there are not suitable treatment options to offer patients. Clearly, the opportunity for interventional radiology to offer innovative options is wide open and is an active and growing area of practice and research, which was evident in the half-day symposium, "Oncology: What the IR Needs to Know," as well as several workshops.

As vascular experts, interventionalists are uniquely skilled in using the vascular system to deliver treatments that specifically target the blood supply feeding the tumor. The use of radiofrequency ablation, cryoablation, yttrium 90 radioembolization, and chemoembolization are active areas of growth and research.

For the past year, the SIR oncology task force has utilized the experience of leading authorities in interventional oncology to make recommendations for implementing a robust infrastructure that would support widely available, high-quality, affordable, and effective clinical practices committed to image-guided interventional oncology. Our task force has also focused on international collaboration because many cancer advances are made outside of the US, and it is very important that the minimally invasive oncology community work