2019 MID- ATLANTIC CONFERENCE

9th ANNUAL CURRENT CONCEPTS IN VASCULAR THERAPIES

2019

Hilton Virginia Beach Oceanfront
Virginia Beach, Virginia

MAY 2-4
A Potpourri of Pelvic Pathology: Endovascular Options
Disclosures

• No financial disclosures
• Embolics may be utilized in off-label indications for some of the described procedures
Prevalent Pathologies

- Varicocele
  - Occurs in 15-20% of all males
  - 40% of infertile males

- Pelvic congestion syndrome (PCS)
  - Chronic pelvic pain responsible for 15% of outpatient GYN visits
  - 30% of patients with pelvic pain have PCS
  - 15% with PCS plus additional pelvic pathology

- Uterine artery pathologies
  - Post partum hemorrhage
  - Uterine fibroids
    - Present in 70% of women by onset of menopause
    - Clinically apparent in 25% of women of reproductive age
    - Symptoms severe enough in 25% to require treatment

- Benign Prostatic Hypertrophy
  - 70% US men age 60-69; 80% older than 70 years
  - LUTS: 50% (50-79 years); 70% (80-89 years); 90% (90 years)
Pertinent Venous Anatomy

- Nutcracker syndrome
- May Thurner syndrome
- Varicocele
- No valves
- Left testicular vein
- Ovarian Vein
- Uterine Venous plexus
- Vaginal Venous plexus
- Inferior Iliac vein
- Uterine Vein
**Clinical diagnosis**

- Dilated pampiniform veins greater than 2-3 mm
  - Grade 1: Small, palpable only with Valsalva
  - Grade 2: Moderate, nonvisible, palpable upon standing
  - Grade 3: Large, visible
  - Grade 4: Subclinical, detected only by sonography
Varicocele: Clinical Presentation
Varicocele Embolization

- Treatment indications:
  - Infertility with appropriate semen abnormalities
  - Groin pain
  - Adolescent varicocele with testicular atrophy
  - Cosmetic issues
  - Recurrence after surgery

- Contraindications
  - Bilateral high grade varicocele
  - Primary treatment of infertility
  - Pediatric population
Varicocele Embolization

• Technique
  • Venous access
    • Femoral with reverse curve sheath
    • Jugular
      • Advantage for right side treatment
  • Catheter position at inguinal canal for initial coil
  • Embolic agents
    • Solid: Coils or plugs
    • Liquid: Sclerosant or glue
  • Must occlude parallel collaterals
    • Most common cause of recurrence
Varicocele Embolization
Varicocele Embolization

- Complications:
  - Venous perforation (usually self limited)
  - Coil migration
    - Lung
  - Non-target embolization
    - Colon
  - Periprocedural pain (up to 10 days)
  - Low grade fever
  - Transient thigh numbness
  - Epididymitis

- Post Procedure
  - Return to normal activities in 24-48 hours
  - Avoid heavy lifting for 5-7 days
  - Soft solid or liquid diet X 3 days to avoid constipation
Varicocele Embolization

- Technical Success:
  - 93-100% following surgery
  - Overall technical failure rate is 13%
    - Rare in left sided varicocle
    - Up to 49% on right sided varicocele
- Recurrence:
  - Vary widely from 0-24%
- Follow up:
  - Ultrasound at 3 months
  - Dilated veins may persist
    - Lack of retrograde flow is the determinant of success

<table>
<thead>
<tr>
<th></th>
<th>Recurrence</th>
<th>Mean Follow up (mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glue</td>
<td>4.2%</td>
<td>16.13</td>
</tr>
<tr>
<td>Coils and sclerosant</td>
<td>8.44%</td>
<td>39.3</td>
</tr>
<tr>
<td>Coils alone</td>
<td>9.1%</td>
<td>39.3</td>
</tr>
<tr>
<td>Sclerosant alone</td>
<td>11.03%</td>
<td>25.48</td>
</tr>
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</table>

Br J Radiology. 2018 Jul;91(1088)
Pelvic Congestion Syndrome

- Noncyclic unilateral or bilateral lower abdominal and pelvic pain of at least 6 months duration
- Heaviness and fullness in lower pelvis, vulvar region or thigh
- Worst at the end of the day or with prolonged standing
- Post-coital pain
- Improves with lying down
- Worsened symptoms during menses
- Depression and anxiety
Pelvic Congestion Syndrome

- Differential diagnostic consideration
  - Endometriosis
  - Inflammatory bowel disease
  - Fibroids
  - Adenomyosis
  - Other
    - Includes psychiatric
- Often cannot make diagnosis until symptoms improve after therapy
  - Embolization both therapeutic and “diagnostic”
Pelvic Congestion Syndrome

- Relationship to a complex spectrum of pathologies
  - Postural Orthostatic Tachycardia (POTS)
  - Interstitial Cystitis
  - Chronic Fatigue Syndrome
  - Irritable Bowel Syndrome
  - Migraine
Members of SIR and ACP announce the formation of a work group to establish a definition/classification system for pelvic venous disorders.

By Kathleen Gibson, MD; Neil Khilnani, MD, FSIR, FACPh; and Mark Meissner, MD

May 10, 2018—Over the last several years, we have seen an increased awareness of the morbidity associated with pelvic venous disorders. The clinical spectrum of pelvic venous disorders includes chronic pelvic pain; vulvar and lower extremity varicose veins; pain in the perineum or a scrotal varicocele; lower extremity pain, edema, or venous claudication; flank pain with or without hematuria; or any combination of these symptoms. The complex anatomy of the abdominal and pelvic venous circulation is only beginning to be
# Pelvic Congestion Syndrome

<table>
<thead>
<tr>
<th>Modality</th>
<th>Imaging Findings</th>
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| Conventional venography (4) | Dilated gonadal, uterine, and utero-ovarian arcade veins >5 mm in diameter  
Retrograde caudal flow in the gonadal vein (unilateral or bilateral)  
Filling of the pelvic veins across the midline via the utero-ovarian arcade  
Opacification of vulvovaginal and/or thigh varices  
Stagnation of contrast material in the pelvic veins |
| Transvaginal US (6,31) | Multiple dilated parauterine varices  
Diameter >4 mm  
Slow flow ≤3 cm/sec  
Dilated arcuate vein in the myometrium, crossing the midline  
Polycystic ovarian configuration |
| Transabdominal US (6) | Retrograde flow in a dilated right or left gonadal vein  
Dilated gonadal vein >5 mm |
| MRI (4,6,37,39) | Retrograde caudal flow of contrast material at time-resolved MR angiography  
Dilated parauterine varices  
Heterogeneous or T2-hyperintensity due to slow flow  
Presence of an arcuate vein crossing the midline, vulvar and/or thigh varices  
Polycystic ovarian configuration  
Absence of an obstructing mass or structural obstruction  
No evidence of endometriosis (although superficial endometriosis deposits may not be seen at MRI or with other imaging modalities) |
| CT (39) | Four ipsilateral tortuous and dilated parauterine veins (at least one >4 mm)  
Dilated gonadal vein (diameter >8 mm, unilateral or bilateral)  
Absence of obstructing mass or structural obstruction |
Pelvic Congestion Syndrome

- Prevalence of pelvic varices reported as up to 10% of the general population
  - Only 40% may develop Pelvic Venous Insufficiency
- Not all women with gonadal vein dilatation and parauterine varices have Pelvic Congestion Syndrome or Pelvic Venous Insufficiency
Pelvic Congestion Syndrome Embolization

- **Technique**
  - Detailed venographic evaluation
    - Determine which vessels contribute
      - Left renal vein (“Nutcracker”)
      - Left common iliac vein (“May-Thurner”)
      - Gonadal
        - Unilateral/bilateral?
    - Determine which vessels to embolize
      - Any combination of the above
    - Similar to varicocele treatment
      - More often need for bilateral embolization
Pelvic Congestion Embolization
UAE and PAE

- Similar historical background
- Embolization initially utilized to treat hemorrhage
- Unexpected outcomes noted
- Led to research for elective indications
  - Eventually led to adoption
  - Often patient driven
- Face significant resistance from referring physicians
  - Competitive to standard of care
ACOG Committee Opinion. Uterine artery embolization.

Committee on Gynecologic Practice, American College of Obstetricians and Gynecologists.

Abstract

Uterine artery embolization for the treatment of symptomatic uterine leiomyomata has become increasingly popular. Based on current evidence, it appears that uterine artery embolization, when performed by experienced physicians, provides good short-term relief of bulk-related symptoms and a reduction in menstrual flow. Complication rates associated with the procedure are low, but in rare cases can include hysterectomy and death. There is insufficient evidence to ensure its safety in women desiring to retain their fertility, and pregnancy-related outcomes remain understudied. The American College of Obstetricians and Gynecologists’ Committee on Gynecologic Practice considers the procedure investigational or relatively contra-indicated in women wishing to retain fertility. The use of uterine artery embolization in postmenopausal women is rarely, if ever, indicated. The Committee strongly recommends that women who wish to undergo uterine artery embolization have a thorough evaluation with an obstetrician-gynecologist to help facilitate optimal collaboration with interventional radiologists and to ensure the appropriateness of this therapy, taking into account the reproductive wishes of the patient. It is also recommended that all patients considering uterine artery embolization be adequately informed about potential complications.

PMID: 14754718
[Indexed for MEDLINE]
Clinical recommendations on the use of uterine artery embolisation (UAE) in the management of fibroids

Third edition (2013)

1. Summary of recommendations

1. The early- and medium-term (to five years) results of uterine artery embolisation (UAE) are good. It is as effective as surgery for symptom control, with the caveat that about a third of women will require a second intervention by five years.

2. For women with symptomatic fibroids, UAE should be considered as one of the treatment options alongside surgical treatments (such as myomectomy and hysterectomy), endometrial ablation, medical management and conservative measures.

3. The evidence for fertility and pregnancy outcomes after UAE and after myomectomy is poor. Similarly there is no robust evidence comparing UAE or myomectomy for these outcomes. Currently, it is impossible to make an evidence-based recommendation about treatment (UAE or myomectomy) for women with fibroids who wish to maintain their fertility. Treatments for fibroids in women of childbearing age who wish, or might wish, to become pregnant in the future should be offered only after fully informed discussion.

4. The procedure is contraindicated in women who have evidence of current or recent pelvic infection, who are pregnant, who are not prepared to accept the small risk of the requirement for hysterectomy in the event of complication or in whom there is significant doubt about the diagnosis of benign pathology.

5. Patients for UAE should be selected and assessed by a multidisciplinary team including a gynaecologist and an interventional radiologist. Direct referral from primary care to an interventional radiologist is acceptable, although local governance arrangements should ensure gynaecology input into the management of patients referred in this manner. Accurate pretreatment diagnosis with MRI is recommended.

6. The procedure should only be undertaken by radiologists with established competence in embolisation techniques who have undergone appropriate training.

7. The responsibilities of both gynaecologist and radiologist for the care of the patient should be established prior to treatment and be set out in a relevant hospital protocol. The patient must be under a named responsible consultant at all times – this could be a radiologist or a gynaecologist (or both). Comprehensive follow-up protocols should be established. This should include contact telephone numbers for advice after discharge from hospital.

8. These recommendations are intended for both the National Health Service and the private sector.
Prostate Artery Embolization

- NICE (National Institute for Health and Care Excellence) Britain

1 Recommendations

1.1 Current evidence on the safety and efficacy of prostate artery embolisation for benign prostatic hyperplasia is adequate to support the use of this procedure provided that standard arrangements are in place for clinical governance, consent and audit.

1.2 Patient selection should be done by a urologist and an interventional radiologist.

1.3 This technically demanding procedure should only be done by an interventional radiologist with specific training and expertise in prostatic artery embolisation.

- UK ROPE (Registry of Prostate Embolization)

The UK ROPE Study

The UK ROPE Study: efficacy and safety of prostate artery embolisation for benign prostatic hyperplasia. An observational study and propensity matched comparison with transurethral resection of the prostate


- But......
Guideline Statement 21

Prostate Artery Embolization (PAE)
21. PAE is not recommended for the treatment of LUTS attributed to BPH outside the context of a clinical trial. (Expert Opinion)
UAE and PAE
UAE and PAE

- Historic origins
  - UAE
    - 1974 Merland (Paris)
      - Menorrhagia in disabled woman treated with embolization
      - Began pre-op embolization in collaboration with Dr. Ravina
        - Several patients improved and did not require surgery
    - 1997: Goodwin reported a series of patients treated in the US
  - PAE
    - Between 1976 and 1990 multiple case reports of bleeding control of hematuria of prostatic origin
    - 2000: Case report for bladder outlet obstruction and hematuria in a non-surgical candidate
    - 2008: Animal experiments
    - 2010: First intentional treatment in humans
    - 2013: Early cohort studies
Why Endovascular?

- Less invasive
- More rapid recovery
  - Less time away from work
    - Particularly since fibroid patients are often young
- Less unwanted consequences
  - UAE
    - Preserve uterus
    - Preserve ability for pregnancy
  - PAE
    - Avoid neurogenic issues related to prostatectomy (sexual dysfunction)
    - Incontinence
    - Stricture
- Avoid general anesthesia
UAE and PAE Anatomic Substrate

Figure 1: Illustration of fibroid location classification. A type I utero-ovarian anastomosis is depicted on the left of the figure (straight arrow) with flow from the ovarian artery toward the uterus in the tubo-ovarian segment feeding into the intramural portion of the uterine artery (curved arrowheads indicate direction of blood flow). A type II utero-ovarian anastomosis is depicted on the right of the figure (open arrowhead) with at least partial direct supply of the fibroid by the ovarian artery without prior connection to the uterine artery. Note that less common extraterine locations, such as cervical or broad ligament fibroids, are not included (the incidences of which have not been well studied).

Figure 3: Illustration of an angiographic classification of uterine artery branching patterns (IGA = inferior gluteal artery, SGA = superior gluteal artery, UA = uterine artery). Type I: Uterine artery as first branch of inferior gluteal artery. Type II: Uterine artery as second or third branch of inferior gluteal artery. Type III: Trifurcation. Type IIIa: Uterine artery and superior gluteal artery bifurcation with inferior gluteal artery as a branch of the latter. Type IV: Uterine artery as a first branch of the internal iliac artery. Type I and III comprise about 90% of cases with equal frequency.
UAE and PAE Anatomic Substrate

PROVISO Acronym
- Pudendal
- Rectal
- Obturator
- Vesical
  - Inferior
  - Superior
- Oblique

Table 1: Angiographic anatomical classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Anatomical description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>IVA originating from anterior division of IIA, in a common trunk with SVA</td>
</tr>
<tr>
<td>Type II</td>
<td>IVA originating from anterior division of IIA, inferiorly to SVA</td>
</tr>
<tr>
<td>Type III</td>
<td>IVA originating from obturator artery</td>
</tr>
<tr>
<td>Type IV</td>
<td>IVA originating from IPA</td>
</tr>
<tr>
<td>Type V (others)</td>
<td>Less common origins</td>
</tr>
</tbody>
</table>
Uterine Artery Embolization

• Elective
  • Symptomatic uterine fibroids
  • Adenomyosis?
  • Preoperative in cases of abnormal placentation
    • Balloon occlusion

• Emergent
  • Post partum hemorrhage
PPH: Scope of the Problem

- Severe bleeding is the single most common cause of maternal death worldwide.
- More than half of all maternal deaths occur within 24 hours of delivery, most commonly from excessive bleeding.
- 140,000 women die of post partum hemorrhage worldwide each year.
  - 1 every 4 minutes.
PPH: Classification

- **Primary/Early PPH:** Within the first 24 hours after delivery
  - Uterine atony
  - Abnormal placentation
  - Surgical injury
  - Uterine inversion

- **Secondary/Delayed PPH:** Occurring more between 24 hours and 6 weeks after delivery
  - Subinvolution of placental site
  - Retained products of conception
  - Endometritis
  - Vascular lesions
    - Uterine artery PSA; Uterine AVM
PPH: Etiologies

The 4 T’s

- Tone: (uterine atony, uterine inversion)
- Tissue: (retained placenta or blood clots, abnormal placentation, connective tissue disorders)
- Trauma: (lower genital tract lacerations, pseudoaneurysms, uterine rupture)
- Thrombotic disorders: (coagulopathic state, anticoagulant use)
PPH: Surgical Management

- When uterotonic agents with or w/o tamponade fail to control hemorrhage:
  - Bilateral hypogastric artery ligation
  - Bilateral uterine artery ligation
    - Ligation of vessels in the uteroovarian ligaments
  - B-lynch suture technique
    - Mechanically compress an atonic uterus
  - Repair uterine rupture
  - Hysterectomy
    - Associated loss of future fertility
Post Partum Hysterectomy

- 1/1000 deliveries in 1990
- Decreased to 1/2000 deliveries by 2009
  - Successful conservative treatments
- Indications for post partum hysterectomy
  - Failure of conservative therapy
  - Complex uterine rupture
  - Abnormal placental adhesion
# Embolization: First Reported Case

**Author**  
Brown, Bryant J. MD; Heaston, Dennis K. MD; Poulson, A. Marsh MD; Gabert, Harvey A. MD; Mineau, D. Edward MD; Miller, Franklin J. Jr., MD

**Institution**  
From the Departments of Obstetrics and Gynecology and Radiology, The University of Utah Medical Center, Salt Lake City, Utah.

**Title**  
UNCONTROLLABLE POSTPARTUM BLEEDING: A NEW APPROACH TO HEMOSTASIS THROUGH ANGIOGRAPHIC ARTERIAL EMBOLIZATION. [Report]

**Source**  

**Abstract**  
A case of severe postpartum hemorrhage is reported. Three separate surgical procedures failed to reveal the source of bleeding, and standard surgical techniques, including bilateral ligation of the hypogastric arteries, were unsuccessful in producing hemostasis. However, angiography successfully identified the specific bleeding vessel, and transcatheter embolization with Gelfoam fragments quickly and effectively stopped the hemorrhage. The authors consider angiographic embolization to be an effective alternative approach to the control of pelvic hemorrhage and recommend that the technique be considered prior to surgical intervention.

(C) 1979 The American College of Obstetricians and Gynecologists
UAE for Post Partum Hemorrhage

- Data limited as studies lack standardization
  - Patient selection
  - Embolization technique
- Lack of randomized control trials
  - Comparing pharmacologic, surgical and endovascular interventions
- Underutilized despite ability to preserve uterus and future childbearing potential
  - Limited awareness of referring clinicians
Primary Postpartum Hemorrhage: Outcome of Pelvic Arterial Embolization in 251 Patients at a Single Institution

Advances in Knowledge

- Pelvic arterial embolization (PAE) is a safe and effective treatment for primary postpartum hemorrhage (PPH) with high technical success (89.6% [225 of 251]) and initial clinical success (86.5% [217 of 251]) rates.
- Overall bleeding control increased to 98.0% (246 of 251) with repeat PAE and/or surgery.
- Multivariate analysis showed that disseminated intravascular coagulation (DIC) and massive transfusion were significantly related to clinical failure (clinical failure rate of 38% and 29%, respectively; $P < .05$ for both).
- Regular menstruation resumed in the majority of patients (97.3% [110 of 113]).

Implication for Patient Care

- PAE for primary PPH is safe and effective with bleeding control achieved in 86.5% of patients after an initial session of PAE; patients with associated DIC and massive transfusion are likely to have a poor outcome after PAE.
How then to integrate IR into the paradigm?

- Emergent intervention
- Elective and prophylactic intervention
  - Balloon catheter placement
  - Embolization
  - Patients with known diagnosis increasing PPH risk
    - Documented accreta
    - Placenta previa with prior history of C-section
    - Cervical pregnancy
Identify high risk patients and engage multidisciplinary input early

- Development of SNGH Placenta Accreta Clinic
- Dedicated fellow associated with high risk OB service
- All patients in region treated in one center
UAE for Fibroid Disease

• Fibroids are the most common benign pelvic neoplasm
  • 50% present with symptoms
    • Heavy menstrual bleeding
    • Frequent menstruation
    • Pelvic pain (dysmenorrhea, dyspareunia)
    • Bulk related symptoms (pelvic pressure, urinary frequency, incontinence, constipation, leg and back pain)
• Adenomyosis
Uterine Fibroid Treatment

- Medical therapy
  - Gonadotropin releasing hormone agonists
  - Tranexamic acid
- Progestin releasing IUD
- Surgery
  - Myomectomy
  - Hysterectomy
    - Responsible for 30% of 600,000 hysterectomies in US yearly
- Myolysis
  - RFA
  - Cryo
- Uterine artery embolization
- HIFU
UAE Evaluation

- History and Physical
  - Pap smear
  - Endometrial biopsy
    - Small risk (1:350-1000 or less) malignancy could be present
      - Less in younger patients
- Imaging evaluation
  - US
  - MRI
    - Exclude additional pathology
    - Localize fibroids
      - Submucosal/intramural/subserosal
    - Size fibroids
    - Determine number of fibroids
UAE Technique

• Vascular access
  • Femoral Unilateral
  • Femoral bilateral
    • Decrease procedure time
    • Decrease radiation dose
  • Radial
    • Patients may sit up or turn on side
      • Advantage if significant pain or nausea and vomiting

• Embolic Agents
  • Most often particles
    • 500-700 micron or 700-900 micron
      • Vessels of perifibroid plexus typically 500-800 micron diameter
      • Typically larger than utero-ovarian collaterals
UAE: Post Procedure

• Post embolization pain is the most significant issue
  • Usually 48-72 hours
    • Can last up to a month
    • Can be managed as inpatient or outpatient
      • Various regimens including and up to PCA pump

• Complications
  • Endometritis requiring antibiotics, delayed contrast reaction, TOA or uterine abscess, amenorrhea, UTI, urinary retention, fibroid sloughing, uterine infarction
  • Non-target embolization
    • Ovary, buttock, sciatic nerve, bladder, vagina
  • Need for hysterectomy < 1%
Uterine Artery Embolization

- Validated as:
  - Safe
  - Effective
  - Cost-efficient
    - 14,000 per year in the US
- Pregnancy
  - Not validated
  - Can occur
    - May have negative effect on subsequent pregnancy
      - Early termination
      - Need for C-section
There was very low quality evidence to suggest that fertility outcomes (live birth and pregnancy) may be better after myomectomy than after UAE, but this evidence was based on a small selected subgroup and should be regarded with extreme caution. The UAE group had a shorter hospital stay and a more rapid return to daily activities. With regards to safety, the evidence on major complications was inconclusive and consistent with benefit or harm, or no difference, from either intervention. However, the risk of minor complications was higher after UAE. Moreover, there was a higher likelihood of needing another surgical intervention after UAE, at two year and at five year follow-up. If we assumed that 7% of women will require further surgery within two years of hysterectomy or myomectomy, between 15% and 32% will require further surgery within two years of UAE. Therefore, it appears that while UAE is a safe option with an earlier initial recovery, it does carry a higher risk of minor complications and the need for further surgery later on.
Benign Prostatic Hypertrophy

- BPH: proliferation of glandular and stromal tissue in the transition zone of the prostate
  - Bladder outlet obstruction and LUTS
    - Assessed by the IPSS/AUASI
    - Validated 35-point scale
      - Includes a QOL score
  - 3 point change is noticeable
  - 30% reduction is considered acceptable for treatment to be considered effective
Benign Prostatic Hypertrophy

- Treatment options
  - Medical therapy
    - Alpha blockers
    - 5–alpha-reductase inhibitors
  - Surgical therapy
    - TURP
      - Glands up to 80-100 cm³.
    - Open prostatectomy
      - Glands > 100 cm³
    - Minimally invasive surgical therapies
      - Green light laser
      - Urolift
      - Transurethral microwave therapy
  - Prostate artery embolization
Prostate Artery Embolization

- Indications:
  - Side effects/failure of medical therapy
  - Poor surgical candidates
  - Patients that refuse surgery
  - Patients desiring to preserve sexual function
  - Specific clinical scenarios
    - Very large prostate
    - Patients with indwelling Foley catheters
    - Hematuria of prostatic origin
Prostate Artery Embolization

• Technically challenging
  • Older patient substrate
  • Atherosclerotic disease common
  • Often small vessels with tortuous anatomy

• Access
  • Femoral
  • Radial
    • Patients < 6 feet tall

• Embolic
  • Particles
    • Sized for 100-500 microns depending on the vessel size
Prostate Artery Embolization

- Safety
  - Post embolization syndrome expected
    - Pain, dysuria, frequency, irritative symptoms
    - Usually resolve in 1 week
    - Treated Symptomatically
  - Minor complications requiring therapy
    - Urinary retention requiring a catheter (2.5 - 4.6%)
    - UTI requiring antibiotics (2.6 - 7.6%)
  - Major complications
    - Rare (6/>2000 patients)
    - 2 required surgery
      - Bladder ischemia requiring partial resection
Prostate Artery Embolization

- Advantages c/w surgery
  - No maximum prostate size
  - Avoids transurethral access eliminating risk of:
    - Urethral stricture
    - Bladder neck stricture
    - Urinary incontinence
    - Can be utilized with prominent median lobe
    - Sexual function better preserved
- Disadvantages c/w surgery
  - Objective measures of urinary function improve less
    - Peak flow rate, PVR
    - Long-term durability not yet established
Society of Interventional Radiology
Multisociety Consensus Position Statement on Prostatic Artery Embolization for Treatment of Lower Urinary Tract Symptoms Attributed to Benign Prostatic Hyperplasia: From the Society of Interventional Radiology, the Cardiovascular and Interventional Radiological Society of Europe, Société Française de Radiologie, and the British Society of Interventional Radiology

Endorsed by the Asia Pacific Society of Cardiovascular and Interventional Radiology, Canadian Association for Interventional Radiology, Chinese College of Interventionalists, Interventional Radiology Society of Australasia, Japanese Society of Interventional Radiology, and Korean Society of Interventional Radiology

Justin P. McWilliams, MD, Tiago A. Bilhim, MD, PhD, EBIR, Francisco C. Camevale, MD, PhD, Shivank Bhatia, MD, Ari J. Isaacson, MD, Sandeep Bagla, MD, Marc R. Sapoval, MD, PhD, Jafar Golzarian, MD, Riad Salem, MD, MBA, Timothy D. McClure, MD, Bruce R. Kava, MD, James B. Spies, MD, MPH, Tarun Sabharwal, MBCh, FRCSI, FRCR, EBIR, Ian McCafferty, MD, MBBS, BSc, MRCP, and Alda L. Tam, MD, MBA

LITERATURE REVIEW

A comprehensive literature review was undertaken using PubMed search terms “(prostate or prostatic) and (embolization or embolisation).” The literature search yielded 280 articles published between the first PAE case series in April 2010 and the date of the literature review in September 2018; 230 of these studies were published in the past 4 years. After excluding duplicative cohorts, case reports, technical papers, letters or comments, and unrelated articles, a total of 67 publications relevant to clinical outcomes following PAE for BPH were identified and reviewed. The total number of patients studied had expanded from 400 at the time of the initial 2014 position statement to more than 2,200, and the longest duration of follow-up increased from 3 years to 6.5 years. Three randomized controlled trials comparing PAE with TURP had been published. Three nonrandomized comparative studies had been performed, 2 comparing PAE with TURP and 1 comparing PAE with OP. Seventeen unique cohort studies were identified from 11 different countries. Six meta-analyses and 19 review articles had been published summarizing the efficacy and safety of PAE. The Executive
RECOMMENDATIONS

1. PAE is an acceptable minimally invasive treatment option for appropriately selected men with BPH and moderate to severe LUTS. (Level of evidence: B; strength of recommendation: strong.)

2. PAE can be considered as a treatment option in patients with BPH and moderate to severe LUTS who have very large prostate glands (> 80 cm³), without an upper limit of prostate size. (Level of evidence: C; strength of recommendation: moderate.)

3. PAE can be considered as a treatment option in patients with BPH and acute or chronic urinary retention in the setting of preserved bladder function as a method of achieving catheter independence. (Level of evidence: C; strength of recommendation: moderate.)

4. PAE can be considered as a treatment option in patients with BPH and moderate to severe LUTS who wish to preserve erectile and/or ejaculatory function. (Level of evidence: C; strength of recommendation: weak.)

5. PAE can be considered in patients with hematuria of prostatic origin as a method of achieving cessation of bleeding. (Level of evidence: D; strength of recommendation: strong.)

6. PAE can be considered as a treatment option in patients with BPH and moderate to severe LUTS who are deemed not to be surgical candidates for any of the following reasons: advanced age, multiple comorbidities, coagulopathy, or inability to stop anticoagulation or antiplatelet therapy. (Level of evidence: E; strength of recommendation: moderate.)

7. PAE should be included in the individualized patient-centered discussion regarding treatment options for BPH with LUTS. (Level of evidence: E; strength of recommendation: strong.)

8. Interventional radiologists, given their knowledge of arterial anatomy, advanced microcatheter techniques, and expertise in embolization procedures, are the specialists best suited for the performance of PAE. (Level of evidence: E; strength of recommendation: strong.)
Summary

• Pelvic venous and arterial pathologies are very common
• There is a trend toward minimally invasive therapies
• Interventional treatments are available and effective for these disease processes
• Interventional therapies are often underutilized
Case 1

- 83 yo M
- BPH, LUTS, hematuria
- Prostate 120 g
- 10 days of hematuria despite CBI and fulguration
- AUA (IPSS) 26
- QOL 3
Case 1

- 83 yo M
- BPH, LUTS, hematuria
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Left internal iliac artery
Common iliac injection
Cone beam CT
8 sec spin
5 sec xray delay
3 for 40 mL injection

Phillips Emboguide
Automatically selects target vessel
(must confirm, this can make errors)

Benefits:
Can overly on screen in any projection in real time
Reduces contrast, dose, time
Left prostate artery, arising from superior gluteal
Left hemiprostate with no shunts
Safe to embolize
Post embolization with 100-300 um embospheres
Right prostate artery
Arising from obturator
Intraprostatic shunt – okay to embolize?

Some other shunt?
Where is this going?
Oblique view
Posterior bladder wall
Not okay to embolize
Coiled it off
Post embolization with 100-300 um Embospheres
And no non-target embolization
Results

- Hematuria stopped
- Discharged the next day
- No follow up for IPSS and QOL yet