Prostatic Artery Embolization: An Emerging Technique in Interventional Radiology CE

■ Sharon Lehmann, MS, APRN, CNS; Michael Rosenberg, MD; Prashant Shrestha, MD; Jafar Golzarian, MD; and Mary Schooley, BA, BAN, RN

ABSTRACT: **This article will discuss benign prostatic hyperplasia and a new interventional radiology procedure, prostatic artery embolization. Information from diagnosis of benign prostatic hyperplasia to prostatic artery embolization procedure nursing care is included. A discussion of the U.S. Food and Drug Admiration influence is given. (J Radiol Nurs 2015;34:209-221.)**

KEY WORDS: **Prostatic artery embolization; Benign prostatic hyperplasia; Interventional radiology; Nursing care.**

INTRODUCTION

As a man ages, it is common that he will develop an enlarged prostate or benign prostatic hyperplasia (BPH). More than 50% of men aged 60-69 years and as many as 90% of men aged 70-89 years have clinical manifestations (Wei, Calhoun, & Jacobsen, 2005). BPH is a histologic diagnosis characterized by proliferation of the cellular elements of the prostate. BPH manifests itself in lower urinary tract symptoms (LUTS) which may include: weak urine stream or difficulty with urination, stopping and starting while urinating along with dribbling at the end of urination, straining while urinating, urinary frequency especially at night, urgent need to urinate and not being able to empty the bladder, blood in the urine, and urinary tract infections (Sarma, & Wei, 2012). The LUTS can be quantified with the International Prostate Symptom Score (I-PSS; McVary, et al., 2011). Age-related vasculopathy has been suggested as the cause for BPH. This theory

Sharon Lehmann, MS, APRN, CNS, Clinical Nurse Specialist, Department of Interventional Radiology, University of Minnesota Physicians, Minneapolis, MN; Michael Rosenberg, MD, Assistant Professor, Department of Interventional Radiology and Medical Director, Interventional Radiology and Vascular Imaging, University of Minnesota, Minneapolis, MN; Prashant Shrestha, MD, Adjunct, Assistant Professor, Department of Interventional Radiology, University of Minnesota, Minneapolis, MN; Jafar Golzarian, MD, Professor, Department of Interventional Radiology, University of Minnesota, Minneapolis, MN and Interventional Radiology Director, University of Minnesota, Minneapolis, MN. He is on the advisory committee of Boston Scientific and is a Consultant for Cook Medical; Mary Schooley, BA, BAN, RN, Care Coordinator, Department of Interventional Radiology, University of Minnesota Physicians, Minneapolis, MN.

Corresponding author: Sharon Lehmann, MS, APRN, CNS, Clinical Nurse Specialist, University of Minnesota Physicians, Department of Interventional Radiology, 420 Delaware St SE, MMC 292, Minneapolis, MN 55455. E-mail: lehma006@umn.edu

1546-0843/$36.00

http://dx.doi.org/10.1016/j.jradnu.2015.10.001

Prostatic Artery Embolization: An Emerging Technique in Interventional Radiology GNA ID # 31891 has been approved for 2.2 contact hours.
This continuing education activity was approved by the Georgia Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.
Go to www.arinursing.org and click on Education, Directed Journal Reading (DJR) or go to www.arinursing.org/education/directedreading.cfm for more information.

suggests that there is an association between BPH (with LUTS and erectile dysfunction) and chronic pelvic pain syndrome and that BPH is a manifestation of an aging vascular disease rather than etiopathogenic factor (Pisco, et al., 2013a).

Since the early 1990s, medical management has become the primary mode of treatment for BPH. Medications for treating BPH include agents that relax the muscles around the urethra, bladder neck, and prostate tissue, such as alpha-blockers, allowing urine to flow more freely. Other medications such as 5-alpha-reductase inhibitors reduce the level of dihydrotestosterone which causes the prostate to shrink and in turn improve urine flow (Thomas, Cannon, Bartlett, Ellis-Jones & Abrams, 2005).

Despite optimal medical management, close to 10% of men who have developed an enlarged prostate will need surgery to correct complications from this disorder. The gold standard for treating BPH has been with a transurethral resection of the prostate if the prostate is $<$60-80 cm^3 or by open surgery if the prostate is larger (Thomas, et al., 2005). This procedure is not without complications including: clot retention, bleeding and transfusion, transurethral resection syndrome, capsular perforation, hydronephrosis, epidymitis, urinary tract infection, urosepsis, failure to void, sexual dysfunction (retrograde ejaculation and erectile dysfunction), and incontinence. Associated morbidities include cardiac arrhythmias, myocardial infarction, pulmonary embolism, pneumonitis, deep vein thrombosis, and death (Rassweiler, Teber, Kuntz, & Hofmann, 2006).

Owing to the relative complications and morbidities with transurethral resection of the prostate, minimally invasive techniques have been developed as an alternative treatment for BPH, including transurethral needle ablation therapy and other laser ablation techniques (Rocco, et al., 2011). These techniques are also with complications, and improvement in symptoms is slower, over 1-3 years. Long-term follow-up on the newer techniques is currently lacking (Kacker, & Williams, 2011). An emerging minimally invasive technique for treating BPH is prostatic artery embolization (PAE) has been used primarily to control hemorrhage after prostatectomy, prostate biopsy, or with bleeding related to prostate cancer (Nabi, Sheikh, Greene, & Marsh, 2003).

The first report of PAE was published by DeMeritt, Elmari, Esposito, & Rosenberg, 2000, in which 150-200 μm polyvinyl alcohol (PVA) particles were used in a 76-year old with refractory hematuria and severe LUTS secondary to BPH. The gross hematuria resolved immediately after the procedure and follow-up at 12 months demonstrated a marked reduction in LUTS as measured by the I-PSS from 24 to 13. They also reported a 40% reduction in prostate volume (PV) and a decrease in the prostate-specific antigen (PSA) level from 40 mg/dL to 4 mg/dL (Table 1 for PSA normals).

Table 1. Age-specific reference ranges for serum prostate specific antigen

Age range (years)	Asian Americans	African-Americans	Caucasians
40-49	0-2.0 ng/mL	0-2.0 ng/mL	0-2.5 ng/mL
50-59	0-3.0 ng/mL	0-4.0 ng/mL	0-3.5 ng/mL
60-69	0-4.0 ng/mL	0-4.5 ng/mL	0-4.5 ng/mL
70-79	0-5.0 ng/mL	0-5.5 ng/mL	0-6.5 ng/mL

MedicineNet.com. Zorn, K.C., Hueber, P.A., 2015, PSA (Prostate Specific Antigen).

Dr. Carnevale and his group in Brazil, and Dr. Pisco and his group in Portugal have studied the PAE procedure extensively. Not only have they developed a technically successful procedure, they have followed the patients for an extended length of time noting successful reductions in I-PSS and quality of life scores, and significant reduction in PV. PAE offers a minimally invasive alternative treatment for patients with LUTS secondary to BPH. This procedure is performed with moderate conscious sedation on an outpatient basis (Carnevale, et al., 2010; Pisco, et al., 2011).

PATHOPHYSIOLOGY

The prostate is a doughnut-shaped gland with multiple lobes, and it is located below the bladder about halfway between the rectum and the base of the penis. It encircles the urethra (the tube that carries urine from the bladder out through the penis), and in young men, it is normally about the size of a walnut. The prostate produces most of the fluid that makes up semen. The prostate can be felt easily during a rectal exam, as the prostate lies just in front of the rectum.

The prostate can be divided in two ways: by zone or by lobe (Figure 1 and Figure 2). It does not have a capsule; rather, an integral fibromuscular band surrounds it. It is sheathed in the muscles of the pelvic floor, which contract during the ejaculatory process.

The "zone" classification is more often used in pathology. The idea of "zones" was first proposed by McNeal in 1968 (Selman, 2011). McNeal found that the relatively homogeneous cut surface of an adult prostate in no way resembled "lobes" and thus led to the description of "zones." The prostate gland has four distinct glandular regions; two of which arise from different segments of the prostatic urethra.

The "lobe" classification is more often used in anatomy. The anterior lobe roughly corresponds to part of