Prostatic Artery Embolization

A promising alternative treatment for benign prostatic hyperplasia.

BY JOÃO M. PISCO, MD, PHD

Benign prostatic hyperplasia (BPH) has a high rate of prevalence of > 50% in men older than 50 years, which increases to > 90% by the age of 80 years.[1] Medical therapy is a first-line treatment option and is indicated for patients with moderate lower urinary symptoms.[2] Minimally invasive treatments, including interstitial laser ablation, transurethral microwave treatment, and transurethral needle ablation, were originally conceived as attempts to offer equivalent efficacy without the burden and risk of operative morbidity.[3] None of the minimally invasive treatments have proven to be superior to transurethral resectioning of the prostate (TURP) from a cost/benefit standpoint, and TURP remains the gold standard.[4]

Prostatectomy may be performed through the urethra (TURP) if the prostate is smaller than 80 to 100 mL, or by open surgery if the prostate is larger; however, both procedures are associated with high complication rates. Medical and surgical treatment options for BPH are also associated with high morbidity rates. Therefore, there is a need for innovative technologies to improve outcomes and minimize patient discomfort and morbidity in the management of BPH.[5]

The first report of prostatic artery embolization (PAE) for the management of BPH in humans was by DeMeritt et al,[6] who reported a single case of BPH with obstructive symptoms and blood loss refractory to other treatments that was successfully managed by PAE with 150- to 250-µm polyvinyl alcohol (PVA) particles. More recently, there has been a report of two other patients in similar clinical scenarios who were successfully treated with the use of 300- to 500-µm microspheres and another report of 15 cases in which embolization was performed with 200-µm PVA particles.[7,8]

CLINICAL PRESENTATION

The symptoms of BPH are categorized as involving problems of either bladder storage or bladder emptying (voiding and postmicturition). Irrigative symptoms, such as frequency, urgency, urge incontinence, and nocturia, are related to storage problems. Emptying problems, such as hesitancy in initiation of voiding, weak stream, dribbling, diminished stream caliber, stop-start urination, and urinary retention, are due to the medical impact of an enlarged prostate. Storage symptoms are significantly more bothersome than voiding symptoms. Urgency and incontinence are the most common bother symptoms of BPH, followed by nocturia, which produces sleep disturbance and significantly affects patients' quality of life (QOL).

Acute urinary retention or urinary tract infection may be the first presenting symptom. Lower urinary tract symptoms may be assessed by the International Prostate Symptom Score (IPSS), which includes questions that are evaluated by the degree of bothersome caused by the patient's symptoms. Because BPH is not a mortal disorder, if symptoms do not negatively affect morbidity or QOL, treatment is not required.

WORKUP AND FOLLOW-UP CONTROL

A history and physical examination, including rectal examination, are mandatory for the management of BPH. Patients must be questioned concerning smoking habits, diabetes, and symptoms of vascular diseases, which are factors that limit PAE. Baseline data are obtained prior to PAE. All patients are evaluated by clinical observation with measurement of the IPSS (ranging from 0 [best] to 35 [worst]), QOL-related symptoms (with a score ranging from 0 [best] to 6 [worst]), sexual function (International Index of Erectile Function, with a score from 0 to 30), uroflowmetry (peak urinary flow and postvoid residual volume), prostate-specific antigen (PSA) level, and transrectal ultrasound to calculate prostatic volume. These parameters are evaluated before PAE, at 1, 3, and 6 months after the procedure, and every 6 months thereafter.[8]

Figure 1. Left internal iliac artery (ipsilateral oblique view) (A). Left prostatic artery (B). Left prostatic artery after embolization (C). After embolization, fewer prostatic vessels are shown.

Magnetic resonance imaging may be performed before and after PAE to evaluate the degree of ischemia.[9] Prostatic biopsy is performed in all cases of suspected prostatic malignancy based on PSA level > 4 ng/mL or suspicious focal lesions detected on transrectal ultrasound or magnetic resonance imaging. All cases positive for malignancy are excluded from PAE.

PATIENT SELECTION

Inclusion criteria include male patients older than 50 years and a diagnosis of BPH with moderate-to-severe lower urinary tract symptoms (ie, IPSS > 18) refractory to medical treatment for at least 6 months, sexual dysfunction or accepting its risk after treatment, and/or Qmax lower than 12 mL/s or acute urinary retention.[10] If patients are indicated for PAE, they should undergo computed tomographic angiography to evaluate the iliac and prostate arteries and the possibility for successful PAE.

Exclusion criteria include malignancy evaluated by PSA, physical examination, transrectal ultrasound, and magnetic resonance imaging in all patients, by prostatic biopsy in suspicious cases, and advanced atherosclerosis and tortuosity of iliac arteries (based on visual evaluation by the interventional radiologists of pelvic computed tomographic angiography performed before PAE in all patients). Patients with minimal-to-moderate lower urinary tract symptoms are also considered for PAE if the Qmax was lower than 12 mL/s and if they are unsatisfied with the results of medical therapy or had urinary retention. If patients have a high score on the IPSS scale and high peak urinary flow and/or small prostate volume, a urodynamic study should be performed to exclude bladder pathology.

THE PROCEDURE

Patients stop all prostatic medication 1 week before embolization, if possible. After successful PAE, all prostatic medication is withdrawn during the entire follow-up period if there is persisting clinical improvement. Patients are started on an acid-suppressing drug (omeprazole, 20 mg once daily), an anti-inflammatory (naproxen, 1,000 mg twice daily), and an antibiotic (750 mg of ciprofloxacin twice daily) 2 days before the procedure and continue for 10 days after PAE. On the day of PAE, patients are given omeprazole (20 mg), naproxen (1,000 mg), and levofloxacin (750 mg) in the morning before PAE and the same medication 8 hours after PAE.

The patients are admitted to the hospital on the day of the procedure. During embolization, analgesic (metamizol, 2 g) and anti-inflammatory (ketorolac trometamine, 30 mg) drugs are administered intravenously. Embolization is performed under local anesthesia with a unilateral access approach, in most cases, via the right femoral artery. A 5-F Cobra-shaped or RUC catheter (Cook Medical, Bloomington, IN) is introduced into the right femoral artery to catheterize the left hypogastric artery and then its anterior division. Angiography of the anterior division of the hypogastric artery is performed in the ipsilateral oblique view to visualize the anatomy of prostatic arteries (Figure 1).

The prostatic vessels are then selectively catheterized with a 3-F, coaxial microcatheter (Progreat [Terumo Interventional Systems, Somerset, NJ] or with a Cantata microcatheter and a Sagita guidewire [Cook Medical]). Another angiogram is obtained to confirm the position of the catheter in the prostatic artery before embolization. Nonspherical PVA particles (100 or 200 µm) are used for embolization.

The endpoint chosen for embolization is slow flow or "near stasis" in the prostatic vessels, with interruption of the arterial flow and prostatic gland opacification. Upon finishing embolization of the left prostatic arteries, the catheter was reformed to select the ipsilateral right prostatic arteries (Figure 2). PAE procedure time is measured starting with femoral puncture access and ending with removal of the catheter after PAE. Fluoroscopy is also recorded.

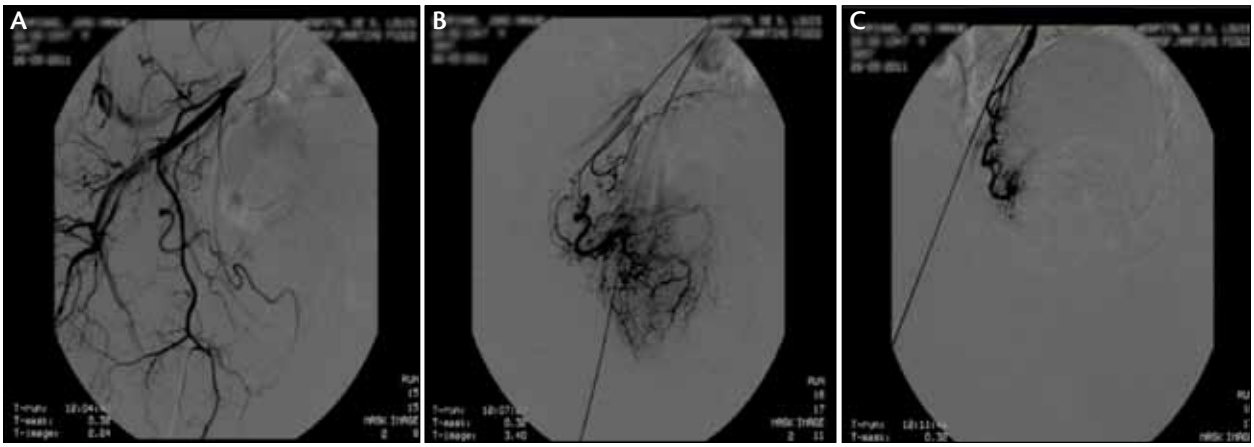

Figure 2. Right internal iliac artery (ipsilateral oblique view) (A). Right prostatic artery (B). Right prostatic artery after embolization (C). After embolization, fewer prostatic vessels are shown.

RESULTS

Technical success is achieved when selective prostatic arterial catheterization and embolization is completed in at least one pelvic side. Clinical improvement is defined as improving symptoms with a reduction of IPSS equal or superior to 25% of the total score and a score lower than 15, a reduction of at least 1 QOL point and a score of ≤ 3, and an increase of Qmax ≥ 2.5 mL/s.

Technical success is approximately 95%. The short-term clinical improvement at up to 6 months is between 85% and 90%. At midterm follow-up (between 1 and 2.5 years), there is an approximate 10% rate of recurrence; therefore, the clinical improvement at midterm is between 75% and 80%. If the patients with clinical failure have good prostatic arteries, PAE can be repeated to achieve clinical improvement. Most

patients are released from the hospital between 3 to 6 hours after the procedure.

COMPLICATIONS

We have not observed major complications, such as sexual dysfunction and urinary incontinence, to occur with this procedure. However, we have had one case of bladder wall ischemia, which was reported.[11] Most patients do not feel any pain during the procedure or only light pain or a burning sensation in the urethra.

Minor complications include urinary tract infections after embolization, transient hematuria, and transient hemospermia balanoprosthitis and inguinal hematoma. Acute urinary retention can occur during PAE and a temporary bladder catheter is placed for a few hours.

CONCLUSION

PAE is a safe procedure with low morbidity and has no associated sexual dysfunction, urinary incontinence, or bleeding. It is a minimally invasive outpatient procedure that is performed under local anesthesia and has good short-term outcomes of 85% to 90% and midterm results (between 1 and 2.5 years) of 75% to 80%. ■

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