

Introduction:

- Patients >40 years of age with BPH who do not respond to medical treatment or cannot undergo surgery should be considered for prostatic artery embolization (PAE). Indications and contraindications for PAE are shown in Table 1. Work up items are seen in Table 1.

- PAE has been shown to be safe and effective to treat both components of benign prostatic hyperplasia¹⁻³:
 - Static component: PAE → ischemia → apoptosis/necrosis of prostate → prostatic volume reduction
 - Dynamic component: PAE → ischemia → apoptosis/necrosis of prostate → ↓ α1-adrenergic receptors → ↓ neuromuscular tone

Table 1: Indications, Contraindications, Work Up

Work up	HPI (prostate symptoms, sexual health, current prostate meds), I-PSS, UA, PSA, PVR, DRE, uroflowmetry, imaging (TRUS, MRI, or CTA)
Candidacy	I-PSS ≥13, failed medical therapy for at ≥3 months, uroflow <10 mL/sec, PVR >100 mL, prostate size >50 g. median lobe <3 cm
Contraindications	Active UTI or prostatitis, prostate or bladder cancer, chronic renal failure, bladder dysfunction, bladder stones, excessive vessel tortuosity or severe atherosclerosis, I-PSS ≤12, high PVR, asymptomatic patient, prostate <50g, medial lobe >3 cm

UA = urinalysis, PSA = prostate specific antigen, PVR = post void residual, DRE = digital rectal exam, TRUS = transrectal ultrasound, MRI = magnetic resonance imaging, CTA = computed tomography angiography

Table 2: Anatomical Variations of the Prostate Artery⁴

Classification	Incidence of Variant	Description
Type I	28.7%	IVA originates from anterior division of IIA with a common trunk with SVA
Type II	14.7%	IVA originates from anterior division of IIA and inferior to SVA
Type III	18.9%	IVA originates from obturator artery
Type IV	31.1%	IVA originates from IPA
Type V	5.6%	Less common origins

IVA = inferior vesical artery, SVA = superior vesical artery, IIA = internal iliac artery

Pre-, Peri-, and Post-procedural Care

- **Pre-procedure:** two Dulcolax for two nights prior to procedure to prevent constipation, insert Foley catheter
- **Periprocedure:** one-time dose of intravenous ciprofloxacin/levofloxacin, nitroglycerin immediately after catheterization of prostatic artery and before injecting embolic, conscious sedation (versed and fentanyl), and anticoagulation (intravenous heparin)
- **Post-procedure**
 - Remove foley
 - Medications: ibuprofen 800mg TID x 7 days, ciprofloxacin 500mg BID x 7 days, Pyridium 100-200mg TID, Vesicare 5mg daily, Dulcolax 20mg OD
 - Intravenous fluids, restrict physical activity x 2-3 days, and follow-up (4-6 weeks s/p PAE)

Technique

- 1) Radial access with tumescent anesthesia (100mcg nitroglycerine, 9mL 1% lidocaine)
 - Recommend anti-spasmodic radial cocktail (e.g. 200mcg nitroglycerine, 2000 IU heparin, 2.5mg verapamil)
- 2) Hypogastric angiogram: identify prostatic artery and origin,
- 3) Catheterization of prostatic artery: materials include ≤2.4F shapable tip wire 0.014 inch
- 4) Selective injection of prostatic artery
- 5) Cone beam protocols
- 6) Embolization of prostatic artery: slow injection, identify potential non-targets, and embolize with coils if necessary
- 7) Hemostasis

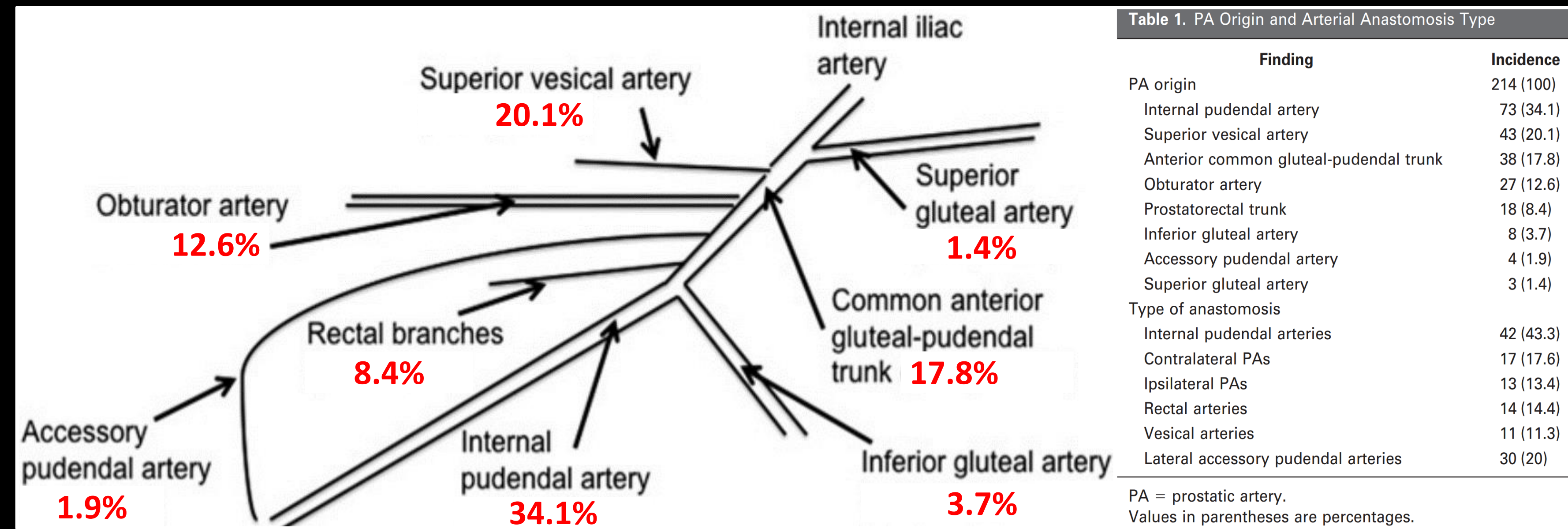


Table 1. PA Origin and Arterial Anastomosis Type

PA origin	Incidence
Internal pudendal artery	214 (100)
Superior vesical artery	73 (34.1)
Anterior common gluteal-pudendal trunk	43 (20.1)
Obturator artery	38 (17.8)
Prostatorectal trunk	27 (12.6)
Inferior gluteal artery	18 (8.4)
Accessory pudendal artery	8 (3.7)
Superior gluteal artery	4 (1.9)
Superior pudendal artery	3 (1.4)
Type of anastomosis	
Internal pudendal arteries	42 (43.3)
Contralateral PAs	17 (17.6)
Ipsilateral PAs	13 (13.4)
Rectal arteries	14 (14.4)
Vesical arteries	11 (11.3)
Lateral accessory pudendal arteries	30 (20)

PA = prostatic artery. Values in parentheses are percentages.

Figure 1: Prostatic Origin and Arterial Anastomosis⁵

Figure 2: Meta-Analysis of Improvements of I-PSS (A)⁶ and Table of Adverse Events (B)⁶

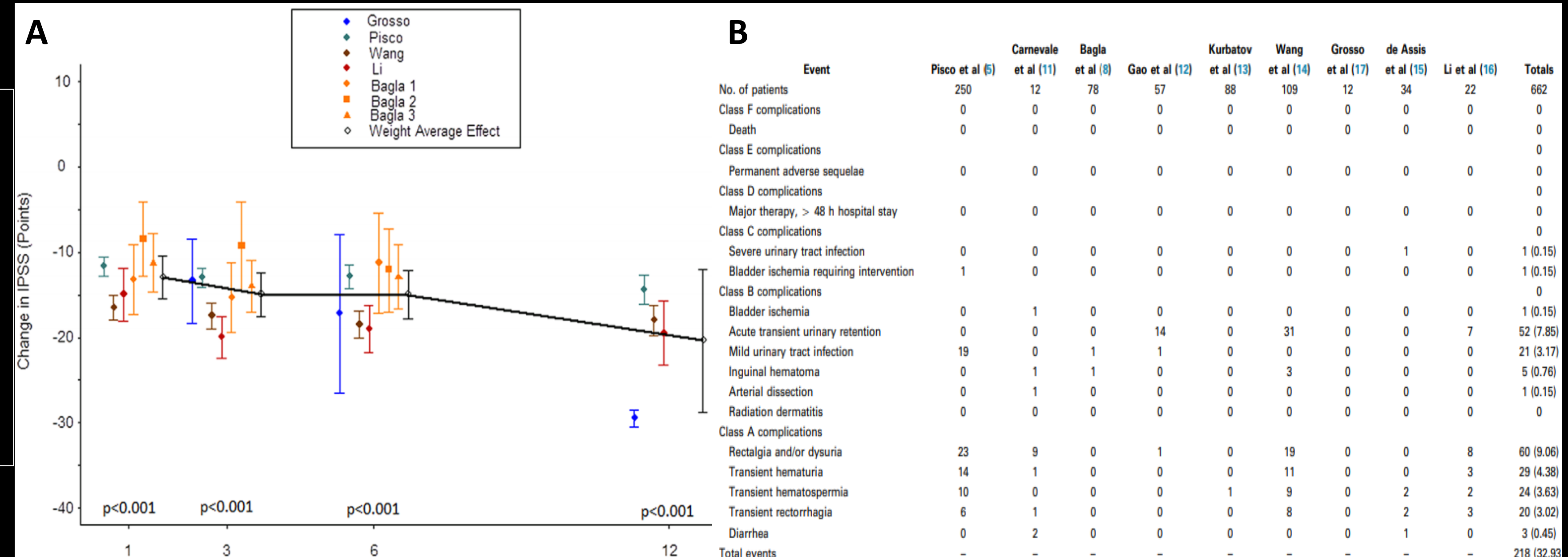


Figure 3: International Prostate Symptom Score (I-PSS)⁷

In the past month	Not at all	Less than 1 in 5 times	Less than half the time	About half the time	More than half the time	Almost always	Patient Score
Incomplete Emptying	0	1	2	3	4	5	
Frequency	0	1	2	3	4	5	
Intermittency	0	1	2	3	4	5	
Urgency	0	1	2	3	4	5	
Weak Stream	0	1	2	3	4	5	
Straining	0	1	2	3	4	5	
Nocturia	None	1 Time	2 Times	3 Times	4 Times	5 Times	
Total I-PSS Score							
Scoring	1-7: Mild			8-19: Moderate		20-35: Severe	

References

- 1) McWilliams JP, Kuo MD, Rose SC, et al. Society of Interventional Radiology Position Statement: Prostate Artery Embolization for Treatment of Benign Disease of the Prostate. *J Vasc Interv Radiol* 2014; 25:1349-1351.
- 2) Gao YA, Huang Y, Zhang R, et al. Benign prostatic hyperplasia: prostatic arterial embolization versus transurethral resection of the prostate—a prospective, randomized, and controlled clinical trial. *Radiology* 2014; 270:920-928.
- 3) S. Goltzarian J, Antunes AA, Bilhim T, et al. 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. *J Vasc Interv Radiol* 2014; 25:665-674.
- 4) Carnevale FC, Soares GR, de Assis AM, et al. Anatomical Variants in Prostate Artery Embolization: A Pictorial Essay. *Cardiovasc Intervent Radiol* 2017 Sep;40(9):1321-1337.
- 5) Bilhim T, Pisco JM, Rio Tinto H, et al. Prostatic arterial supply: anatomic and imaging findings relevant for selective arterial embolization. *J Vasc Interv Radiol*. 2012;23(11):1403-1415. doi:10.1016/j.jvir.2012.07.028
- 6) Uflacker A, Haskal ZJ, Bilhim T, Patrie J, Huber T, Pisco JM. Meta-Analysis of Prostatic Artery Embolization for Benign Prostatic Hyperplasia. *J Vasc Interv Radiol*. 2016;27(11):1686-1697.e8. doi:10.1016/j.jvir.2016.08.004
- 7) Barry MJ, Fowler FJ Jr, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebus WK, Cockett AT. The American Urological Association symptom index for benign prostatic hyperplasia. The Measurement Committee of the American Urological Association. *J Urol*. 1992; 148(5):1549-57; discussion 1564.