

Prostate artery embolization (PAE) for benign prostatic enlargement (BPE)

Somani B K<sup>1</sup>, Hacking N<sup>2</sup>, Bryant T<sup>2</sup>, Coyne J<sup>2</sup>, Flowers D<sup>2</sup>, Harris M<sup>1</sup>, Dyer J<sup>1</sup>.

Department of Urology<sup>1</sup> and Interventional Radiology<sup>2</sup>,  
University Hospital Southampton NHS Trust,  
Southampton  
UK

Corresponding Author:

Bhaskar K Somani  
Consultant Urological Surgeon and Honorary Senior Lecturer  
University Hospital Southampton NHS Trust  
Southampton, UK

Email: bhaskarsomani@yahoo.com  
Tel: 02380795272

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**Abstract:**

Prostate artery embolization (PAE) for lower urinary tract symptoms (LUTS) is a promising minimally invasive alternative treatment for benign prostatic enlargement (BPH).

Prostate artery embolization (PAE) for lower urinary tract symptoms (LUTS) is a potential minimally invasive alternative treatment for benign prostatic enlargement (BPE) [1-4]. The first step for PAE is a clinical assessment of the urinary symptoms by a urologist [5]. Men with proven bladder outflow obstruction, who have either failed to respond adequately to medical therapy or have experienced intolerable side effects can consider entering trials of PAE as an alternative to proceeding to surgical treatment.

Prostate artery embolization for control of bleeding post-biopsy or prostatectomy has been used with some success [6,7]. Carnevale and colleagues described the first treatment of benign prostatic hyperplasia (BPH) with PAE in 2 patients with acute urinary retention (AUR) [8]. Pre-operative assessment for PAE should include prostate volume measurement, symptom assessment and sexual function evaluation. Clinical assessment by digital rectal examination (DRE) and transrectal ultrasound (TRUS), serum PSA, uroflowmetry and /or urodynamic assessment should be done along with patient self reporting by an International prostate symptom score (IPSS), Quality of life (QoL) and an International index of erectile function (IIEF) questionnaire [9].

The technique involves assessment of prostatic and pelvic arterial anatomy by doing a pre-procedural CT angiography [1,4]. As the prostatic arterial supply is variable, this allows selection of suitable patients and PAE planning. This also allows unwanted

collaterals to bladder, rectum or penis to be preserved thereby avoiding non-target embolization. Unsuitable cases include those with excessive vessel tortuosity or atherosclerosis. The procedure is then performed under a local anesthetic usually by a right groin approach through the right femoral artery. A selective embolization is then performed using small-diameter hydrophilic microcatheters and polyvinyl alcohol (PVA) with the end point being 'near stasis' in the prostatic vessels. Interruption of arterial flow is accompanied by prostate gland opacification [1,4]. Authors report technical success if at least unilateral selective prostate embolization in either pelvic side is achieved with clinical success as improvement in symptoms (IPSS reduction of 25% or more and QoL reduction of at least 1 point) [10].

Patient selection is usually achieved in a multidisciplinary manner in conjunction with urologists and interventional radiologists. Patients with failed medical therapy, prostate size of >40gm, IPSS score >18 and a QoL score >3 are suitable [9]. Contraindications include prostate malignancy, chronic renal failure, bladder diverticula or stones, neurogenic bladder, active urinary tract infection (UTI), and other urethral/bladder diseases affecting LUTS/BPE treatment [1,9]. Severe atheroma also excludes successful cannulation and is common over 75 years of age. The advantages of PAE lie in being a minimally invasive local anesthetic procedure done usually as a day case and potentially avoiding the complications associated with transurethral resection of prostate (TURP).

The largest prospective non-randomized series published on PAE to date is by Pisco and colleagues [10]. Of the 255 patients, technical success was achieved in 250 patients (98%) with a clinical success rate of 82% after the first month dropping to

72% in 3 years. They recommend stopping all prostate medications 2 weeks prior to and then after a successful PAE. Minor adverse events reported were urethral burning (9%), UTI (7.5%), transient haematuria (5.5%) or haematospermia (0.5%), acute urinary retention (2.5%) and rectorrhagia (PR bleeding) (2.5%) [10]. Non-target embolization can cause transient ischaemic proctitis and bladder ischaemia [10, 11]. Both clinical and urodynamic parameters seem to improve with PAE [12]. In another large retrospective study of 103 patients, after a mean follow-up of 6 months, prostate volume decreased by 23% with a 50% reduction in IPSS and a more than 2 point improvement in QoL [13]. This was accompanied by an improvement in flow rate, IIEF scores and a reduction in PSA. As yet unpublished RCT data from Sao Paulo (pers comm.) suggests the results of PAE to lie in efficacy between drug therapy and TURP.

According to National Institute for Health and Care Excellence (NICE) PAE should only be undertaken in the context of research and after consideration of the patient by an MDT including a urologist and an interventional radiologist [14]. PAE may offer an acceptable alternative to endoscopic prostate surgery in patients failing medical therapy who are not ready to face the risks of retrograde ejaculation or sexual dysfunction seen with endoscopic prostate surgery. However, although PAE is an exciting minimally invasive technique with promising initial short-term results, appropriate patient selection and good technique is paramount for its success.

We are now the first UK center to perform PAE with encouraging preliminary results in 35 patients done so far. Ethical approval for PAE was obtained from 'New procedures committee' and 'Divisional governance of our hospital'.

The study population was very symptomatic with mean IPSS of 24 (range:14-35) and QOL due to urinary symptoms of 4.9 (range:3-6). Enrolled patients mean age was 64 (range 54-74) with LUTS for 6.7 years (range 2-20 years). Mean prostatic volume was 94.9cm<sup>3</sup> with sizes ranging up to 180cm<sup>3</sup>.

A technical success rate of 100% has been achieved (selective catheterization and embolization of at least one pelvic side, with all major prostatic supply embolized in 90%). Patient reported outcome measure questionnaires show significant improvement with average IPSS reduction of 12 points (at 1 month, sustained at one year follow up) and improvement in QOL by 3 points from 5 (unhappy) to 2 (mostly satisfied). The mean IPSS and QoL at 6 months were 12 (range: 1-32) and 2 (range: 0-5) respectively. Similarly mean IIEF has increased from 39 to 55. A prostate volume reduction of 42% has been recorded with an increase in peak urinary flow of 32%. There have been no major complications, no retrograde ejaculation nor UTI or the other common complications seen after TURP. Minor complications only have been recorded including; mild self-limiting suprapubic pain, transient haematospermia in 1 patient and small non-limiting arterial dissections in two patients.

So far the data comes from uncontrolled pilot studies found inadequate by NICE. We plan to address this weakness with the UK-ROPE trial (Registry of Prostate Embolisation) that is being planned to commence in early 2014 under the control of the British Society of Interventional Radiology (BSIR), the British Association of Urological Surgeons (BAUS) and NICE. This will enable us to compare TURP with PAE to establish the safety and efficacy of the latter before its widespread use in the UK.

### **Conflicts of Interest**

Dr Tim Bryant and Dr Nigel Hacking are contracted to provide a proctoring service for PAE by Cook Medical.

All other authors have nothing to disclose.

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