SPECIAL COMMUNICATION

Prostatic Artery Embolization to Treat Lower Urinary Tract Symptoms Related to Benign Prostatic Hyperplasia and Bleeding in Patients with Prostate Cancer: Proceedings from a Multidisciplinary Research Consensus Panel

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ABBREVIATIONS

AUR = acute urinary retention, BOO = bladder outlet obstruction, BPH = benign prostatic hyperplasia, FDA = U.S. Food and Drug Administration, IDE = investigational device exemption, IPSS = International Prostate Symptom Score, LUTS = lower urinary tract symptoms, PAE = prostatic artery embolization, PV = prostate volume, QOL = quality of life, TUMT = transurethral microwave thermotherapy, TURP = transurethral resection of the prostate, RCP = research consensus panel, UTI = urinary tract infection

BACKGROUND

Benign prostatic hyperplasia (BPH), a common condition related to aging, involves histologic changes associated with unregulated but benign proliferations of glandular and stromal prostate tissue leading to increased prostate volume (PV) and smooth muscle tone. Increased PV (the static component) or stromal smooth muscle tone (the dynamic component) may cause physical compression of the urethra and mechanical bladder outlet obstruction (BOO) (1). BOO may produce lower urinary tract symptoms (LUTS), a cluster of chronic urinary disorders including urinary frequency and urgency, nocturia, difficulty initiating urination, sense of incomplete bladder emptying, decreased force of urinary stream, and interruption of urinary stream. Both women and men can experience LUTS. In men, LUTS can arise from benign prostate enlargement and BOO or from primary bladder disorders such as overactive bladder and interstitial cystitis.

The most widely used instrument for measuring LUTS is the International Prostate Symptom Score (IPSS). The IPSS questionnaire has eight separate items. It scores seven individual items on a scale of 0–5 points and then sums the items, with a resulting range of 0–35 points. Symptom categories include none to mild (1–7 points), moderate (8–19 points), and severe (20–35 points). An eighth question assesses quality of life (QOL). In epidemiologic studies and clinical trials, investigators have variously defined voiding dysfunction attributed to BPH by histologic analysis of prostate tissue, radiologic enlargement of the prostate, decreased urinary flow

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rates, noncancer surgery of the prostate, physician diagnosis, LUTS, acute urinary retention (AUR), and initiation of medical therapy (2–6).

BPH-associated morbidities affect 75% of men in the United States by age 70 years. In 2000, the most recent year for which comprehensive data were available in the United States, BPH-associated conditions cost $1.1 billion in direct health care expenditures and accounted for > 4.4 million office visits, 117,000 emergency department visits, 105,000 hospitalizations, and 21–38 million hours in lost productivity (4). Estimated annual costs of LUTS and BPH treatment in the United States currently total $3.9 billion (5). Despite widespread oral medication use, data suggest that adverse events of BPH, including AUR, urinary tract infections, renal failure, and bladder stones, have either increased or persisted during the past decade (3).

Age, genetics, sex steroid hormones, inflammation, and metabolic and lifestyle factors such diabetes and obesity are some of the risk factors of LUTS and BPH. PV, age, decreased urinary flow, and AUR are risk factors for clinical progression. Older age, a high baseline IPSS, peak urinary flow rates < 12 mL/s, and PV > 30 mL are risk factors for AUR.

According to American Urological Association BPH/LUTS Clinical Guidelines, treatment options include watchful waiting; medical therapy with α-adrenergic receptor blockers, 5α-reductase inhibitors, or anticholinergic agents; minimally invasive therapies such as transurethral needle ablation or transurethral microwave thermotherapy (TUMT); and surgical therapies such as open prostatectomy or transurethral resection of the prostate (TURP) (6–9). Prostatic artery embolization (PAE), a new, minimally invasive, outpatient-based procedure for LUTS, BOO, and urinary retention associated with BPH, has putative feasibility in preliminary, single-institution case series. Because the Society of Interventional Radiology (SIR) Foundation considers PAE for BPH an emerging research priority, a multidisciplinary research consensus panel (RCP) charged with recommending a prioritized research agenda was convened. This article presents details of the proceedings of the RCP meeting held on March 11, 2013.

METHODS

Panel Membership

As a result of a previous application process, a lead investigator was selected to organize the RCP. The lead investigator, in cooperation with the SIR Foundation, invited a multidisciplinary group of scientists with relevant experience (seven interventional radiologists, four urologists, and one diagnostic radiologist), representatives of governmental agencies, and industry representatives to the RCP meeting on March 11, 2013. The governmental agencies represented included the U.S. Food and Drug Administration (FDA) (three representatives from the Urology and Lithotripsy Devices Branch and two representatives from the Center for Devices and Radiological Health Office of Science and Engineering Laboratories) and the National Institutes of Health (one representative from interventional radiology [IR]).

Agenda Methodology

The purpose of the RCP meeting was to identify and develop strategic IR research priorities for PAE for the treatment of symptomatic BPH and to identify panel investigators willing to commit to developing a study protocol. An initial panel presentation ensured that all participating panelists were up to date on the current status of BPH and its treatment. The panel then solicited clinical and basic science research priorities from the panelists and from the audience. The panel reviewed these priorities and consolidated them into a list of five priorities, choosing to develop a protocol for future research of the first priority. The Prioritization Guidelines were as follows:

- Transformative/pivotal—research that is of potential importance to clinical practices and global health care
- Feasible—research that is expected to be feasibly developed, funded, and implemented within a defined time period
- Translational—research that is expected to translate into improvements or new developments for clinical practices within 5 years
- Innovative—research that displays an exceptional degree of innovation or potential for advancement of interventional medicine
- Strategic—research that preserves the role of interventional radiologists as care providers in a multidisciplinary team

This article reviews the current treatment options available for BPH and the research available for PAE as a treatment for LUTS, BOO, and urinary retention associated with BPH and summarizes the recommendations of the RCP for future research.

TRADITIONAL MEDICAL AND SURGICAL THERAPY FOR BPH

Medical therapy for male LUTS did not enter mainstream medical practice until the early 1990s, when the first α-adrenergic receptor blockers and later 5α-reductase inhibitors were approved by the FDA and introduced into practice. Before these approvals, the choices for patients with LUTS consisted of watchful waiting or surgery. The availability of effective medical therapy for LUTS, direct-to-consumer outreach by the pharmaceutical industries, a realization of the relative frequency of side effects of surgery, and a focus on QOL all have led to a steady proportional decrease in the