Technical Feasibility of Prostatic Artery Embolization From a Transradial Approach

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OBJECTIVE. The objective of this study was to evaluate the technical feasibility of performing prostatic artery embolization (PAE) with a transradial approach (TRA). Nineteen consecutive PAEs performed using a TRA were reviewed to determine the technical success of the procedure, which was defined as bilateral embolization. Procedural details, complications, and limitations were recorded.

CONCLUSION. Technical success was achieved in all 19 procedures. The associated complications were minor and included two small (< 5 cm) hematomas and one potential case of delayed radial arteritis. PAE performed with a TRA is technically feasible.

In recent years, there has been increased interest in the use of the transradial approach (TRA) for percutaneous coronary intervention, with evidence suggesting that use of the TRA results in fewer complications at the access site, improves patient satisfaction, and offers potential cost savings compared with the traditional transfemoral approach (TFA) [1]. In interventional radiology, the TRA has been safely and effectively used in transarterial chemoembolization [2] and uterine artery embolization [3].

Prostatic artery embolization (PAE) is an emerging therapy for the treatment of lower urinary tract symptoms secondary to benign prostatic hyperplasia [4]. To our knowledge, only PAE performed using the TFA has been reported; however, PAE performed using the TRA provides several advantages that are specific to this patient population, in addition to those previously mentioned. These advantages include allowing elevation of the legs during a potentially lengthy procedure, to alleviate lower back pain, and allowing immediate postprocedural ambulation, to help facilitate urination, which may have been made more difficult by prostate swelling caused by the procedure. However, because of the distance from the forearm to the pelvis, and because of the small diameter and tortuosity of the prostatic arteries, it has been questioned whether PAE performed using the TRA can be technically successful. We therefore describe our initial experience performing PAE with a TRA.

Materials and Methods

After receiving approval from the institutional review board at the University of North Carolina, we reviewed electronic medical records to retrospectively collect demographic and procedural data for 19 consecutive patients (mean age, 64 years; range, 50–74 years) who underwent PAE performed using a TRA at a single institution from December 2014 to August 2015. The height of the patients ranged from 66 to 76 inches. Technical success was defined as achieving bilateral PAE. Postprocedural complications were identified from follow-up documentation.

Before selecting the TRA, each patient was evaluated using a Barbeau test (i.e., a modified Allen test in which pulse oximetry is used) to determine whether collateral circulation would be adequate should a complication occur that might compromise the radial artery. Type D circulation (i.e., complete occlusion of the ulnar artery or palmar arch) is the only absolute contraindication to a TRA. However, several other relative contraindications do exist, including radial artery occlusion, subclavian artery occlusion or stenosis, the radial artery having a diameter smaller than the outer diameter of the sheath, current or future hemodialysis, or a known radial artery loop.

The patient was positioned on the fluoroscopy table, with the left arm positioned by his side, replicating the room configuration used when PAE is performed with a TFA from the left (Fig. 1). The patient's wrist was supinated and slightly hyperextended. A cushion was placed under the knees if there was concern that lower back pain might occur during the procedure. Under ultrasound

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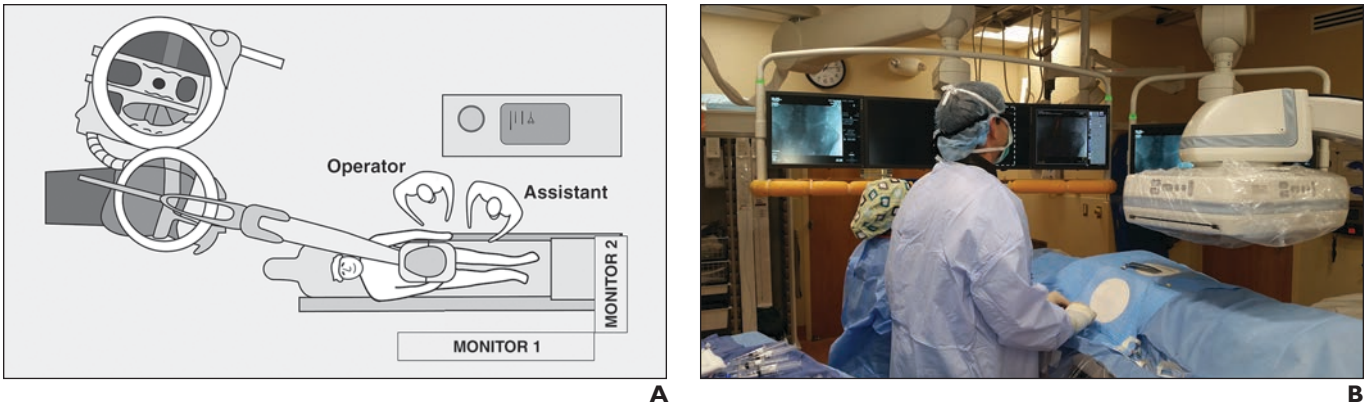

Fig. 1—Room configuration for prostatic artery embolization performed from transradial approach, with left arm adducted at side of patient.
A, Schematic shows positions of operator and assistant. (Illustration by Burke CT)
B, Intraprocedural photograph corresponding to schematic in panel **A**.

guidance, access to the left radial artery was then obtained using a 21-gauge needle, a 0.021-inch nitinol wire, and a 5-French hydrophilic sheath (Glidesheath, Terumo). Two milligrams of verapamil, 3000 units of heparin, and 200 μg of nitroglycerin were diluted with the patient's blood and were administered through the sheath to prevent arterial spasm and thrombus formation. A 125-cm 5-French vertebral catheter (Vert Slip-Cath Beacon Tip, Cook Medical) and a 180-cm 0.035-inch hydrophilic wire (Glidewire, Terumo) were used to advance the catheter through the left arm, down the descending thoracic aorta, and into the abdomen. Once the left internal iliac artery had been selected, a 155-cm 2.4-French microcatheter (Direxion, Boston Scientific) was then inserted and used in conjunction with a 0.018-inch hydrophilic wire (Glidewire GT, Terumo) to advance the microcatheter into the prostatic artery. After completion of the embolization, the right prostatic artery was selected using a similar technique.

On completion of the procedure, the sheath was removed while a compression band (TR Band, Terumo) was inflated over the left wrist arteriotomy with the use of the patent hemostasis technique [5] (Fig. 2). During recovery, the compression band was deflated in increments of 3 mL, starting 45 minutes after its placement. Patients were able to walk and use the bathroom immediately after the procedure was completed. The radial pulse was examined before patient discharge. Follow-up telephone calls or clinic visits occurred at 1 day, 1 month, and 3 months after the procedure, to assess for complications.

Fig. 2—Photograph showing inflation of compression band before sheath removal. Band is inflated enough to achieve hemostasis but not enough to occlude radial artery.

Results

Nineteen patients underwent PAE performed using the TRA. None of the patients had type D circulation, which would have resulted in their exclusion from the study. During the procedure, no conversions from the use of a TRA to the use of a TFA occurred. The mean duration of the procedure was 122 minutes (range, 65–200 minutes). The mean volume of contrast medium used was 122 mL (range, 50–215 mL). Radiation dose statistics included a mean duration of fluoroscopy of 40.4 minutes (range, 23.6–84.2 minutes) and a mean dose-area product of 17,796 μGy·cm^2 (range, 4765–36,276 μGy·cm^2). Technical success, which was defined as achieving bilateral PAE, was achieved in all 19 PAEs performed.

After the procedure, none of the patients required urgent bladder catheterization to relieve acute urinary retention. Two of 19 patients (11%) developed small (< 5 cm) hematomas at the access site, which were treated with compression and ice and were resolved by discharge. All patients were discharged home with normal left radial artery pulse examinations. One patient reported having increased pain in the left arm 5 days after the procedure was performed. This pain resolved within 1 week and was treated with nonopioid analgesics only. None of the patients had signs of bladder or rectal injury during the postprocedural period.

Discussion

We were able to successfully perform PAE from a TRA with a mean fluoroscopy time of 40.4 minutes, which is comparable to the mean duration of 36.5 minutes that has been reported for PAE performed from a TFA [4]. However, our mean dose-area product (17,796 μGy·cm^2), which reflects values from digital subtraction angiography imaging, cone-beam CT, and fluoroscopy, was significantly lower than that reported for PAE performed from the TFA (55,923 μGy·cm^2) [6]. However, it should be noted that this disparity likely reflects the fact that a greater number of cone-beam CTs were performed in the referenced report, compared within our series.

Disadvantages of using the TRA include limitations associated with the lengths of available catheters. The height of the tallest patient in this series was 76 inches, and the microcatheter was nearly inserted to the hub during embolization. On the basis of this experience, we limit our use of the TRA to patients with a height of 74 inches or less, to prevent running out of catheter length.

Another concern is the added risk of stroke resulting from the catheter traversing the origins of the great vessels. A review of 124,000 cases of percutaneous coronary intervention that included use of the TRA from both the right and the left sides indicated that the cumulative risk of neurologic complications was 0.11% [7]. However, we believe that the risk of stroke after PAE performed using a TRA is significantly lower than 0.11%, because minimal catheter manipulation is required to select the descending thoracic aorta and because the TRA is performed from the left side only, limiting catheter traversal to the origin of the left vertebral artery. The true risk of stroke in this cohort still needs to be determined, but we believe it to be so low that it would be outweighed by the potential benefits of using the TRA. Finally, there are potential disadvantages to working from the left side of the patient, including reversing the normal hand position during catheter manipulation and facing ergonomic challenges in rooms that were not designed for access on the left side.

Only minor complications, including the development of two small hematomas at the access site, were seen in this series of patients. In their study, Pancholy et al. [5] had no hematomas develop at the access site in 480 cases, suggesting that the frequency in our study was unexpectedly high. We attribute this higher frequency to suboptimal placement of the compression band that occurred in several cases early in our experience with the TRA.

The results from the present study suggest that PAE performed using a TRA is technically feasible and results in minimal associated complications and patient radiation exposure comparable to PAE performed using a TFA. Further research is needed to determine whether there is a disparity in the clinical efficacy of the TFA versus the TRA for PAE and whether the TRA truly results in greater patient satisfaction and cost savings in this patient population.

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