What's New In Minimally Invasive Procedures

PAE, UFE, GAE, Emborrhoid

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CARDIOVASCULAR HEALTH CLINIC

What is Interventional Radiology

- What is IR
  - Sub-specialty who provides minimally invasive image guided diagnosis and treatment of diseases
  - Utilize Fluoroscopy, US, CT, and MRI
- Why IR
  - Typically an outpatient procedure
  - Minimally invasive "Procedure" not surgery
    - Reduced cost, shorter recovery times, no large incisions, reduced pain
  - Minimize potential complications
  - Typically performed with moderate sedation

Who is CHC and how are we different?

- Outpatient based practice that provide an alternative to having procedure performed in the hospital.
- State of the art facility
- Reduced waiting periods and process of hospital admissions
- Highest level of endovascular technologies.
- Patient can undergo all necessary evaluation and testing in a single appointment.
- Quicker appointment time.
- Multi-specialty team involving Vascular Surgery and Cardiology

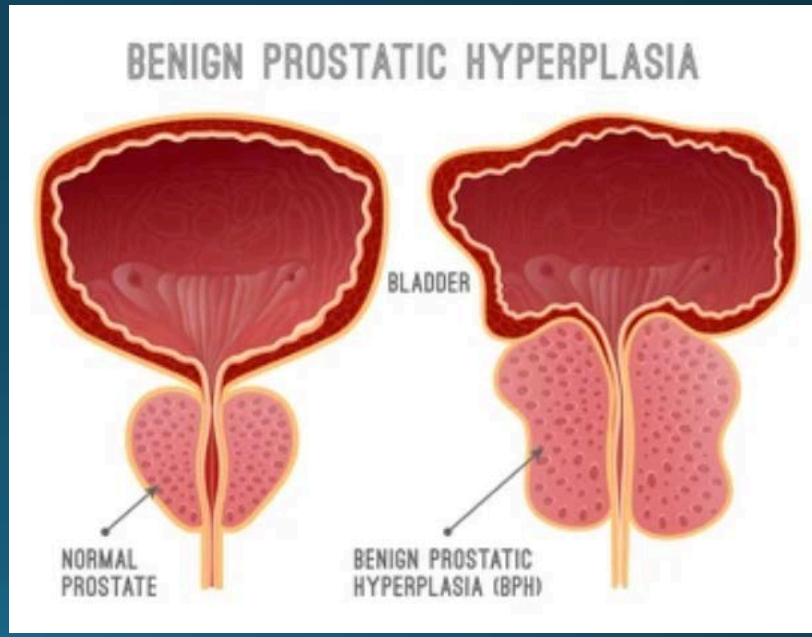
Who are we and how are we different?

- True surgical subspecialty clinic
- Pre and post procedure follow ups
- Direct communication with referring physician and patients


TOSHIBA

Benign Prostatic Hypertrophy

- Benign prostatic hyperplasia affects more than 50% of men by the age of 60 years
- Up to 80% of men older than 70 years
- Prevalence is increasing as the population ages.
- Hormone mediated proliferation of stromal and epithelial tissue within the prostate
- Results in Bladder Outlet Obstruction (BOO)



BPH

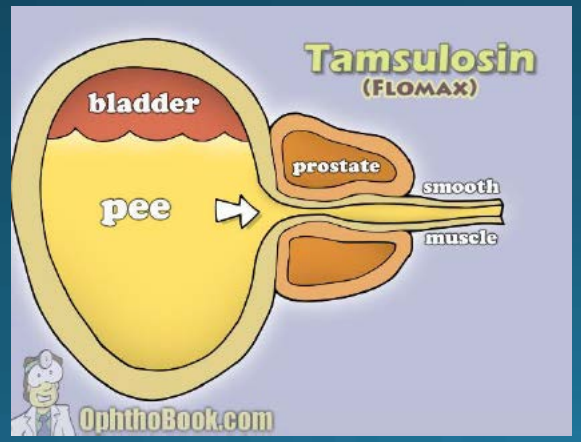
- Nearly 20 million US men have BPH
- 12 million require therapy
- Annual US cost is > 3 billion dollars
- 54% avoided treatment altogether, mostly feared complications

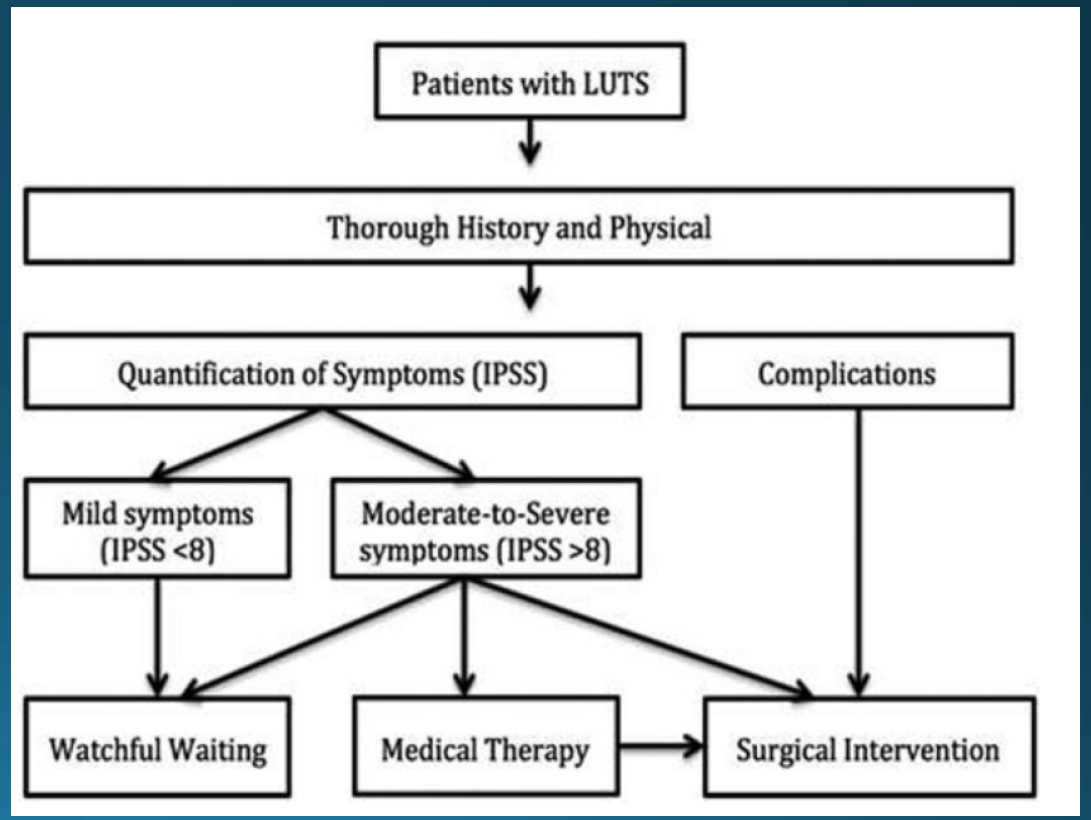
BPH Symptoms

- Obstructive/Voiding
  - Hesitation
  - Straining
  - Weak stream
  - Sensation of incomplete emptying
  - Dribbling
  - Incontinence
  - Urinary retention
- Irritative/Storage
  - Frequency
  - Urgency
  - Dysuria
  - Nocturia

Treatment Options

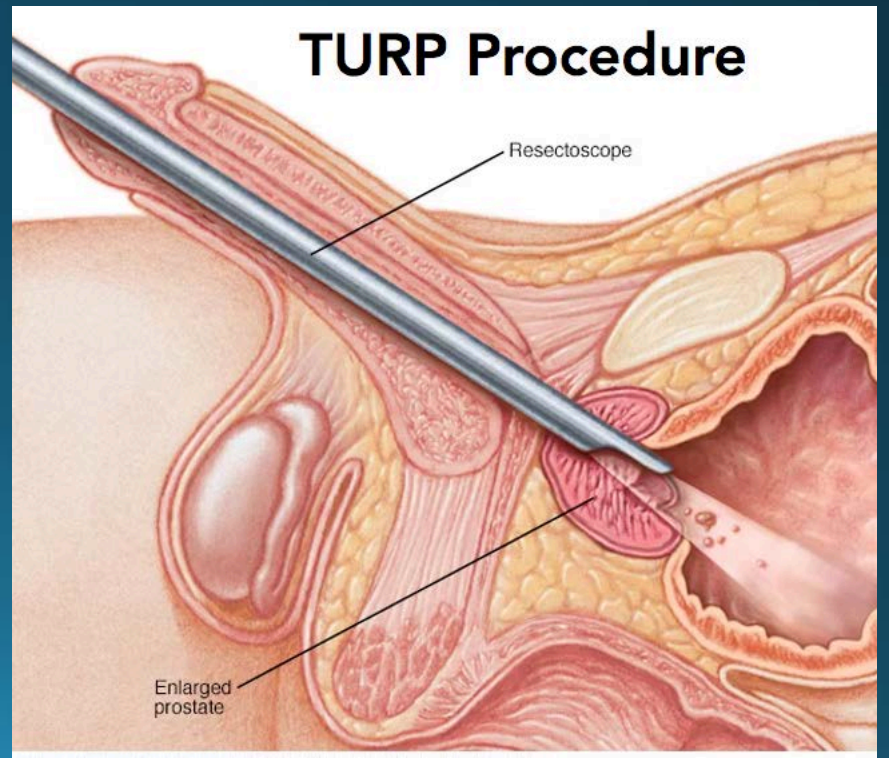
- Medical Therapy
  - α-blocker, 5-α reductase inhibitors
- Surgical Intervention
  - Bipolar TURP
  - Greenlight laser
  - Holmium laser
  - TUNA/TUMT
  - Urolift

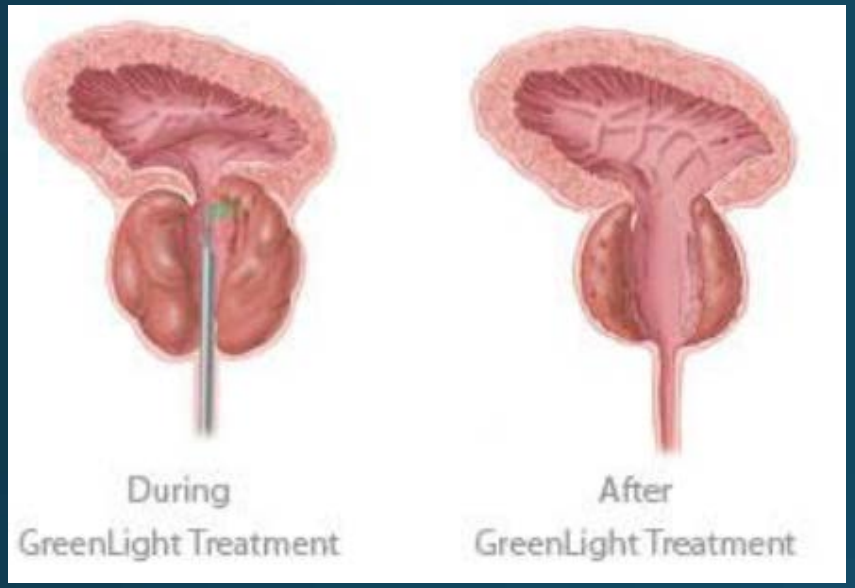


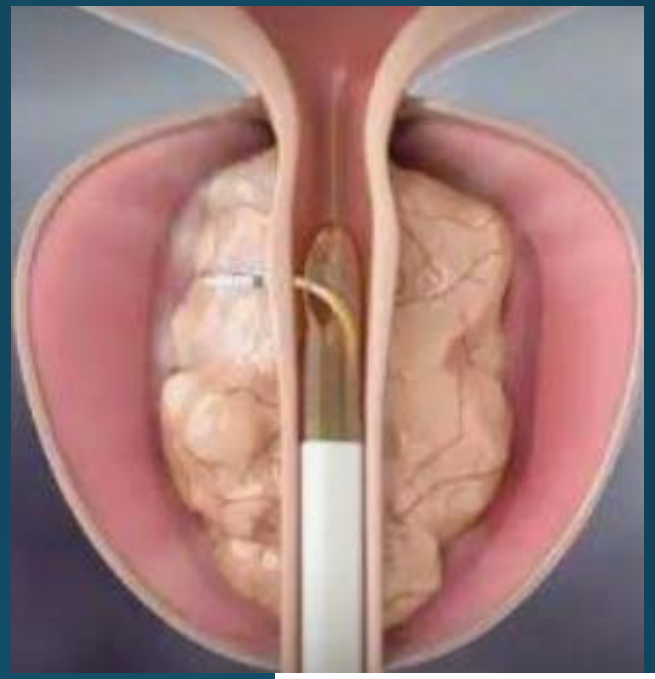


Surgical Treatment Options

- Transurethral resection of the prostate (TURP)
- Considered the surgical standard of care for medium-sized prostates, while prostates larger than 100 mL may require simple prostatectomy
  - Complications 20%:
    - Retrograde Ejaculation
    - Bleeding
    - Incontinence
    - ED







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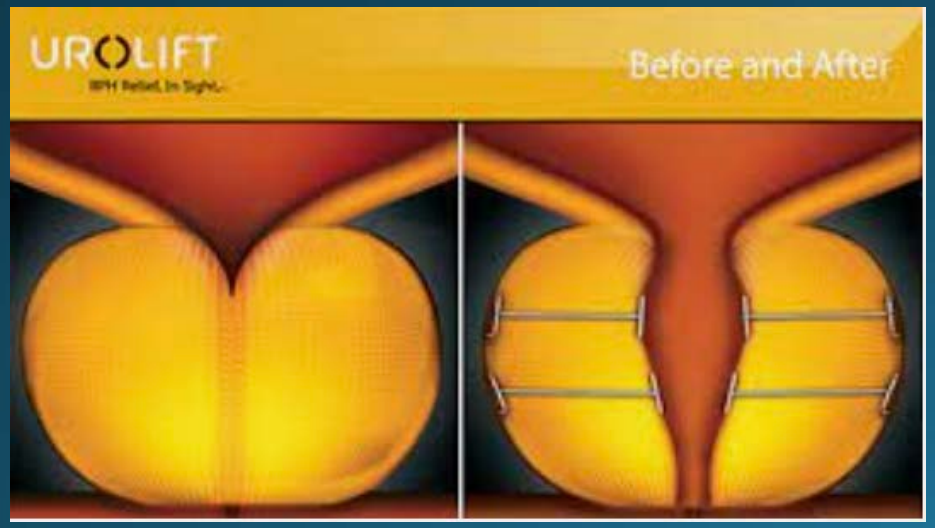
THE NEW WAVE IN BPH TREATMENT



Prostate Artery Embolization

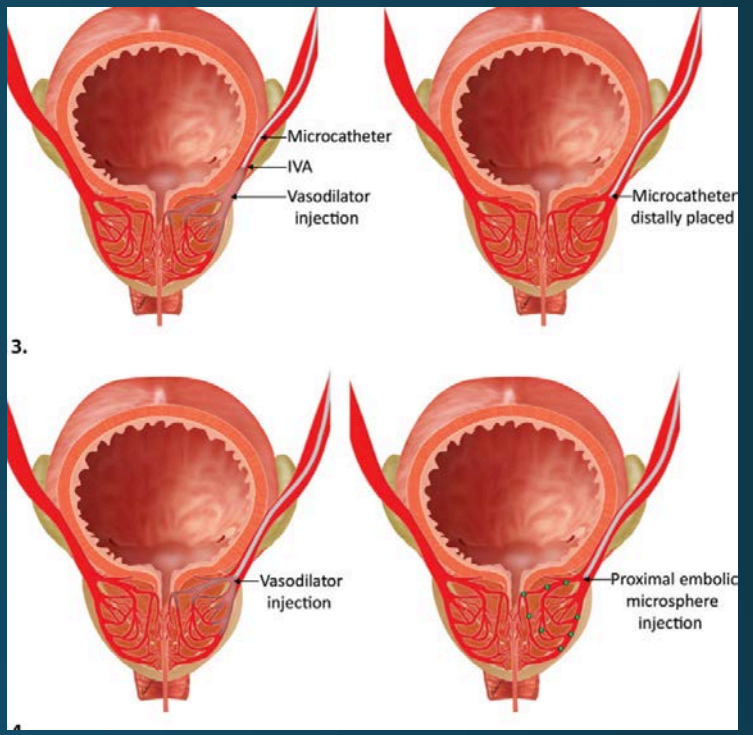
- PAE is technically demanding, and successful outcomes require detailed knowledge of the benign prostatic hyperplasia disease process, patient evaluation, and the pelvic arterial anatomy.

PAE Procedure

- Procedure has been performed for past 30 years
- Studies specifically for LUTS in 2000, DeMeritt et al
- In 2011, a case series evaluating feasibility of PAE in patients with LUTS was published by Pisco et al.[26] PAE was technically successful in 14 of the 15 patients. There was significant IPSS reduction, improved quality of life (QoL), increase in urinary peak flow rate (Qmax), and PV reduction.
- FDA approved January 2018

PAE Procedure

- Similar experience as a heart angiogram
- Outpatient
- No foley catheter
- 1.5 hour recovery time
- 19/20 patient have no post procedure discomfort
- 93% success rate
- Does not exclude from future procedures
- NO SEXUAL SIDE EFFECTS



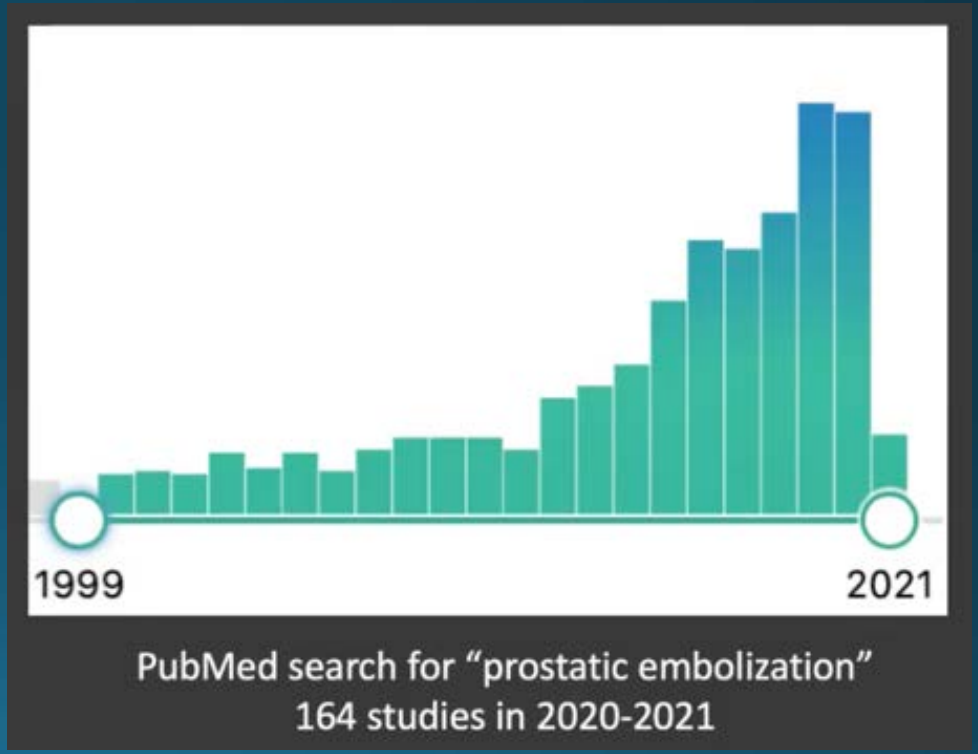
Who is a PAE Candidate

- Moderate to severe IPSS score
  - significantly effecting QOL
- Poor urologic candidates
- Unable to tolerate standard medications
  - poorly responding or side effects
- Hematuria
- Catheter dependent
- Don’t want to risk sexual dysfunction or incontinence

PAE Results

- Most important PAE studies of 2 years

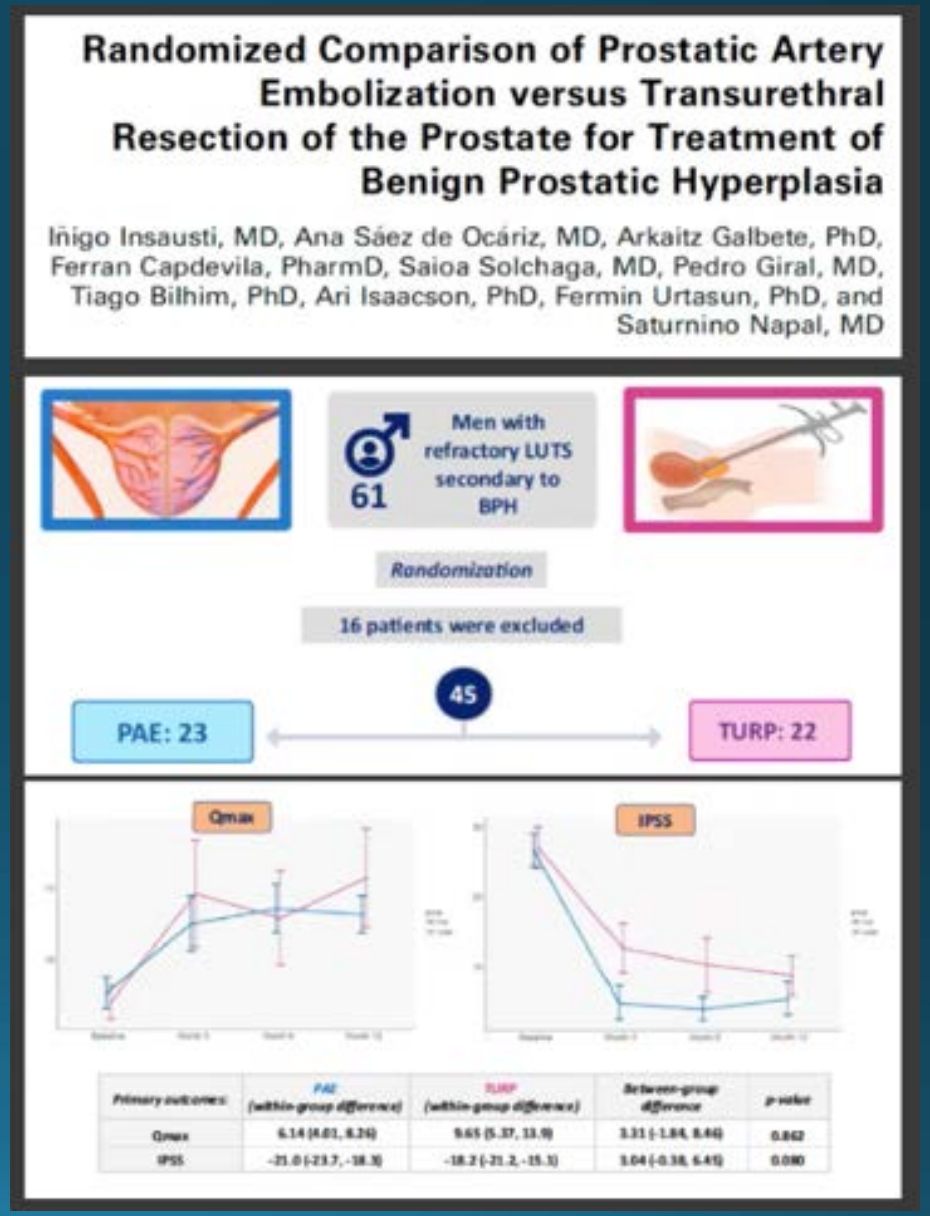
- New RCT vs TURP
- Long term results
- Repeat PAE
- Median Lobe effect
- Drug eluting beads



PubMed search for “prostatic embolization”
164 studies in 2020-2021

Another RCT

- Insausti 2020
  - 23 PAE vs 22 TURP
  - PAE performed with 300-500 Beadblock
  - Compare results out to 1 year
- PAE had similar outcomes
  - IPSS improvement similar 21 vs 18
  - Mean Hgb at 1 month higher for PAE
  - Pain levels lower with PAE
  - Higher satisfaction PAE
  - 3x fewer adverse events



Long Term PAE Results

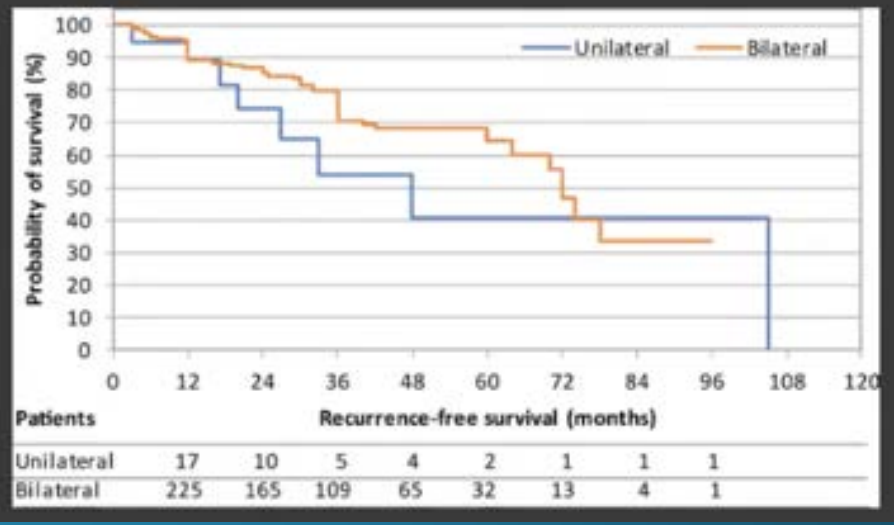
- Carnevale 2020: Retrospective study of 317 patients treated with PAE
  - 94% bilateral vs 6% unilateral
  - 8 year follow up
- Results
  - Mean IPSS improvement 16 points
  - Symptom recurrence in 23% at mean 27 months
  - Recurrence free survival
    - 89% 1 year
    - 80% 2.5 years
    - 35% 6.5 years

Prostatic Artery Embolization for the Treatment of Lower Urinary Tract Symptoms Due to Benign Prostatic Hyperplasia: 10 Years' Experience

Francisco Cesar Carnevale, MD, PhD • Airton Mota Moreira, MD, PhD • Andre Moreira de Assis, MD • Alberto Azambel Antunes, MD, PhD • Vanessa Cristina de Paula Rodrigues • Miguel Srougi, MD, PhD • Giovanni Guido Cerri, MD, PhD

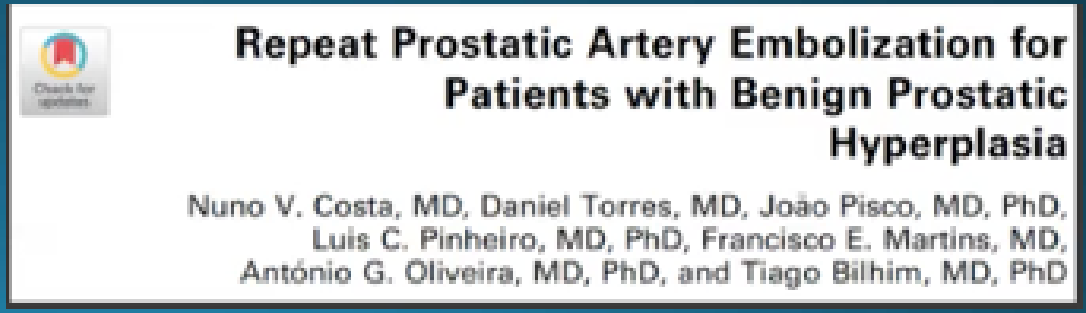
Table 1: Baseline Characteristics of 317 Men Included in the Study

Variable	Mean and Standard Deviation	Range	No. of Men
Age (y)	65 ± 8	46–91	317
IPSS	19.7 ± 6.3	2–35	279
Quality-of-life score	4.8 ± 0.9	0–6	316
Prostatic volume (cm^3)	93 ± 49	30–330	316
PVR (mL)	108 ± 118	0–790	244
PSA level (ng/mL)	5.4 ± 5.4	0.2–37.5	317
Q_{max} (mL/sec)	6.8 ± 4.1	0–25	289



Repeat PAE

- Costa 2020: Retrospective study of 108 patients treated with repeat PAE
  - 39 had no response to first PAE
  - 69 had relapse at >6 months
- Technical
  - 76% had recanalization, 24% collateral supply
  - Repeat procedure longer 81 vs 67 min
- 12 Month Follow Up
  - Better IPSS improvement for relapsers

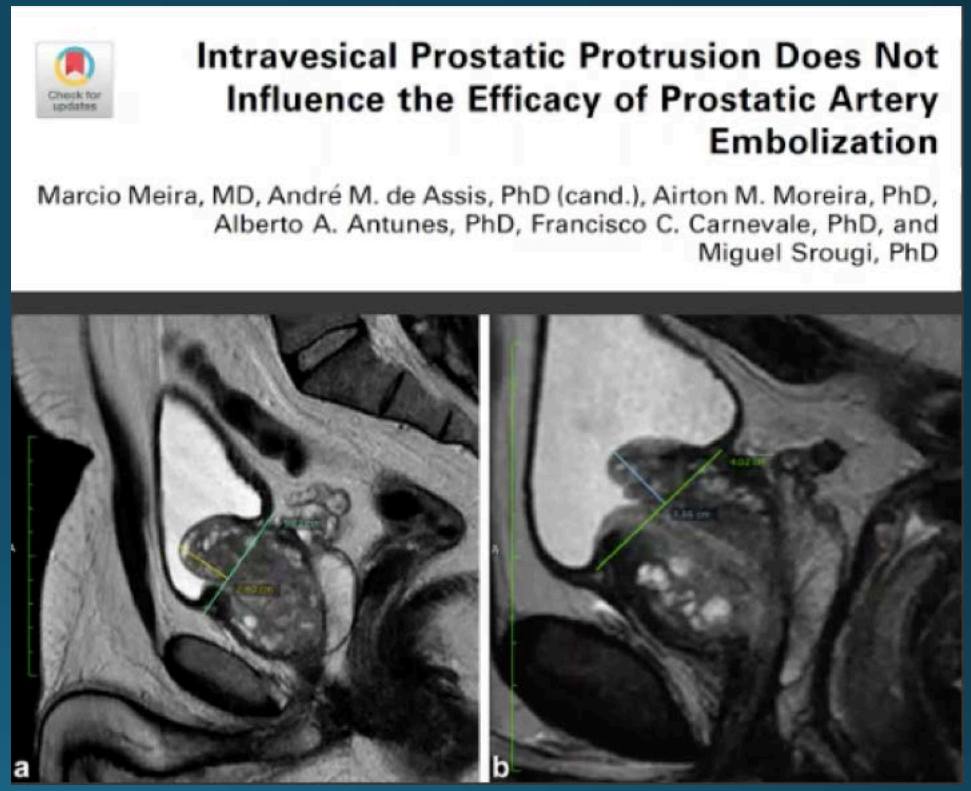


Repeat Prostatic Artery Embolization for Patients with Benign Prostatic Hyperplasia

Nuno V. Costa, MD, Daniel Torres, MD, João Pisco, MD, PhD, Luis C. Pinheiro, MD, PhD, Francisco E. Martins, MD, António G. Oliveira, MD, PhD, and Tiago Bilhim, MD, PhD

Median Lobe Effect

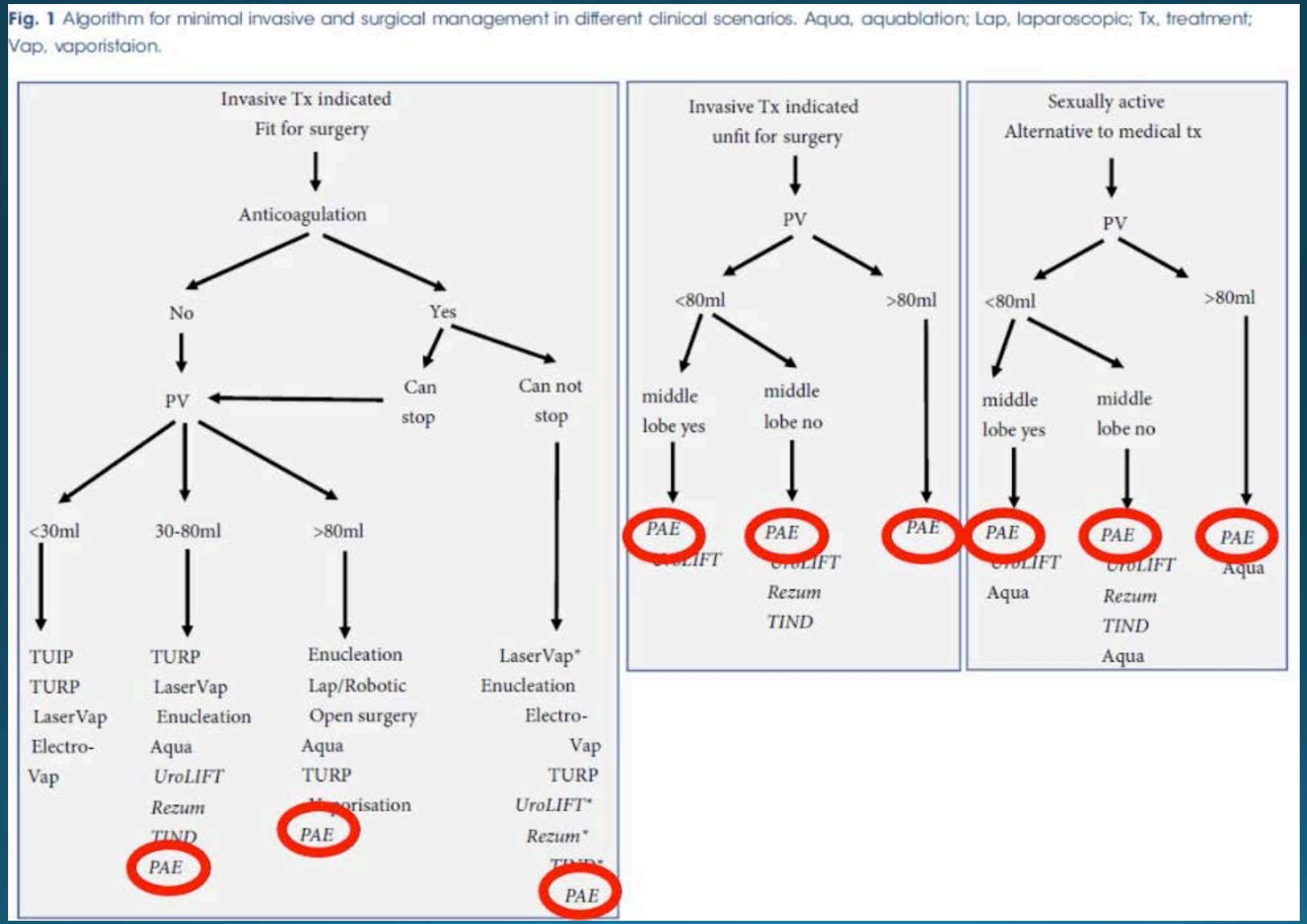
- Meira 2020: Retrospective comparison of 128 PAE pts divided by intra vesical prostatic protrusion
  - 19 grade 1
  - 77 grade 2
  - 32 grade 3
- IPSS improvement similar among all
- Grade 3 had higher complication rate
  - 1 hematuria
  - 1 persistent UTI
  - 1 ball valve effect requiring TURP



Intravesical Prostatic Protrusion Does Not Influence the Efficacy of Prostatic Artery Embolization

Marcio Meira, MD, André M. de Assis, PhD (cand.), Airton M. Moreira, PhD, Alberto A. Antunes, PhD, Francisco C. Carnevale, PhD, and Miguel Srougi, PhD

Hopefully soon



PAE Complications

- Major
  - Bladder ischemia 0.4%
- Minor
  - Dysuria 9.2%
  - UTI 7.6%
  - Self limiting hematuria 5.6%
  - Self limiting hematospermia 0.4%
  - Self limiting hematochezia 2.4%

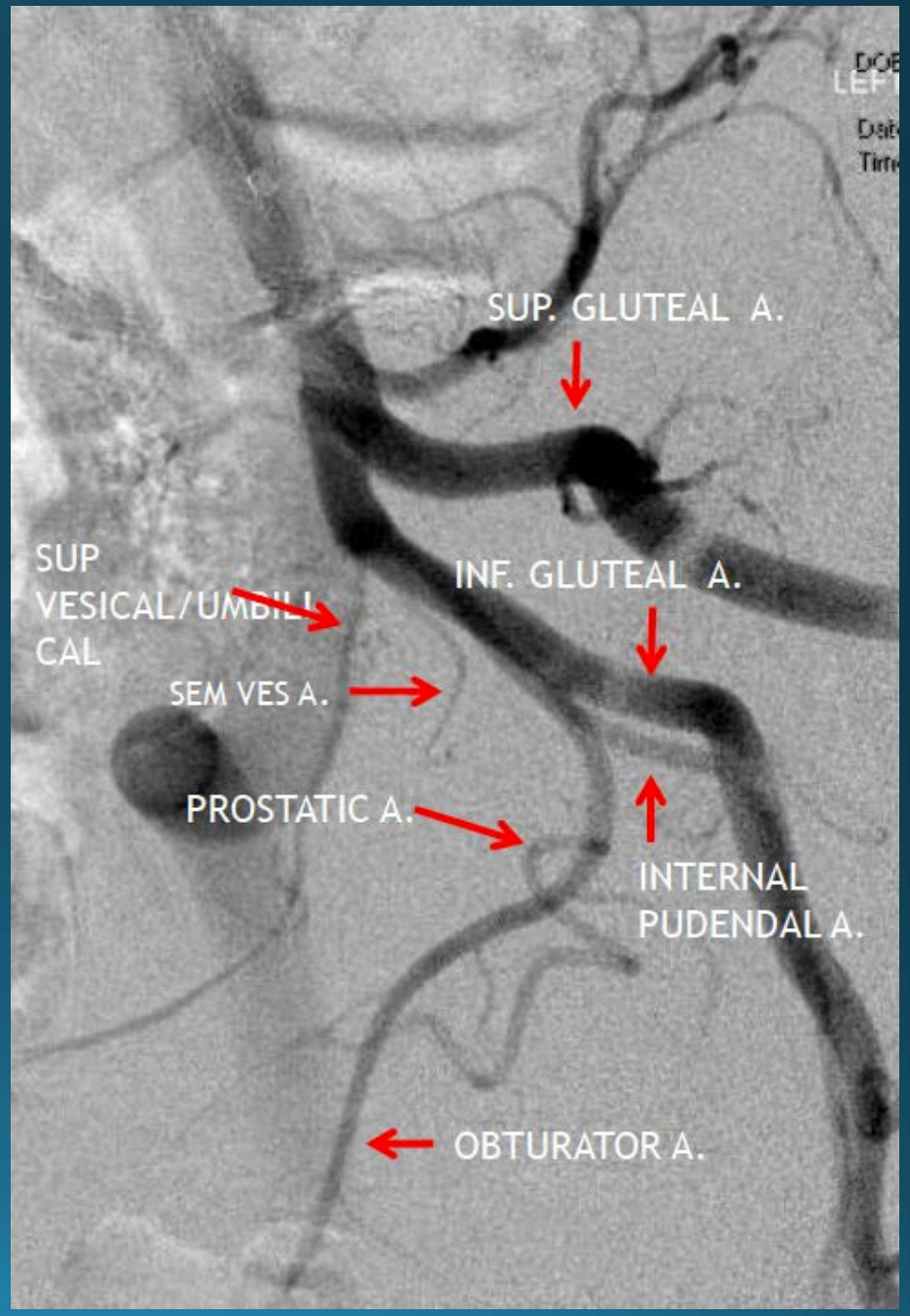
PAE

- What about prostate cancer?
  - PAE is not a treatment for malignancy
  - Can be performed on patients with low grade malignancy and LUTS

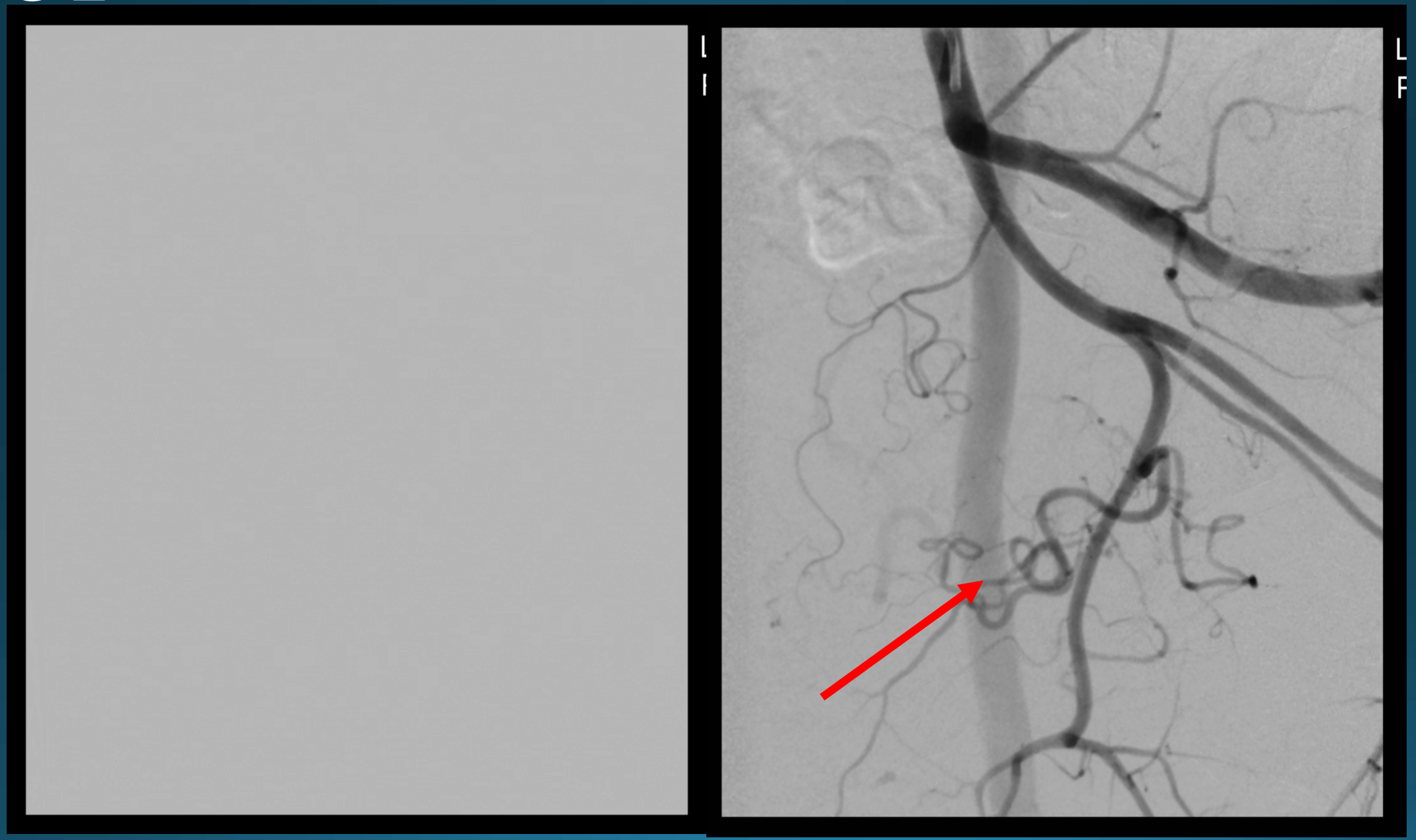
- PSA
  - Procedure will temporarily increase PSA secondary to inflammation.
  - Will ultimately decrease below prior baseline secondary to decrease prostatic volume.

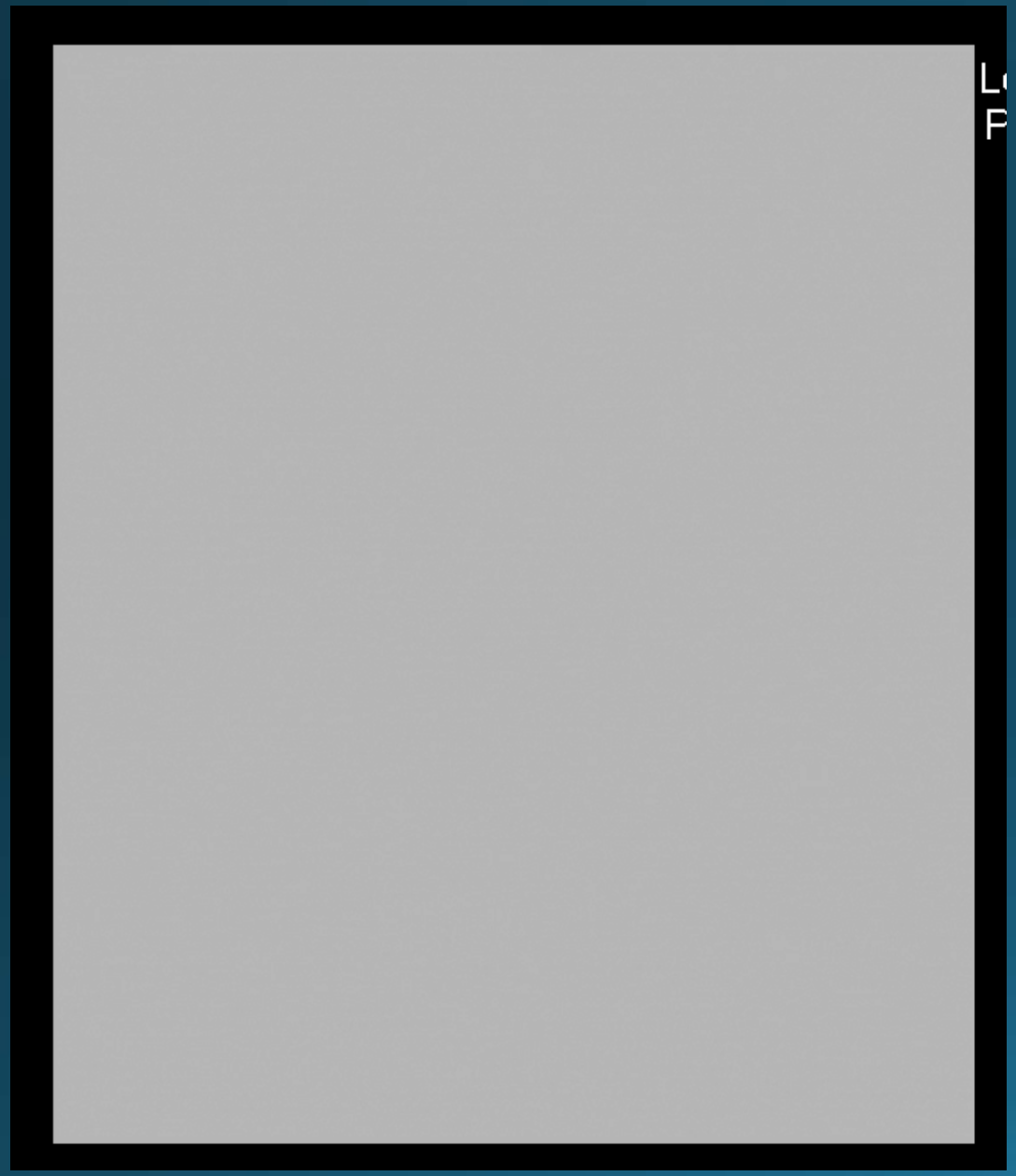
Anatomy

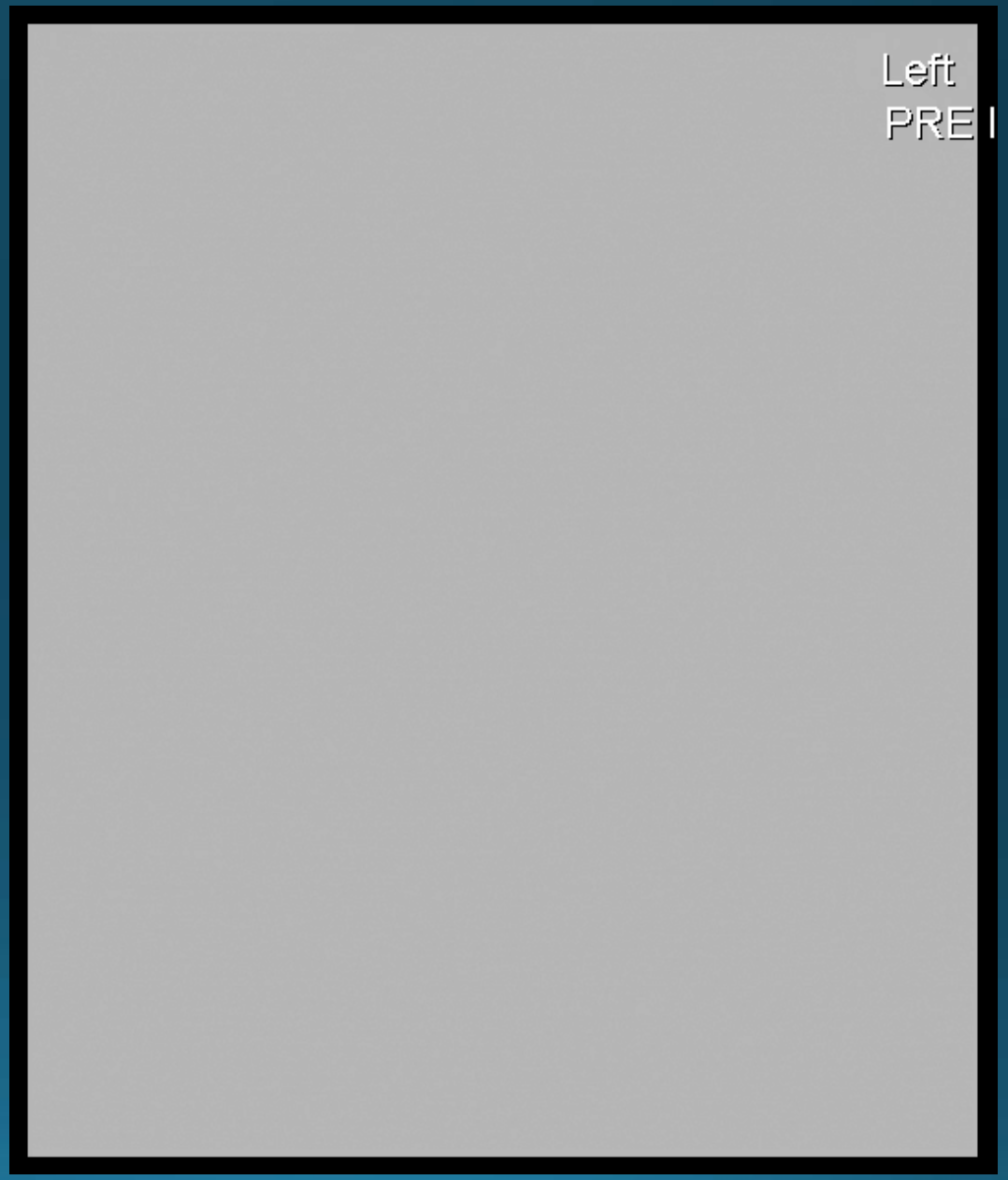
- Angiogram from Internal Iliac Artery
- Look over thoroughly and determine anatomy



Case 1



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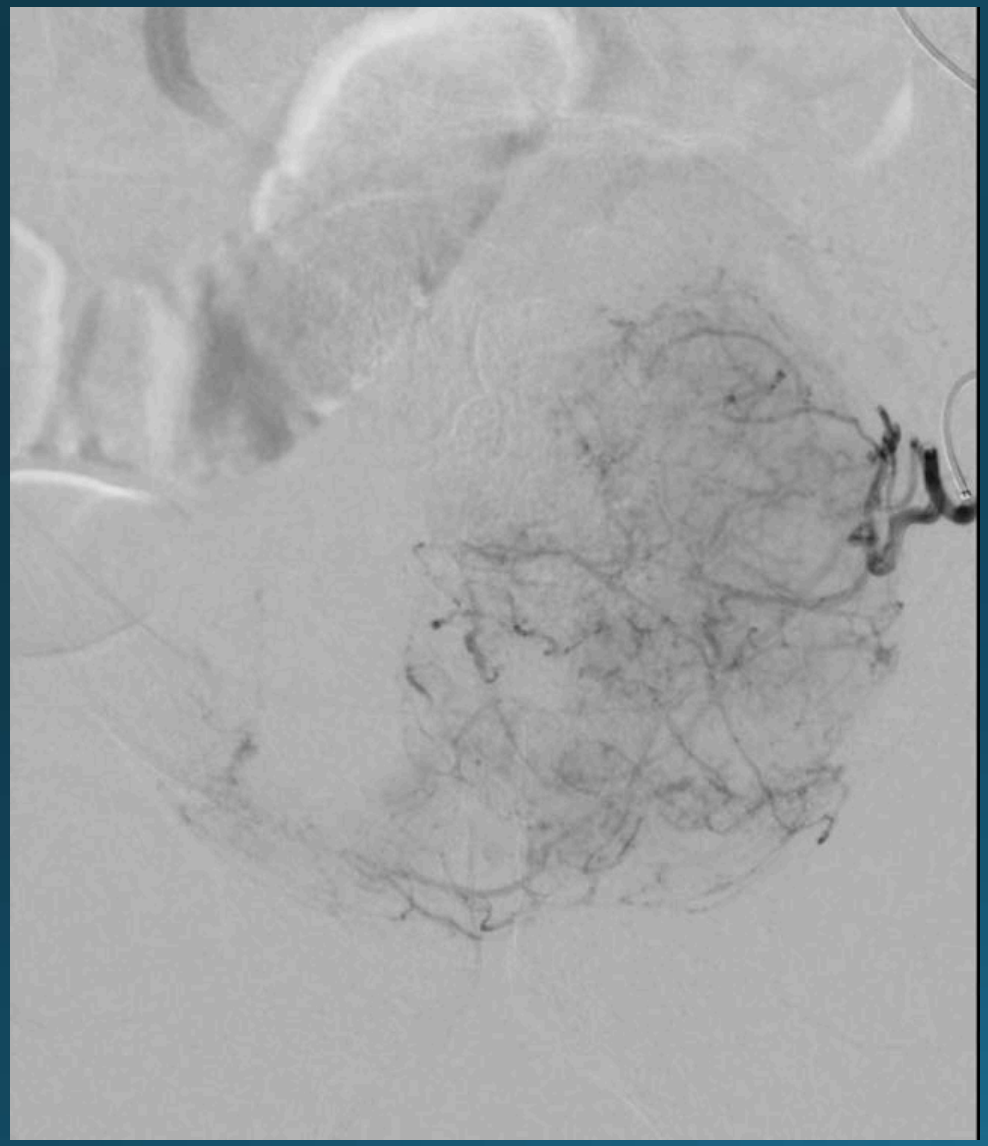


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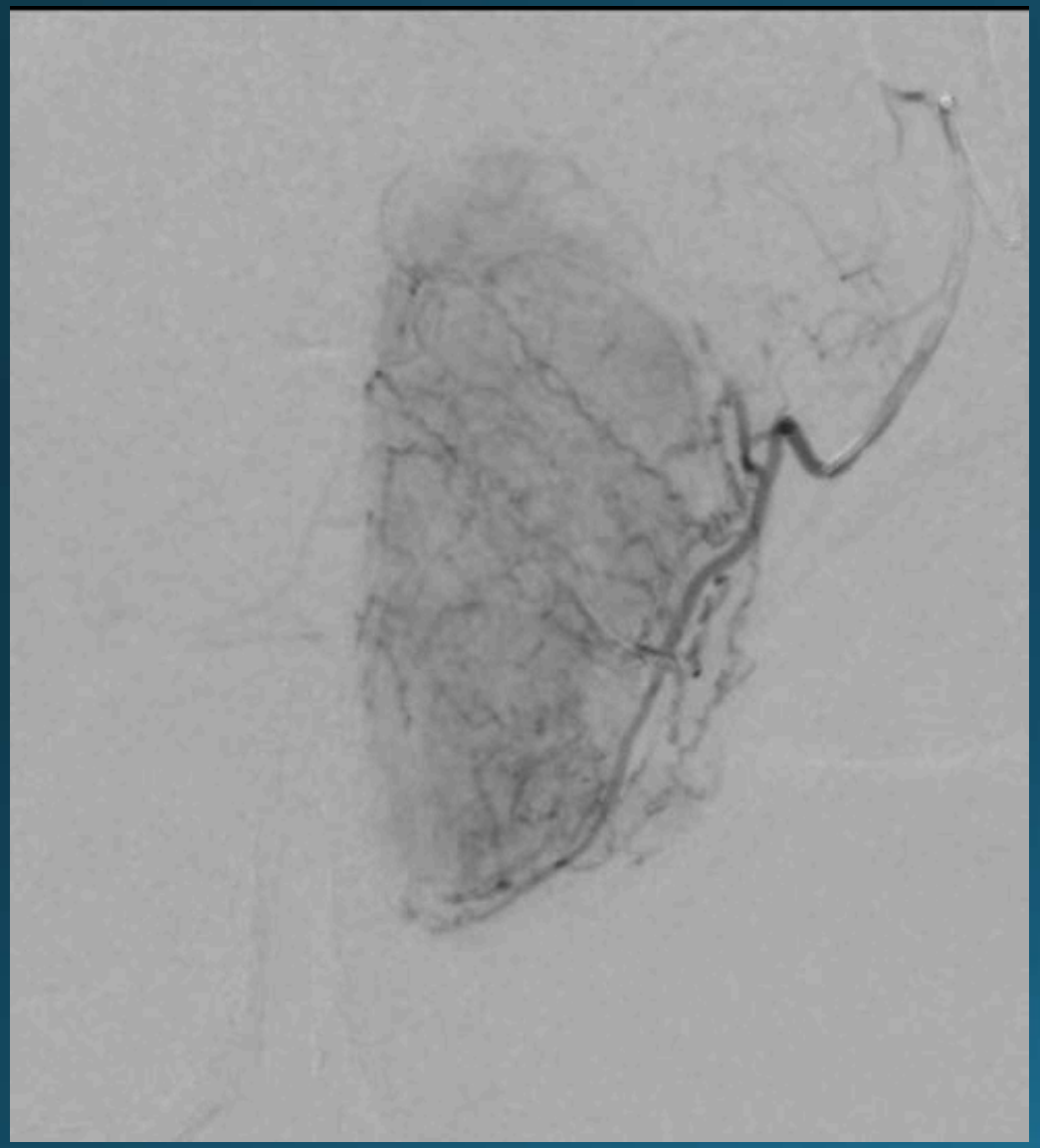
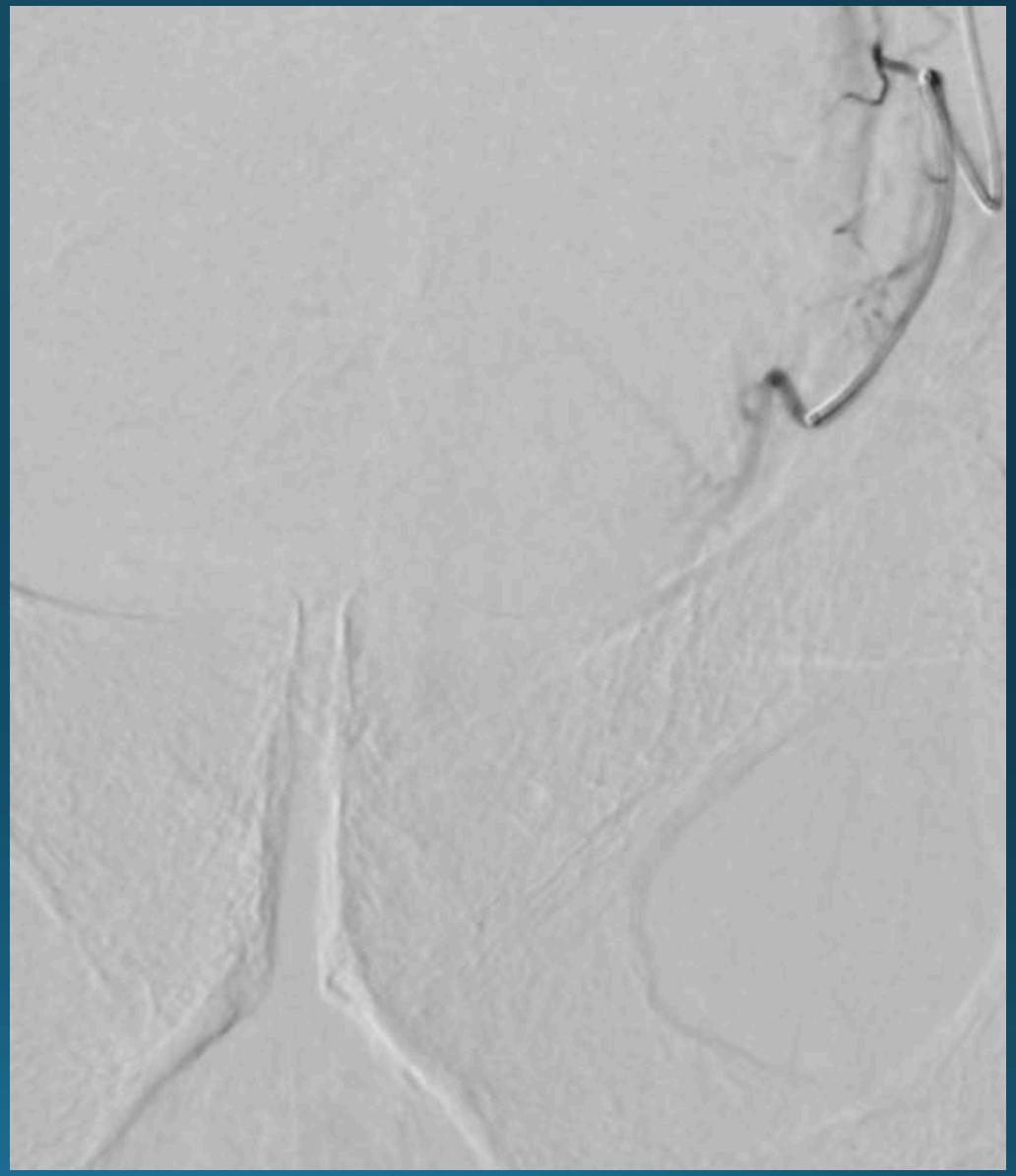
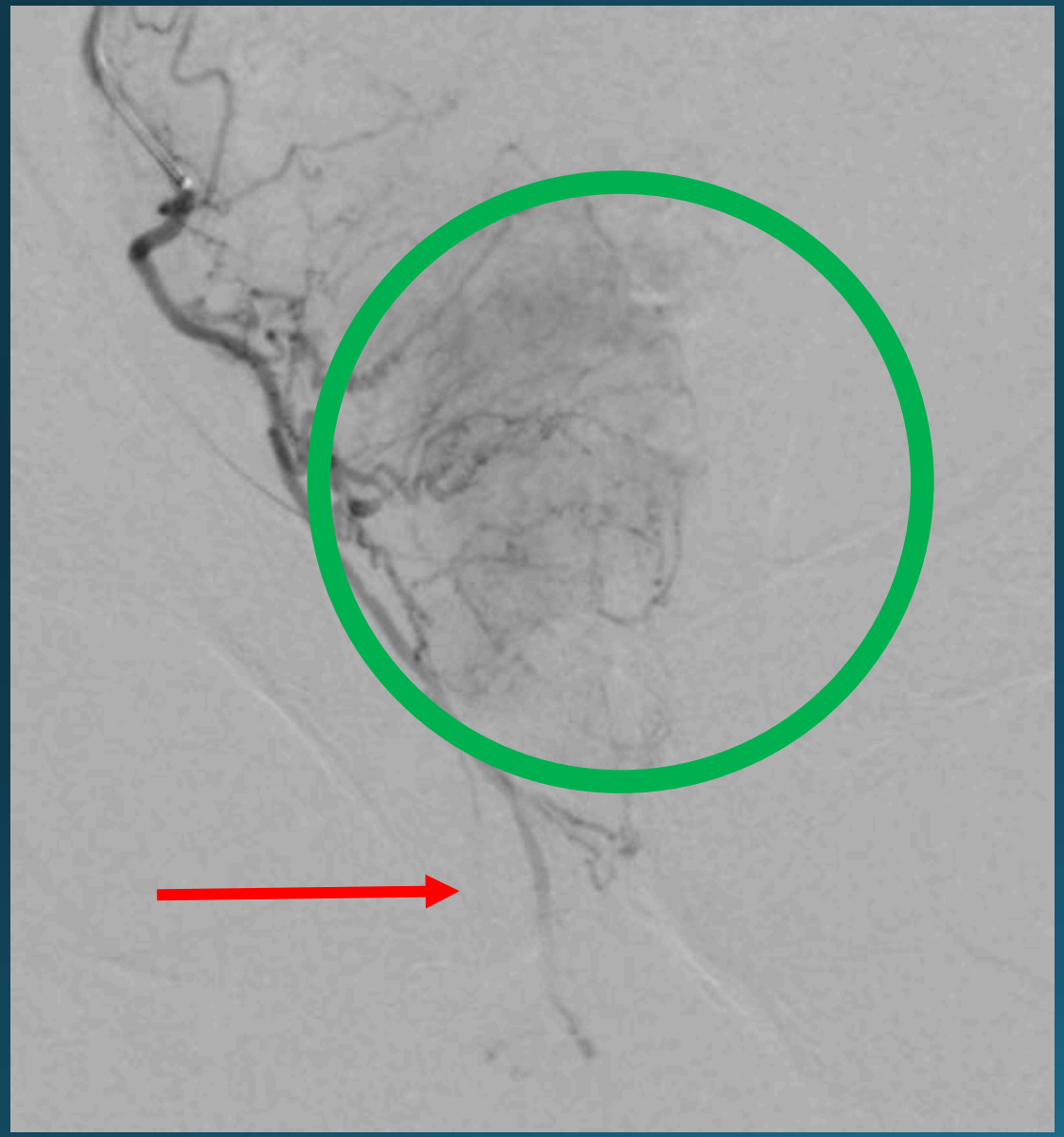
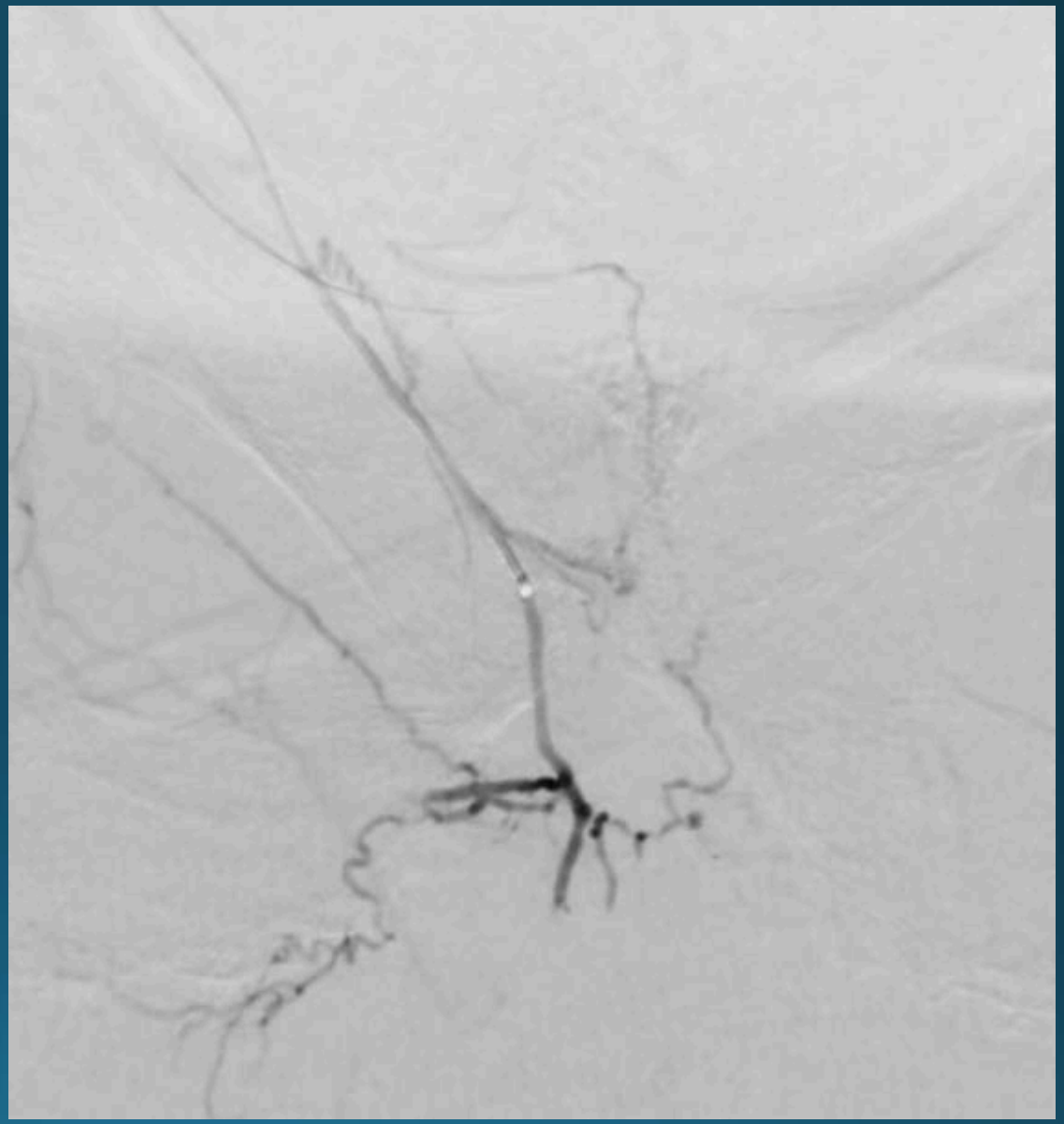
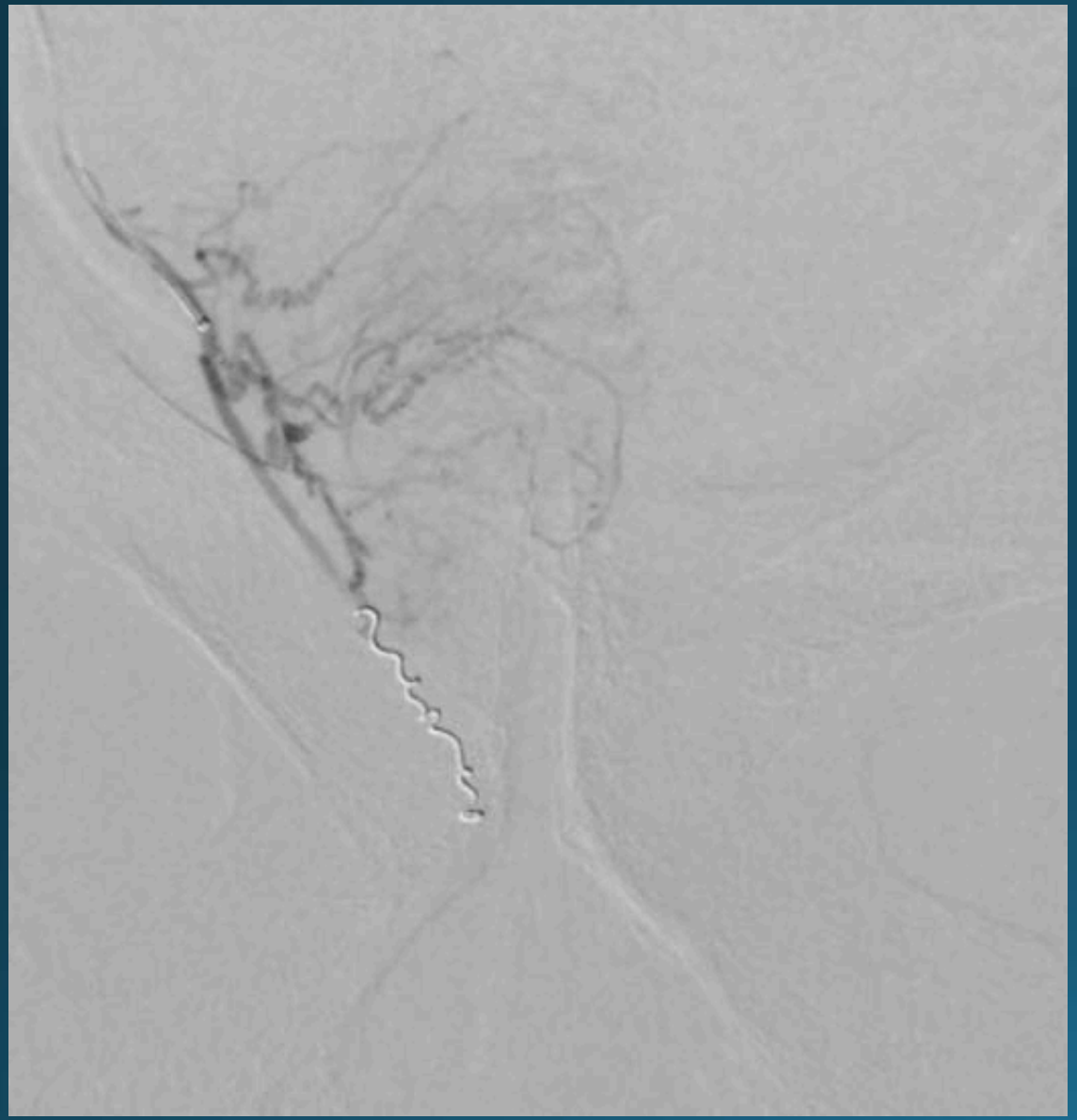
Case 2

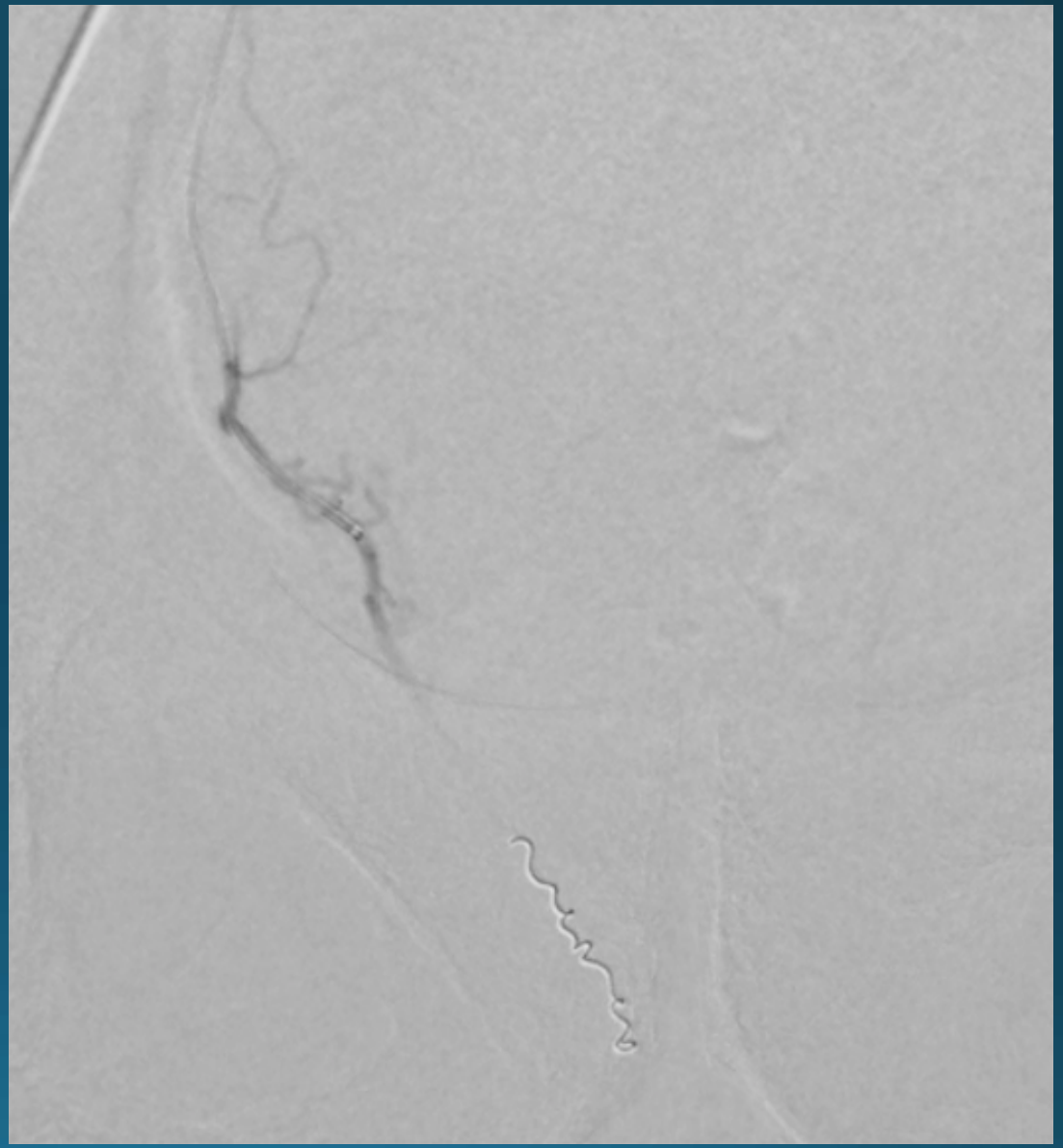




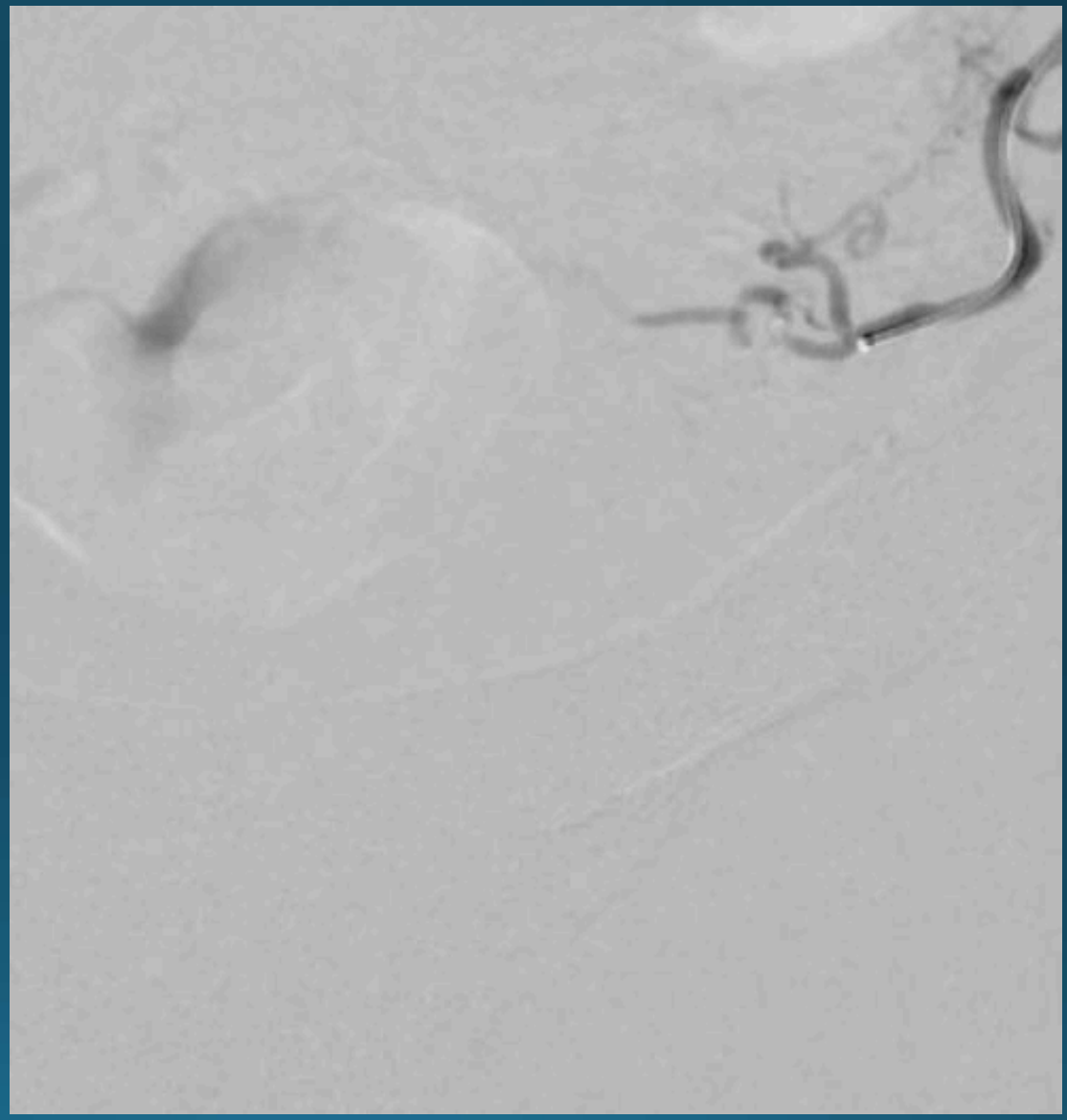


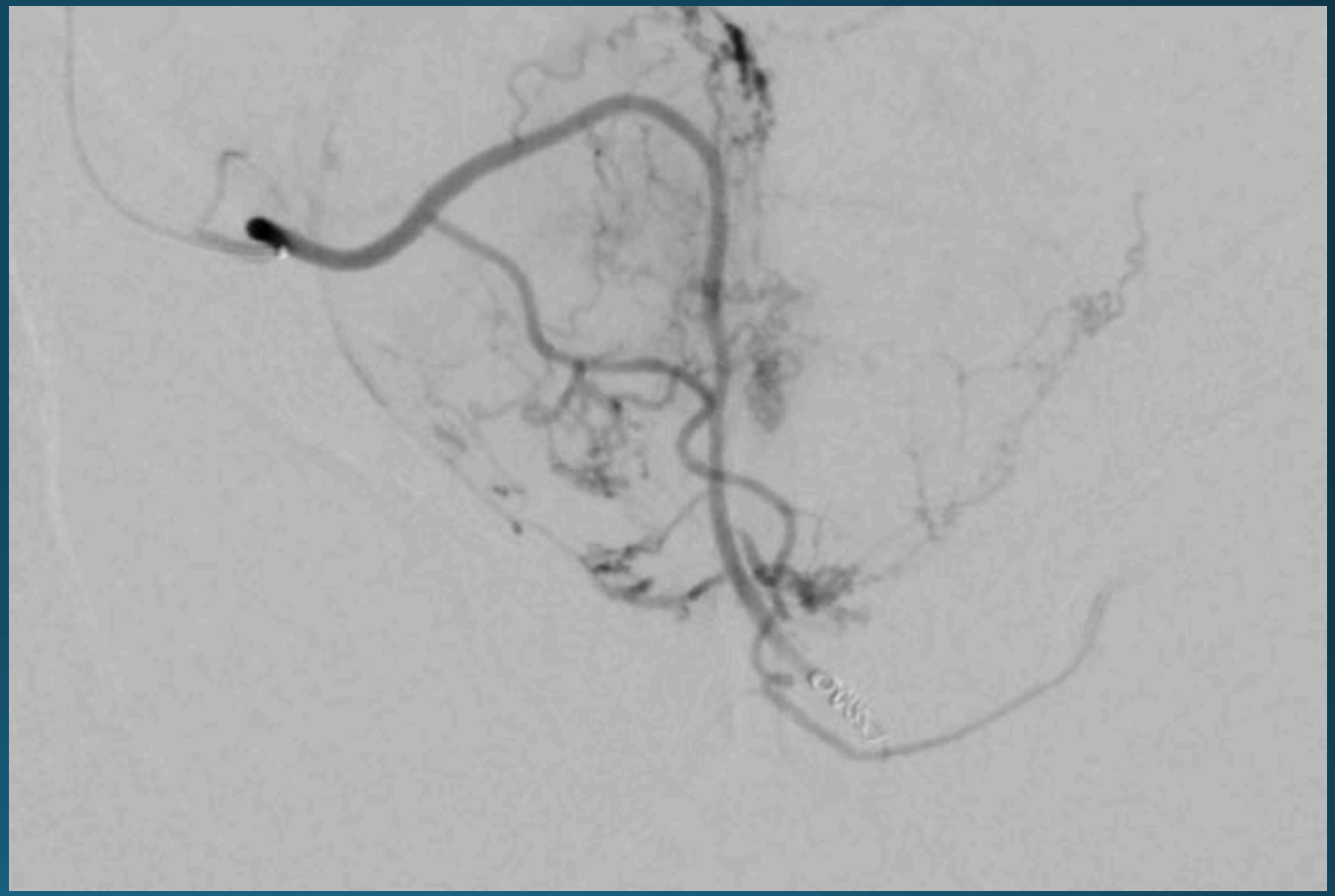


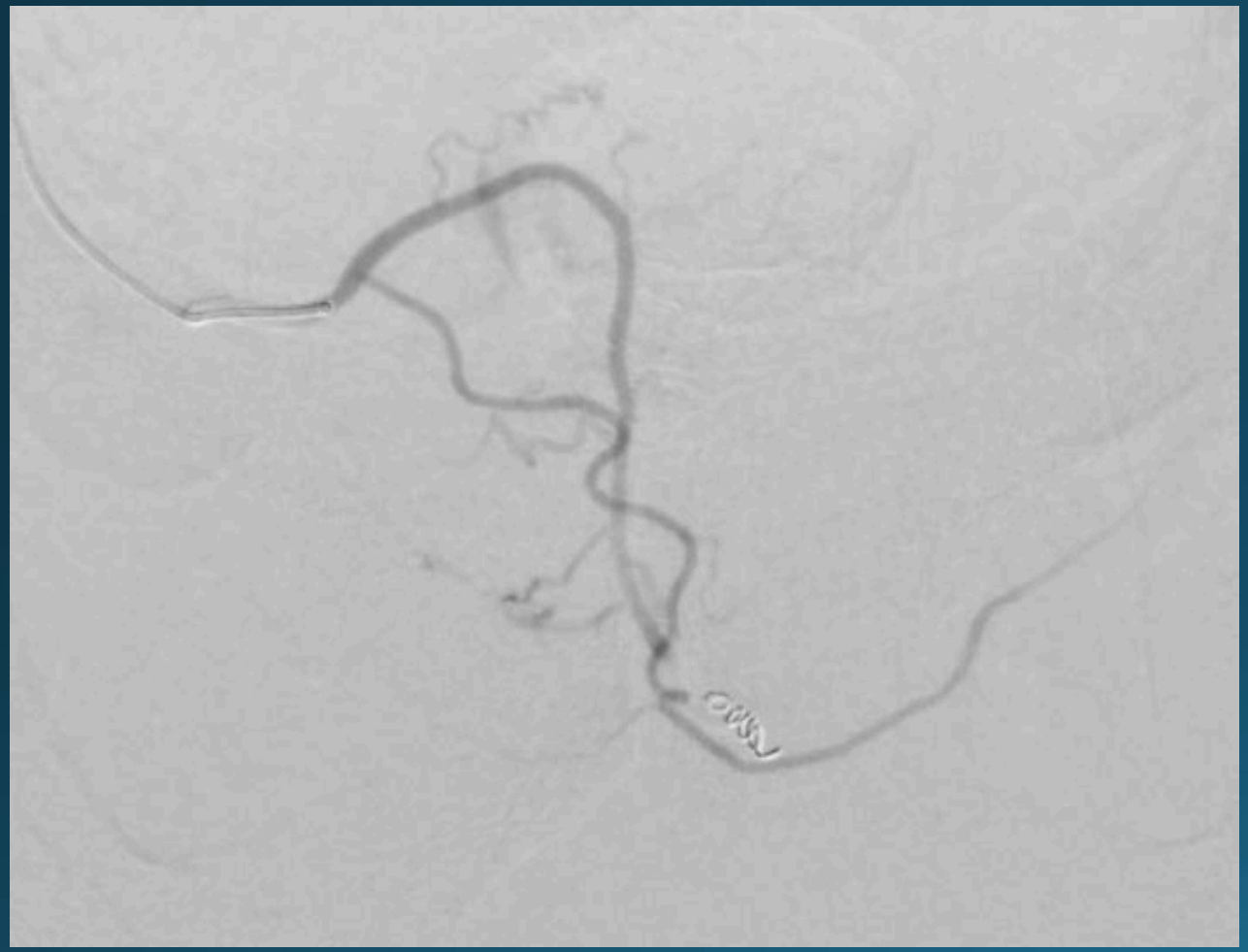


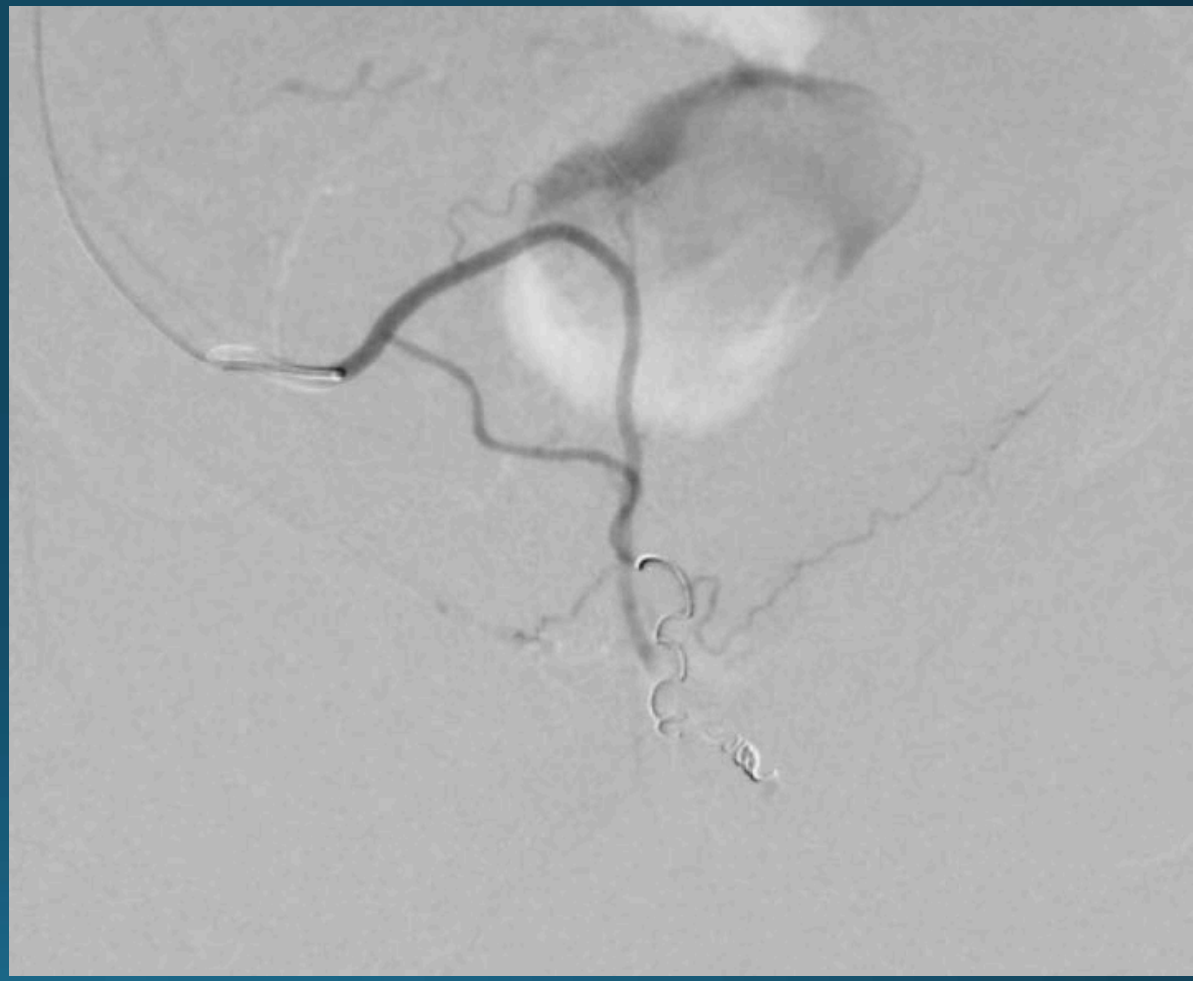


Case 3









Uterine Artery Embolization

AKA: UFE or UAE

What are Uterine Fibroids?

- Fibroids are non-cancerous growths in the uterus.
- Fibroids develop from the smooth muscular tissue of the uterus.
- They may grow slowly or quickly, or they may simply stay the same size. However, if they get too large, they may start causing painful and life-altering symptoms

Who can get Fibroids?

- 3 out of 4 women will develop fibroids during their lifetime. Most are unaware they have fibroids. Sometimes, doctors will incidentally discover fibroids during a routine pelvic or pregnancy exam, and then refer their patients to a specialist to have the fibroids treated.
- 70-80% of women will get uterine fibroids, but most mistakenly think they are not at risk
- 30% have never heard of uterine fibroids
- 44% of women diagnosed have never heard of Uterine Fibroid Embolization (UFE)

Common Symptoms of Fibroids

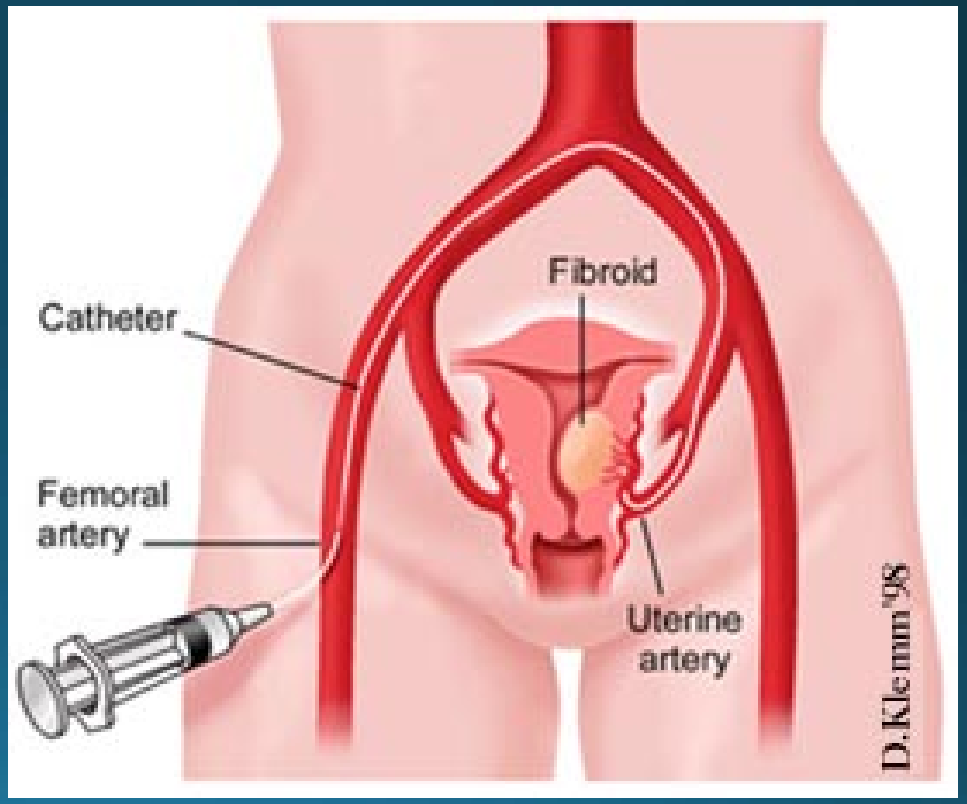
- Pelvic Pain
- Excessive Menstrual Bleeding
- Urinary Incontinence
- Constipation
- Pain During Intercourse
- Anemia

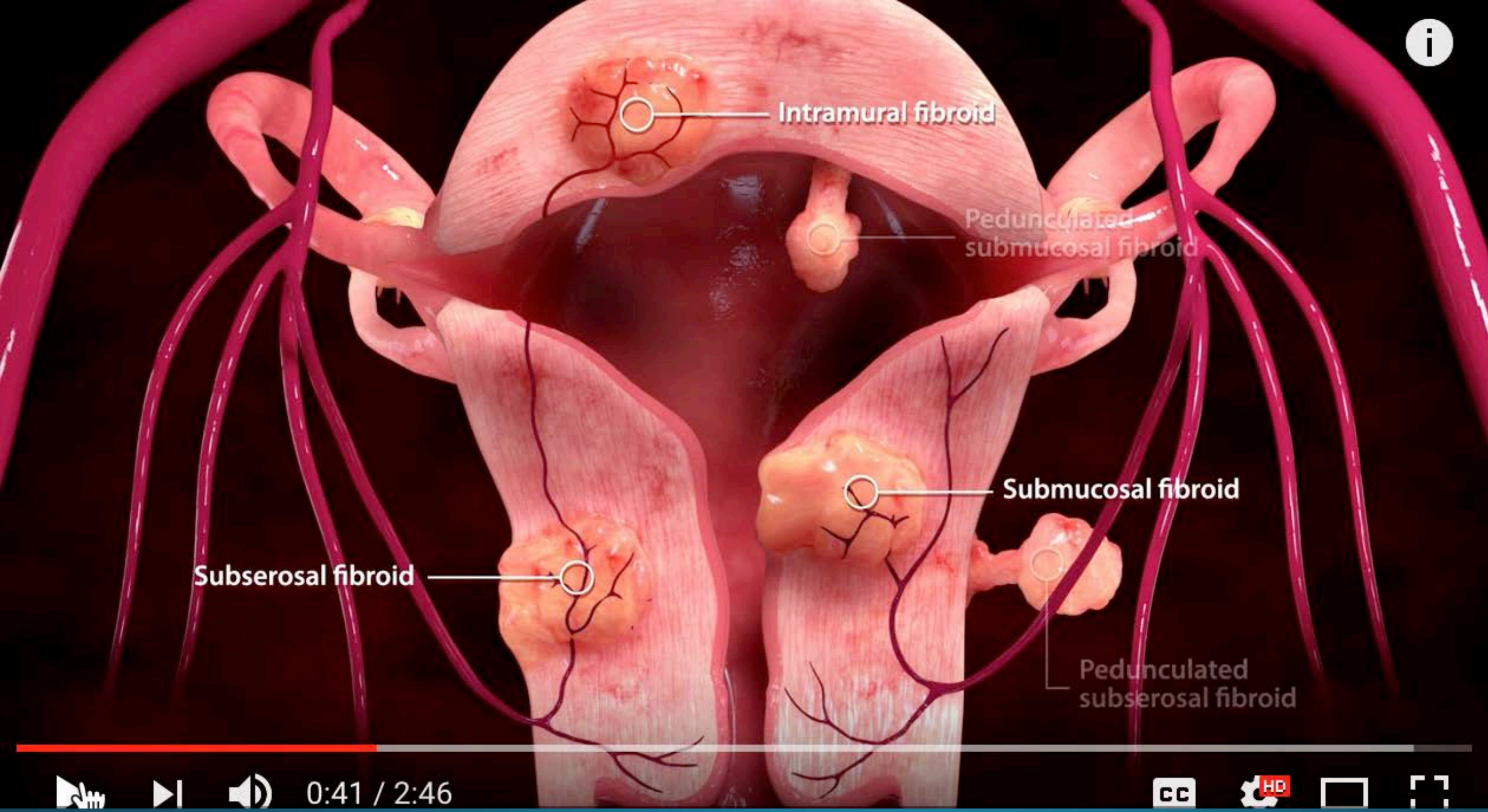
Risk Factors for Fibroids

- African American Females
- Having a mother with history of fibroids
- Diet high in red meat and low in vegetables
- Females age 30-50

Uterine Fibroid Embolization

- Outpatient procedure allowing you to keep your uterus
- Typically takes less than 1 hour
- No incision
- Back to work in 4-5 days




Intramural fibroid
Pedunculated submucosal fibroid
Submucosal fibroid
Subserosal fibroid
Pedunculated subserosal fibroid
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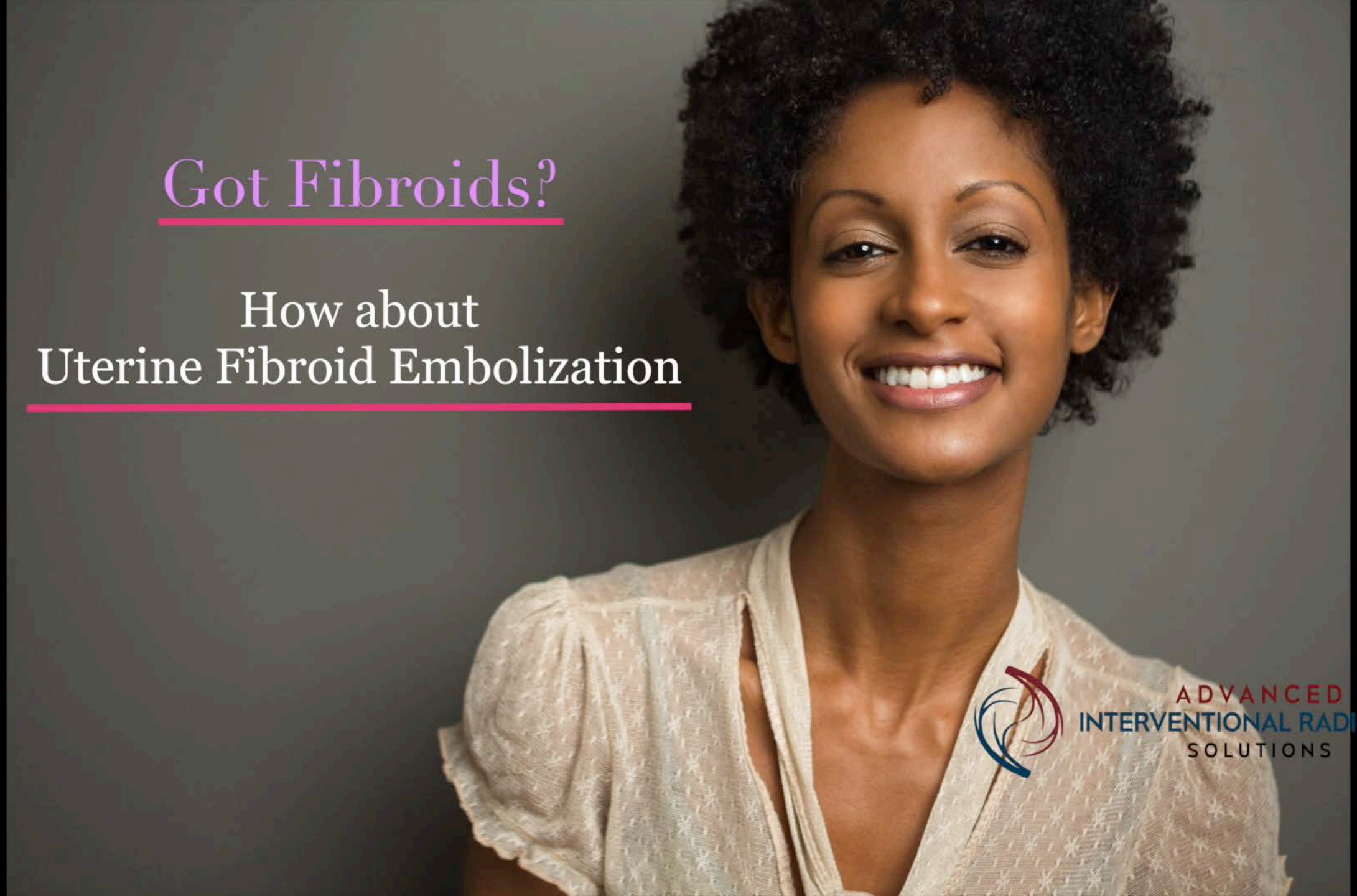
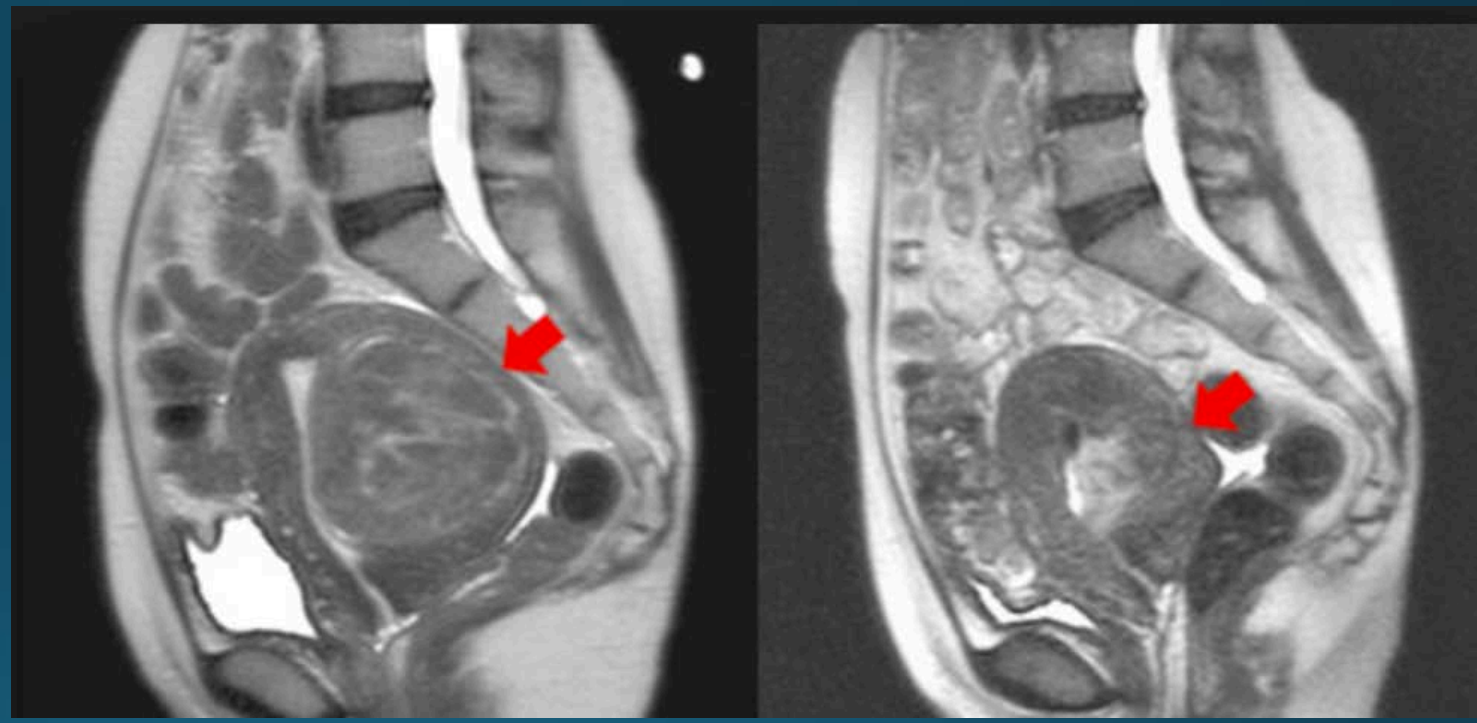

Got Fibroids?
How about
Uterine Fibroid Embolization
ADVANCED
INTERVENTIONAL RADIOLOGY
SOLUTIONS

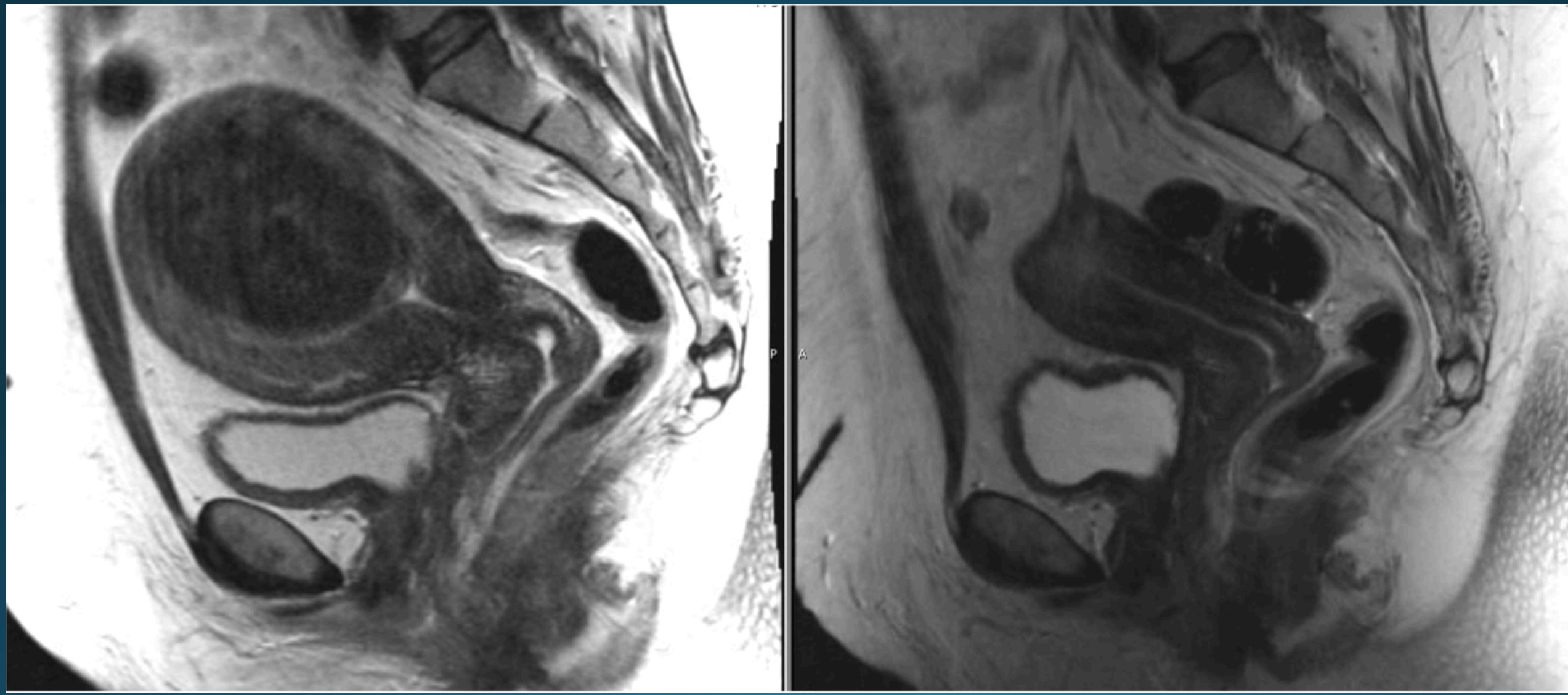
UFE

- Performed since 1995
- >90% success rate
- Complication <3%



Pre

Post



Post Operative Course

Hysterectomy

- 60% performed to tx myomas
- 17% morbidity rate
- 3-5 day hospitalization

UFE

- Home same day as treatment
- Regain normal activities within 4-5 days
- Keep your uterus

Misconceptions of UFE

- It will cause premature ovarian failure
  - There is less than 2% risk under age 45
- Fibroids will come back
  - Less than 10% symptoms will return
- UFE should not be performed if you want to become pregnant
  - Recent large patient studies demonstrate better pregnancy rates compared to myomectomy.

Associated Risk

- Associated risk of UFE are less than 2%
- Associated risk of hysterectomy are up to 20%

- Recent study of 2100 women demonstrated long term health risk in women who underwent hysterectomy (ovarian sparing)
  - 33% increase risk of heart disease
  - 4.6 x higher risk of congestive heart failure
  - 18% increase risk of obesity

Pregnancy after UFE

- Retrospective cohort study of 398 female patients under the age of 43 years who were treated by uterine artery embolization
- 2003 and 2017

Clinical investigation of fertility after uterine artery embolization

Olivier Serres-Cousine, MD • Fiene Marie Kuijper, MSc • Emmanuel Curis, PhD • Diana Atashroo, MD

Published: May 28, 2021 • DOI: https://doi.org/10.1016/j.ajog.2021.05.033 • Check for updates

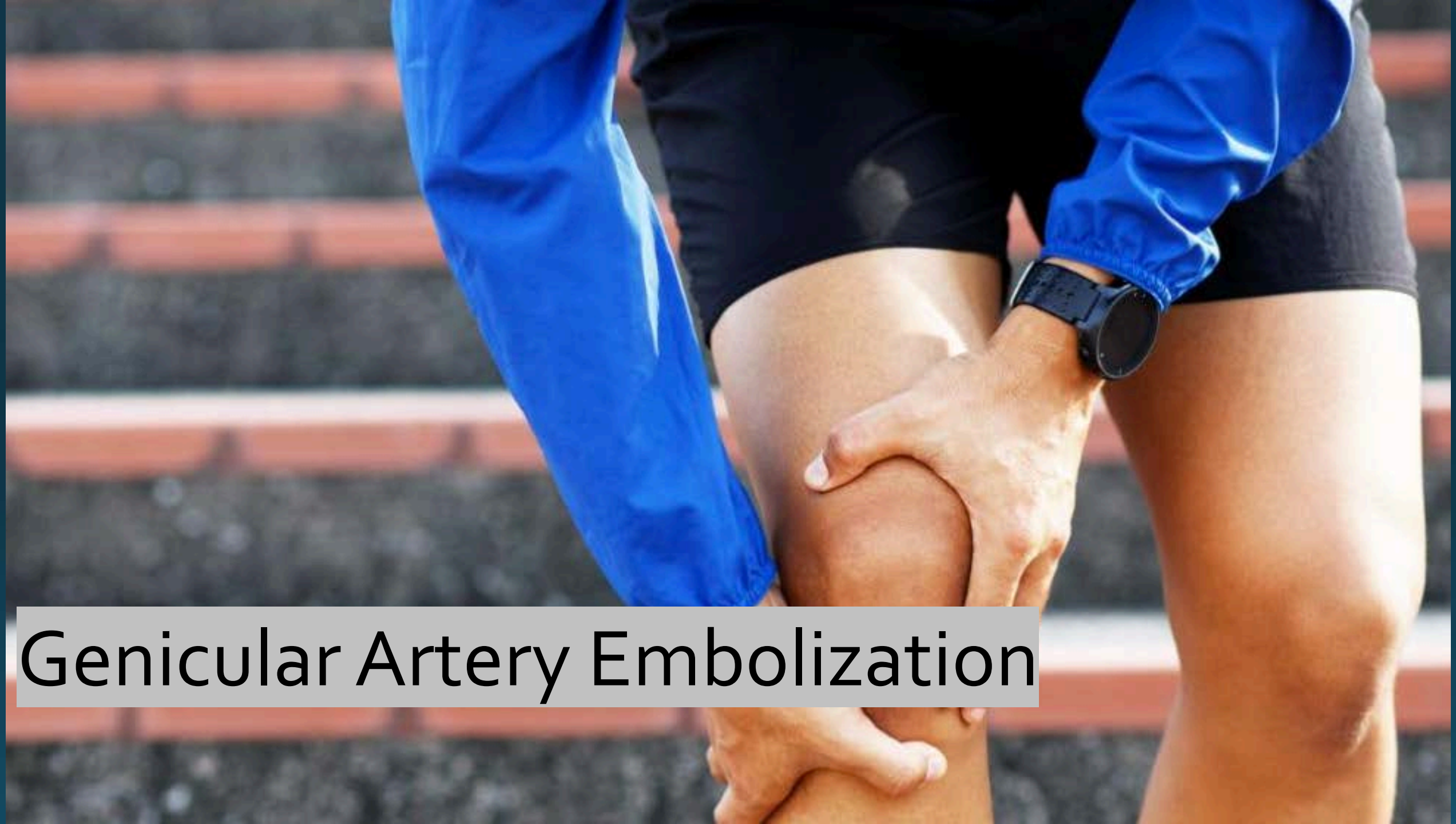
Pregnancy after UFE

- The overall clinical success rate (ie, resolution of preembolization symptoms such as heavy menstrual bleeding, iron-deficiency anemia, pelvic pressure) was 91.2%
- Mean 73% reduction in myoma volume
- 148 pregnancies and 109 live births
- 74 children were born at term; 23 were born preterm, on average at 35.12±2.78 weeks

Pregnancy after UFE

- 74% of pregnancies resulted in a live birth
  - 68% of births occurred at term
  - Average fertility rate for US is 75-80%

- High cesarean rate may be due to obstetricians treating UAE similar to myomectomy scar
  - Rate of cesarean delivery: 46.8% vs 21% in the normal population



Genicular Artery Embolization

Embolization for Pain Management of Knee Osteoarthritis (GAE Procedure)

- 25 Million people in USA suffer from OA
- Knee joint most common
- 1st line therapy for mild/moderate pain is medical management (NSAIDS)
- Complications
  - Renal Failure
  - Exacerbation of asthma
  - GI bleeding

Osteoarthritis

- Hyaluronic acid and platelet rich plasma injections have variable success
- Surgery last option
- What about pt's who are resistant to medical therapy but not severe enough dz to warrant joint replacement?

Osteoarthritis Knee

- What is the rationale?
  - Angiogenesis occurs where there is chronic inflammation.
    - Altered biomechanics, Joint trauma, age, obesity and immune/inflammatory response
  - Cytokines (VEGF) released and induce angiogenesis
  - Blood vessels grown into cartilage, synovium and adjacent bone
    - Bringing new sensory nerve fibers.
    - Perpetuate more inflammation and bone/cartilage destruction

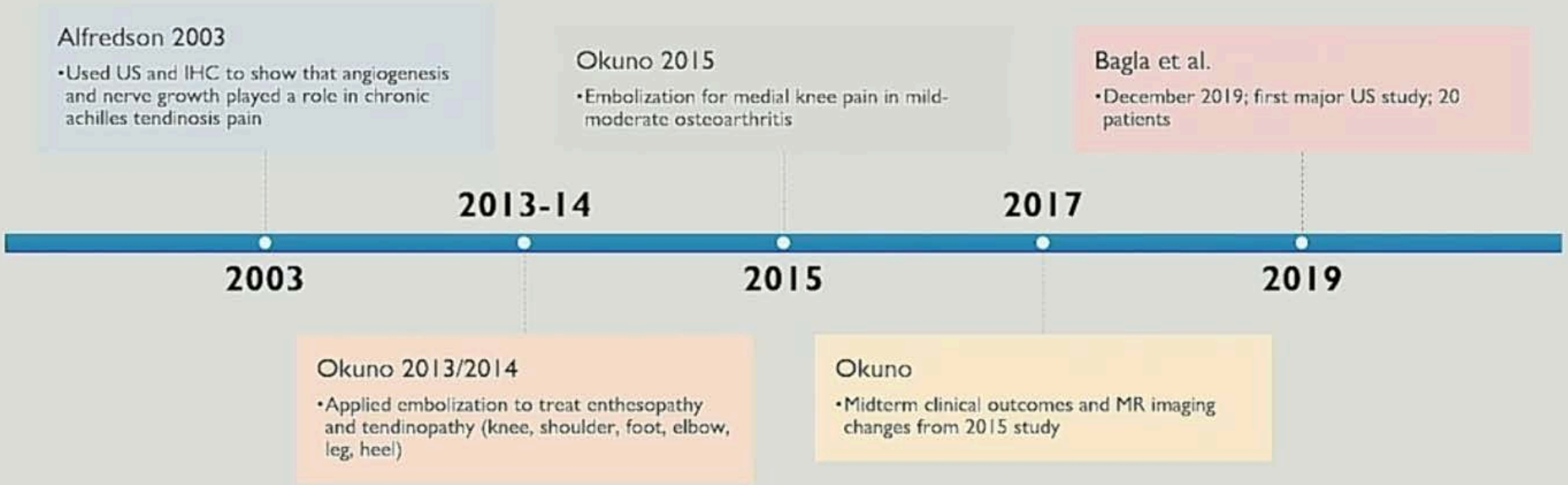
Mapp et al. Nat Rev Rheumatol. 2012

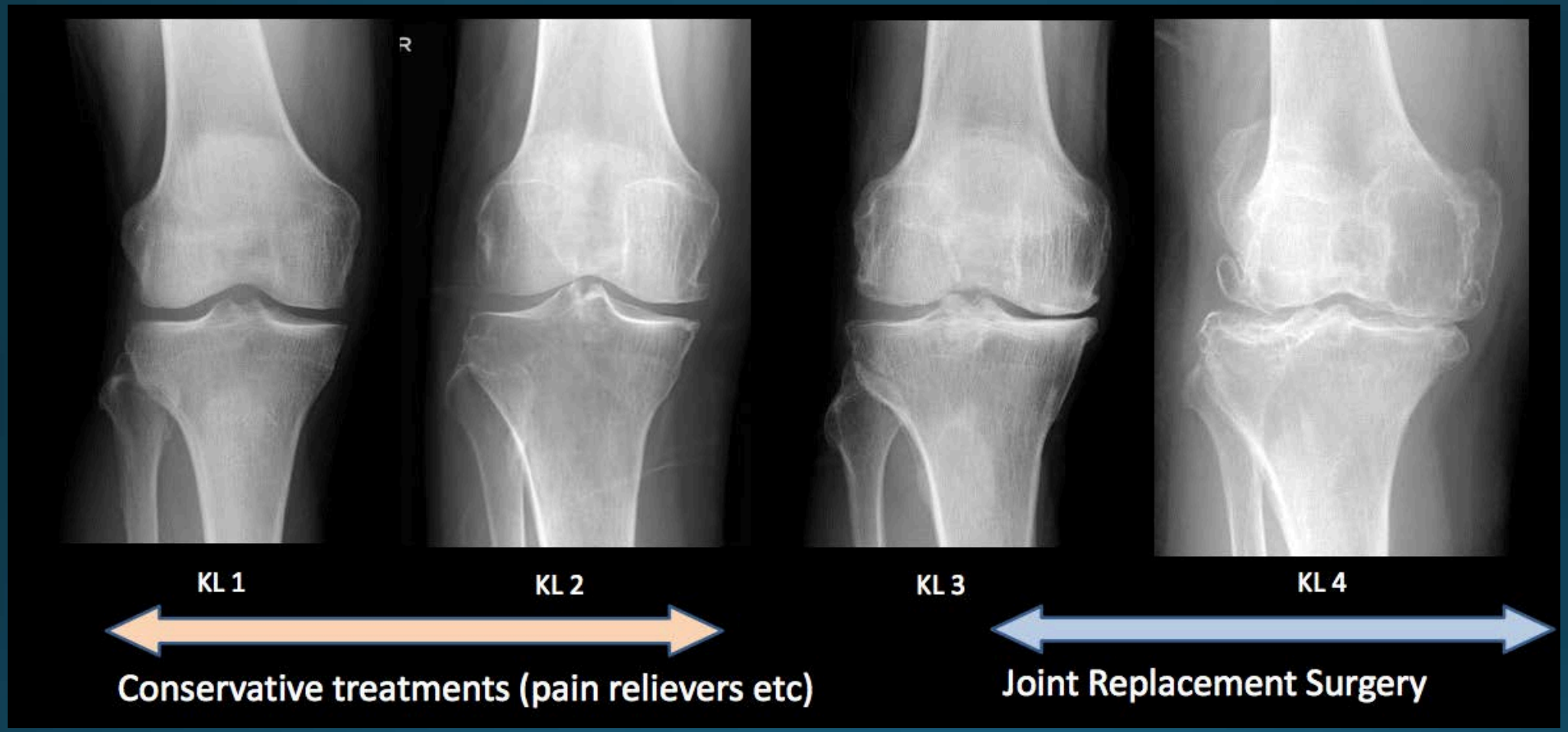
Osteoarthritis Knee

- Embolization of abnormal vasculature decreases symptoms and potential delay in further joint derangement.

- Recent study demonstrate 94% cases of knee osteoarthritis have abnormal neovascularity

A BRIEF HISTORY OF GAE





Transcatheter arterial embolization Using Imipenem/Cilastatin Sodium for Tendinopathy and Enthesopathy Refractory to Nonsurgical Management. *J Vasc Interv Radiol 2013 June ; 24: 787-792*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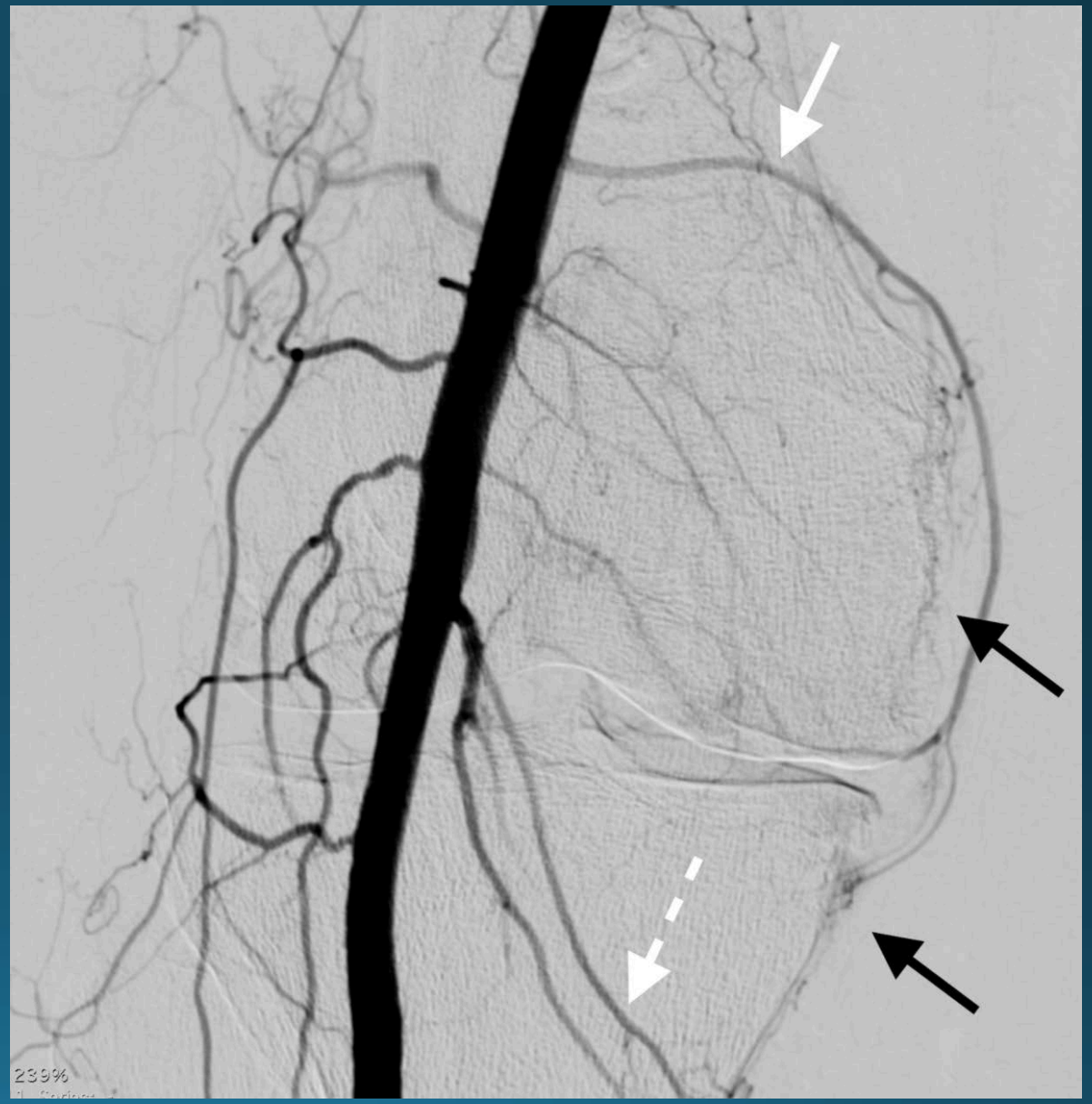
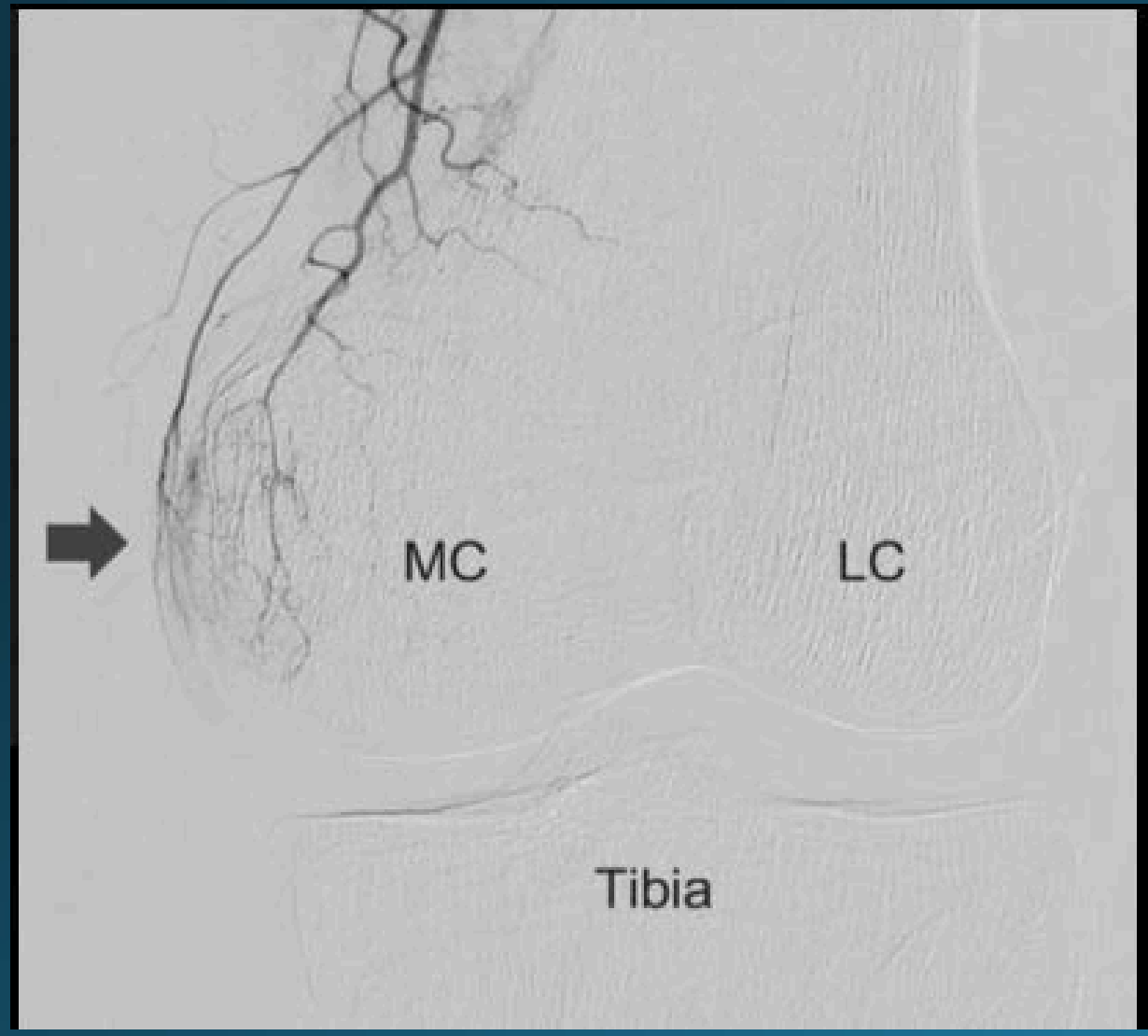

239%

Before Embolization



After Embolization

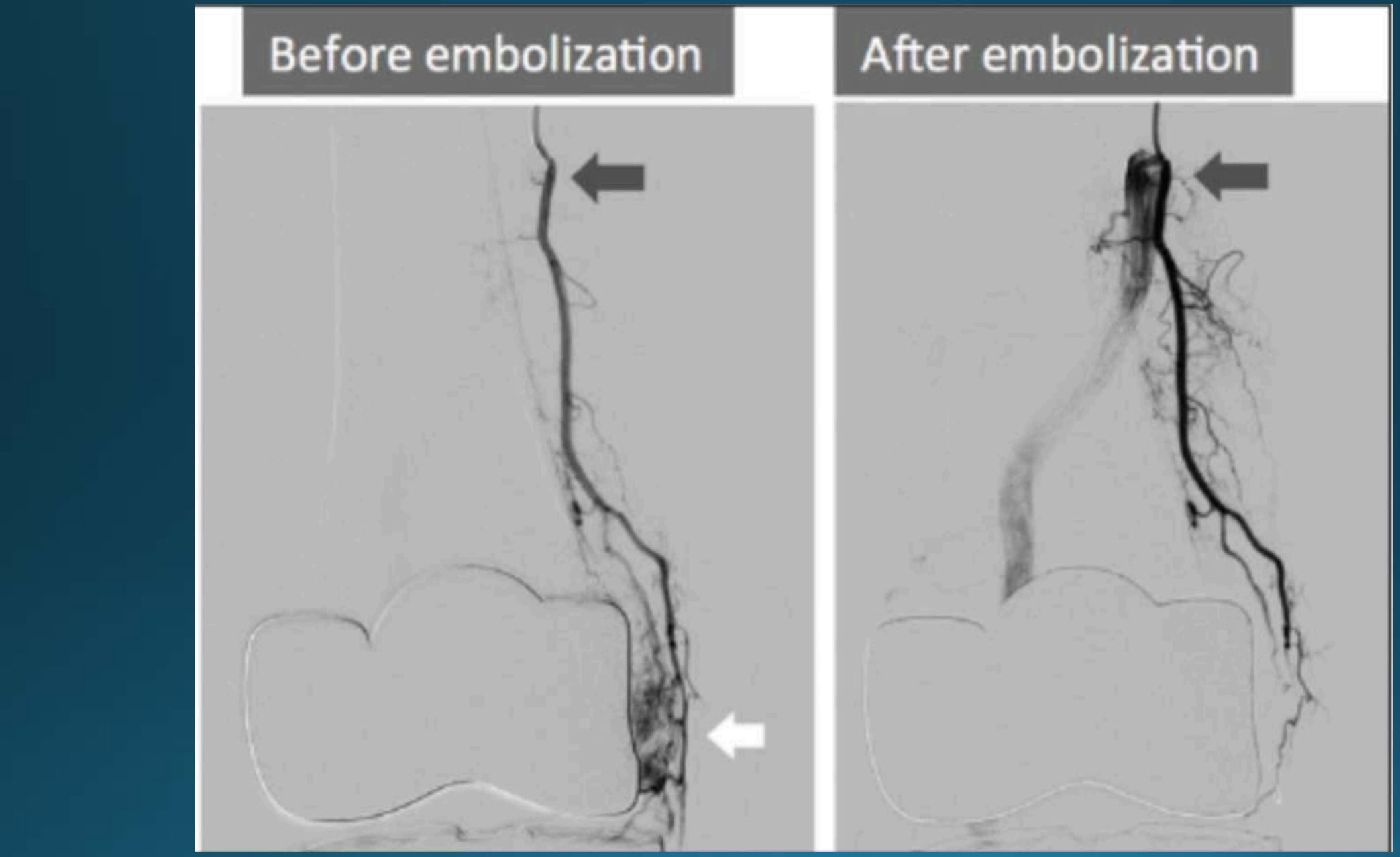
Pre and Post Embolization

What about post Arthroplasty?

- 600,000 total knee replacements per year
- Suspected to increase to 3 million by 2030
- 20-34% of patients experience chronic pain after TKA

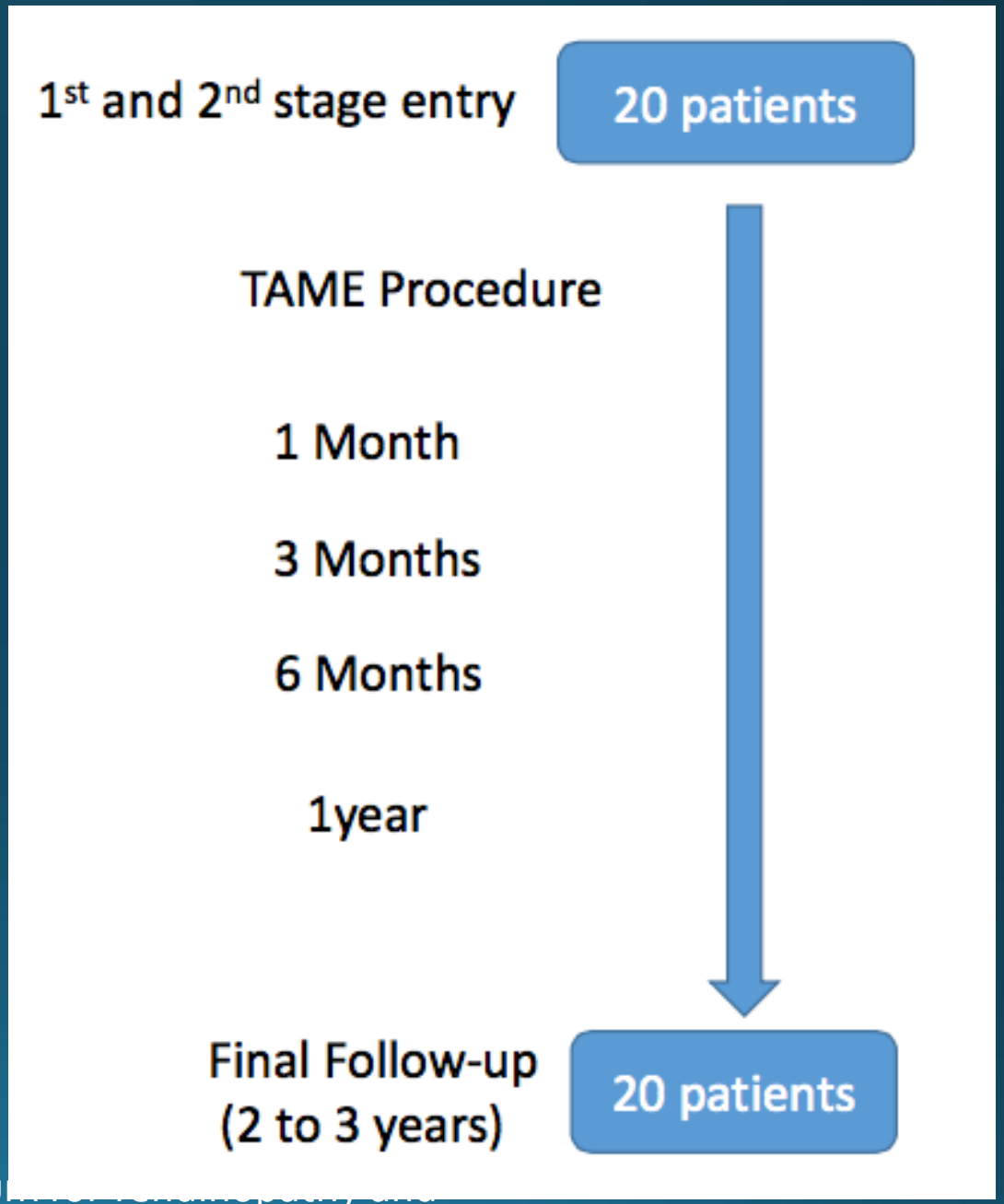
GAE

- A 75-year-old woman presented to the clinic with chronic residual right knee pain 2 years after total knee arthroplasty. Nighttime pain was her main complaint, and she also noted pain that occurs when stepping down stairs. Conservative treatment had not been effective.
- The patient reported that her pain had completely resolved at 1-month follow-up and has been maintained for 2 years.

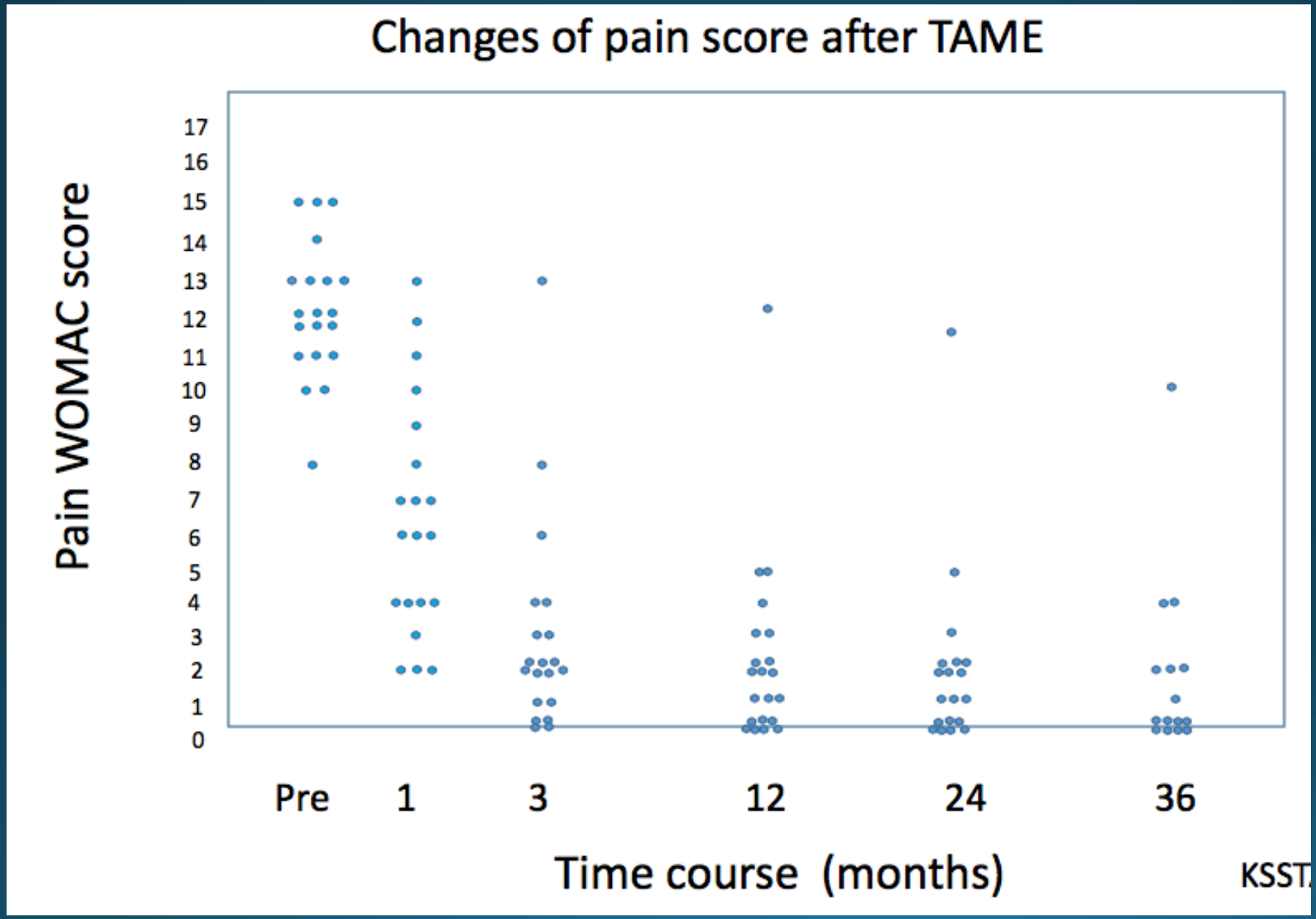

Before embolization
After embolization

Osteoarthritis Knee

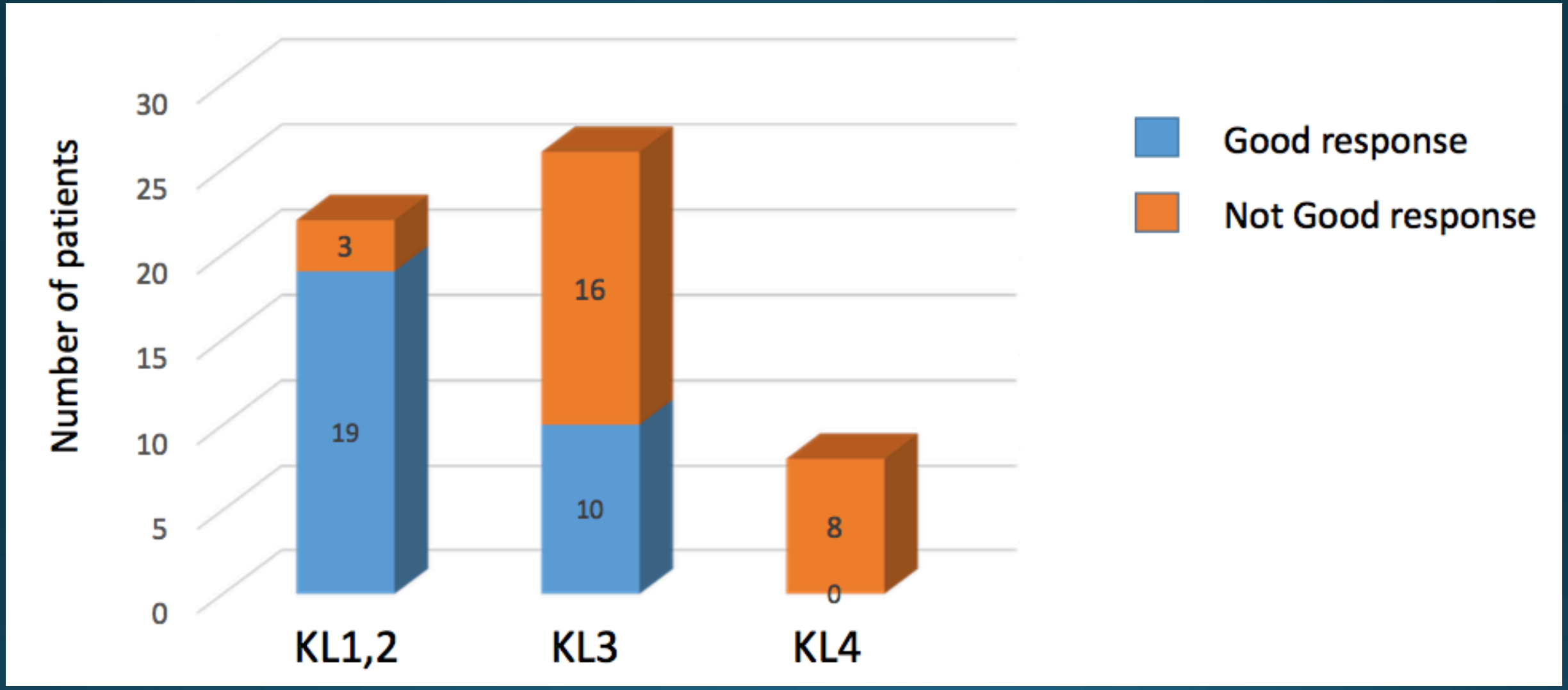
- Long term outcomes for Mild Knee Osteoarthritis



Transcatheter arterial embolization Using Imipenem/Cilastatin Sodiu
Enthesopathy Refractory to Nonsurgical Management. *J Vasc Interv Radiol 2013 June ; 24: 787-792*



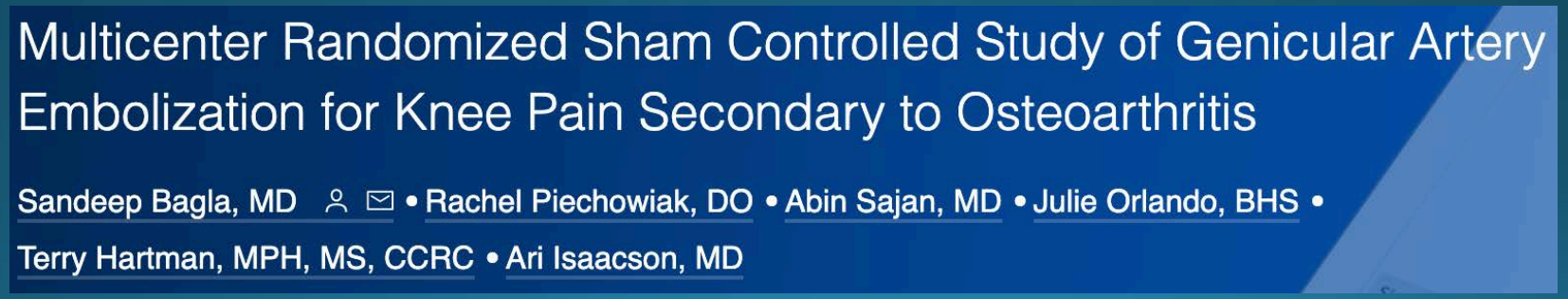
Transcatheter arterial embolization Using Imipenem/Cilastatin Sodium for Tendinopathy and Enthesopathy Refractory to Nonsurgical Management. *J Vasc Interv Radiol 2013 June ; 24: 787-792*



Transcatheter arterial embolization Using Imipenem/Cilastatin Sodium for Tendinopathy and Enthesopathy Refractory to Nonsurgical Management. *J Vasc Interv Radiol 2013 June ; 24: 787-792*

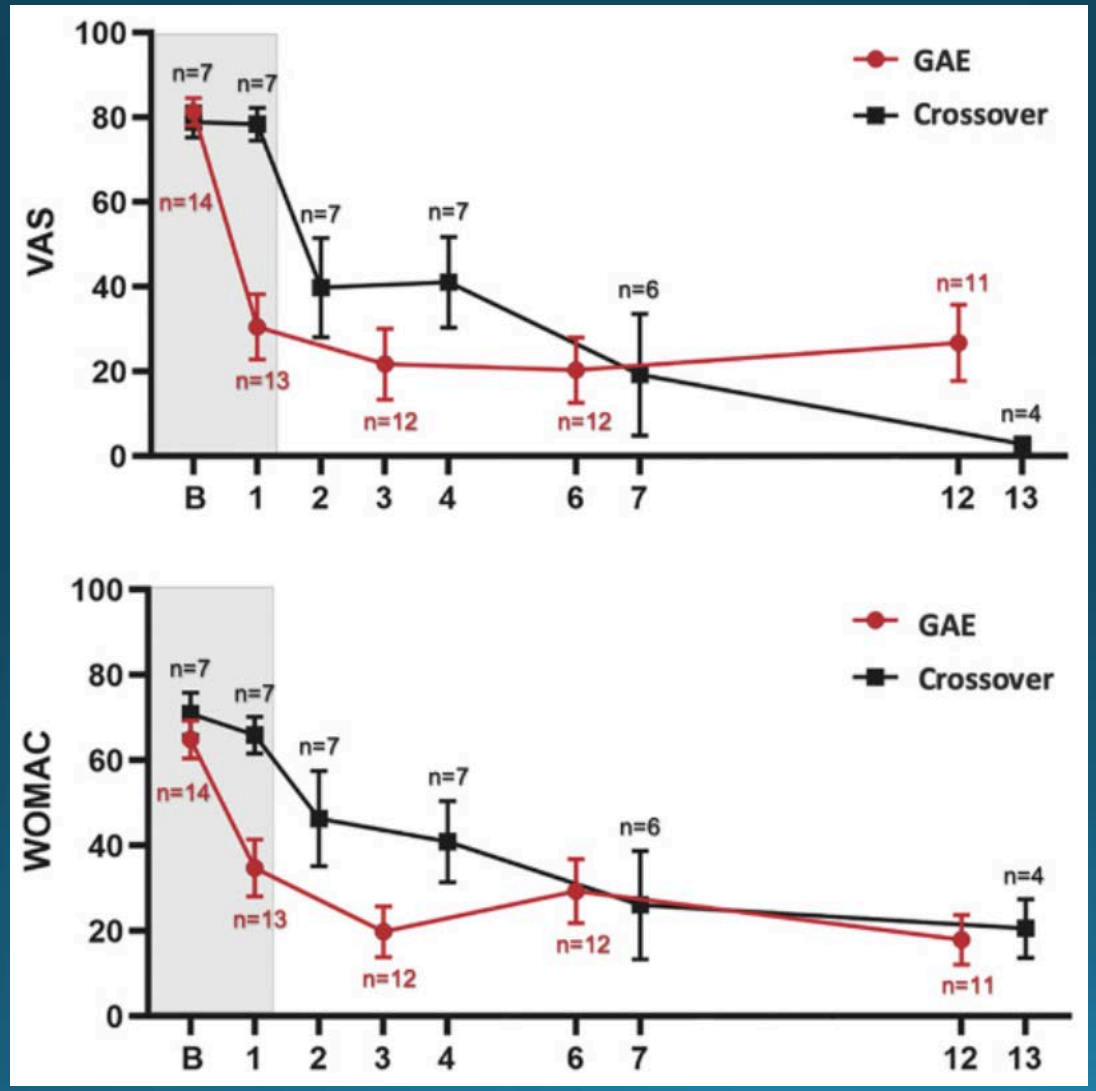
Sham controlled study

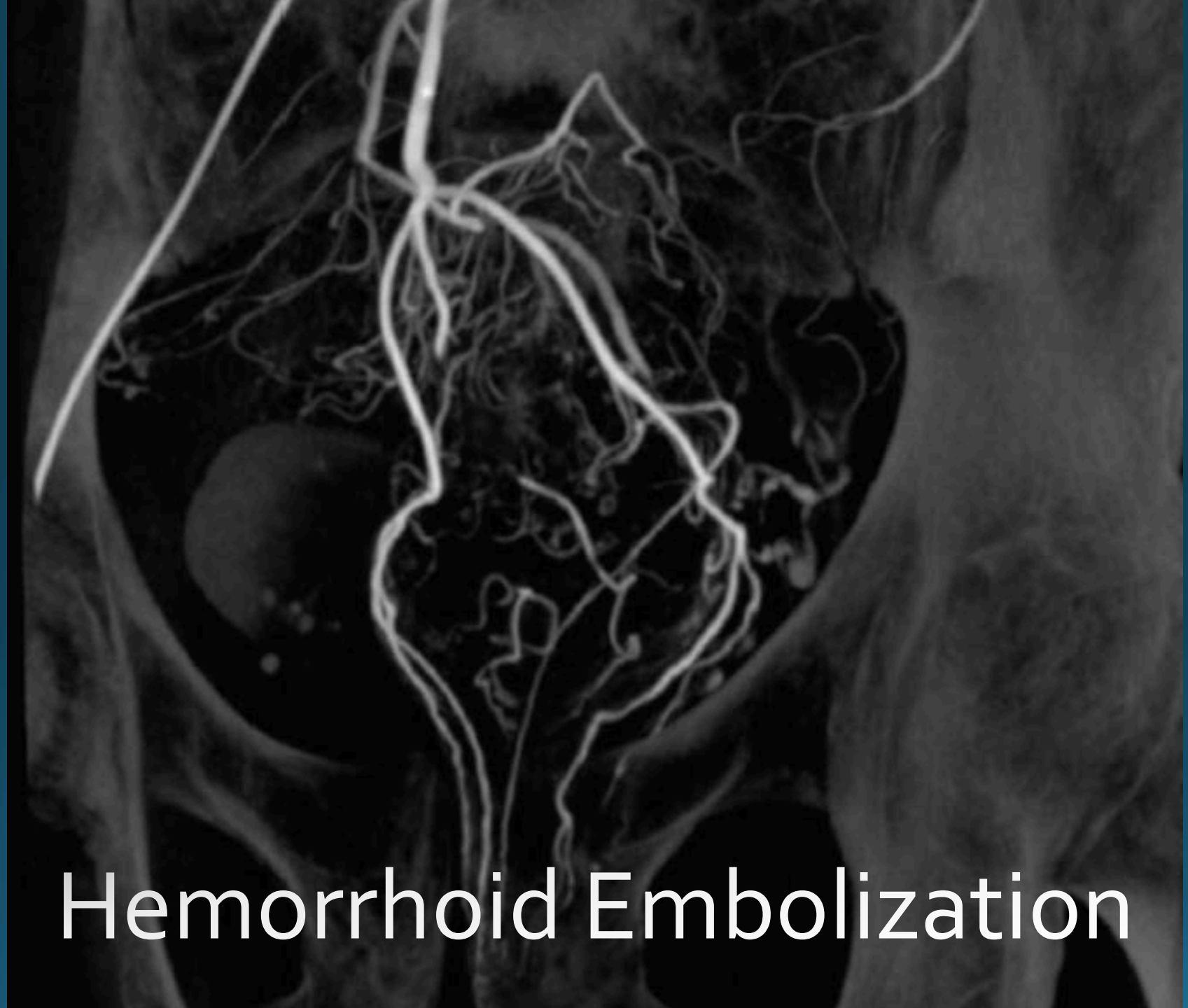
- multicenter, single-blinded randomized controlled trial
- 21 subjects
- Kellgren–Lawrence grade 1–3
- All Sham subjects failed to show improvement at 1 month and crossed over
- Followed by WOMAC score, VAS score, and magnetic resonance imaging of the knee with contrast


Multicenter Randomized Sham Controlled Study of Genicular Artery Embolization for Knee Pain Secondary to Osteoarthritis

Sandeep Bagla, MD • Rachel Piechowiak, DO • Abin Sajan, MD • Julie Orlando, BHS • Terry Hartman, MPH, MS, CCRC • Ari Isaacson, MD

Sham Study Results

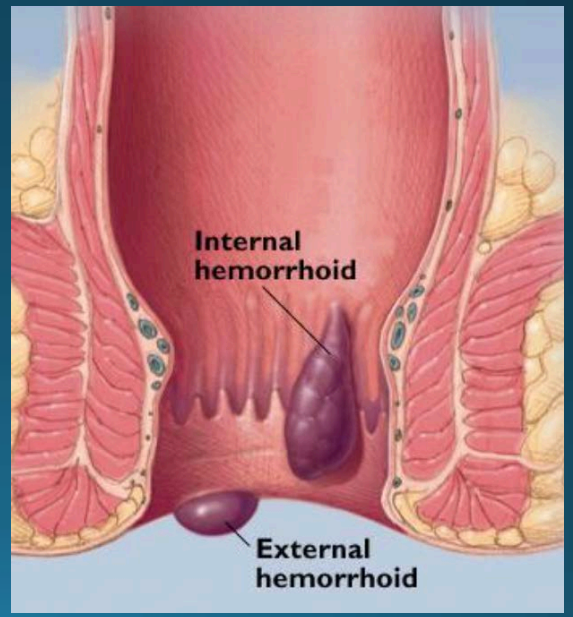




Hemorrhoid Embolization

Emborrhoid Procedure

- New treatment option for patients with chronic hemorrhoidal disease
- Hemorrhoidal disease
  - Most common anorectal disease affection millions world wide
  - Typical presentation rectal bleeding
  - Pain less common (more common External, fissures, neuralgia, pelvic floor disorders



Internal Hemorrhoids

- Vascular structure made up of richly anastomosed arterial-venous network forming corpus cavernosum recti (CCR)
- Pathology is thought to be the result of chronic hypertrophy of these vascular structures
- Major inflow to CCR is from Superior Rectal Artery

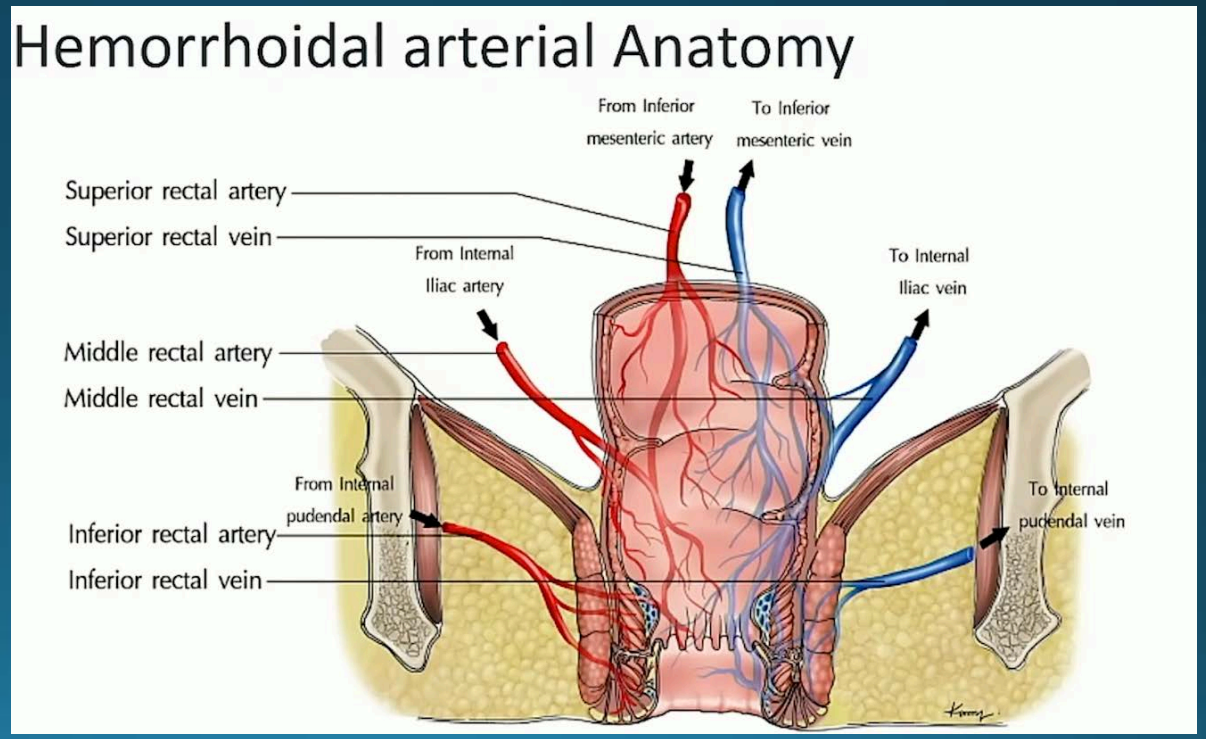
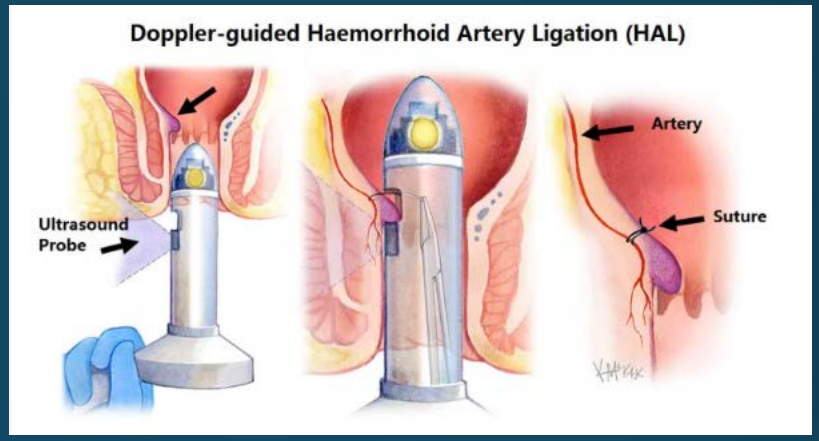


Table 1. Staging of Internal Hemorrhoids

Stage	Symptoms
I	Occasional discomfort and/or bleeding but no obvious external abnormality
II	Hemorrhoids protrude with defecation but reduce spontaneously
III	Hemorrhoids protrude and require digital reduction
IV	Hemorrhoids protrude and cannot be reduced

Hemorrhoid Treatment

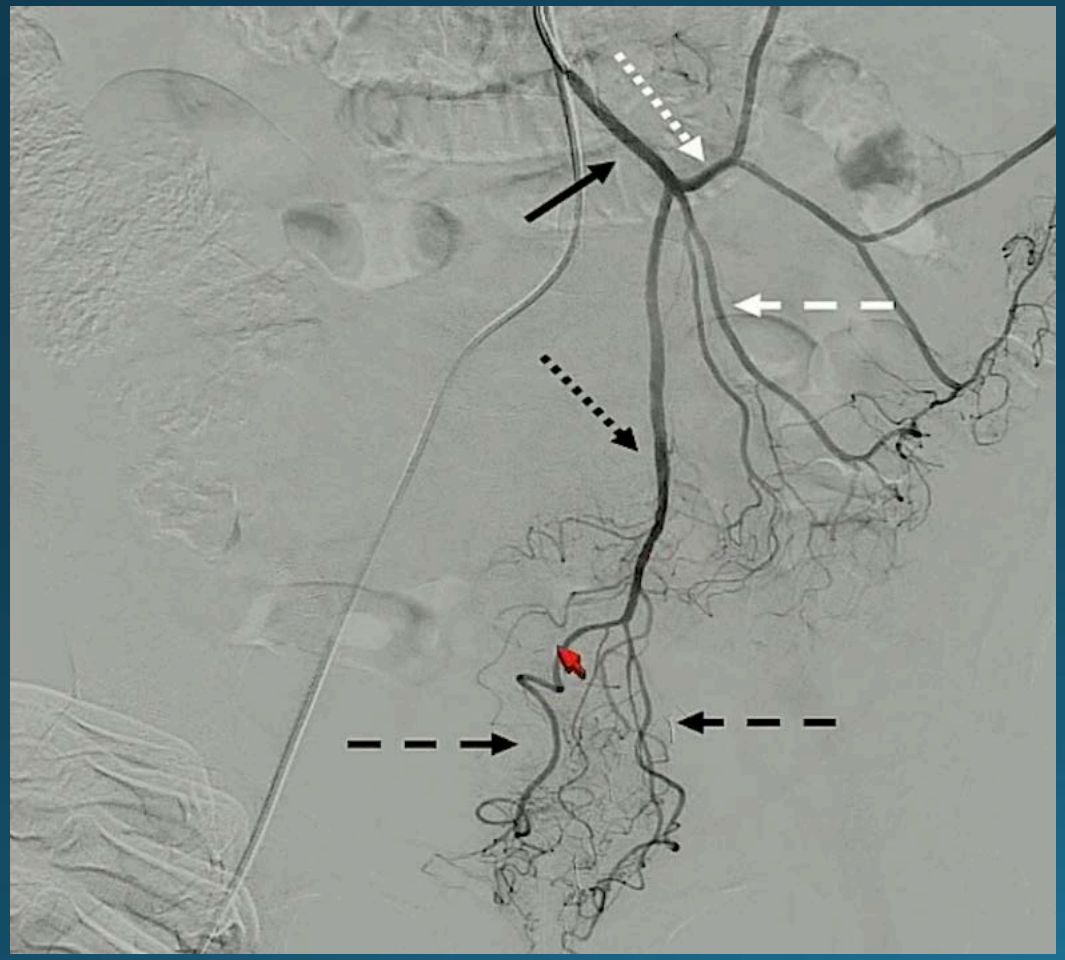


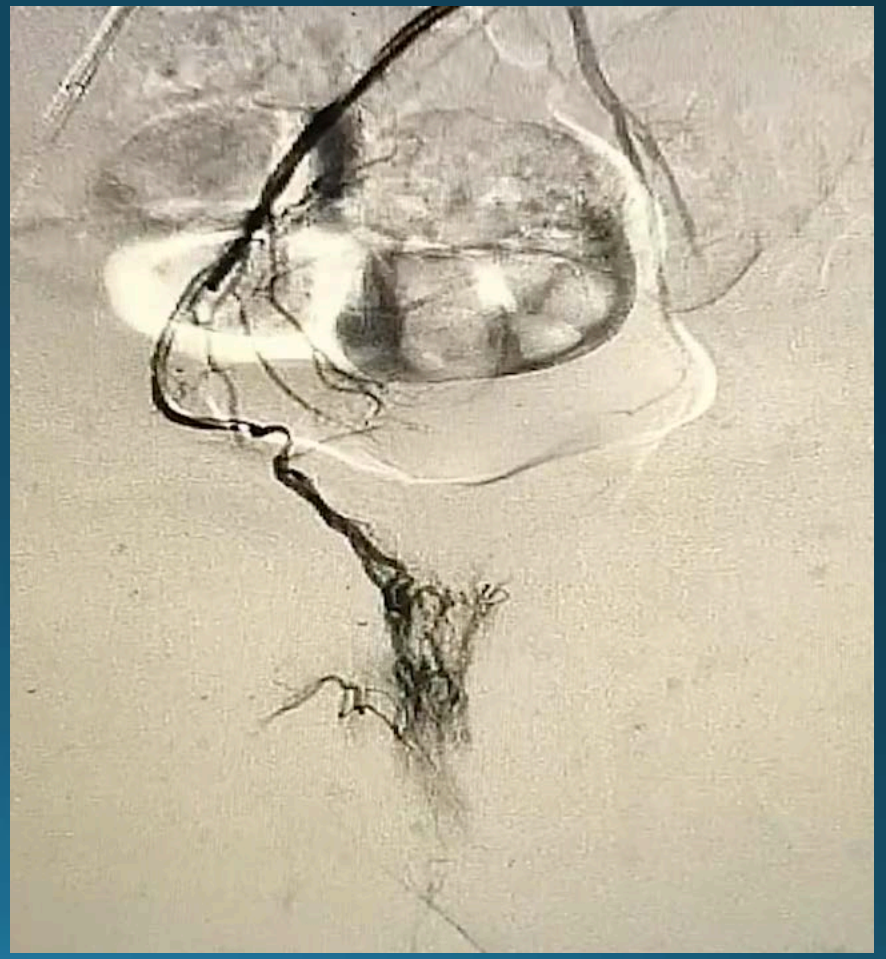
- Medical treatment
  - Hygiene and dietary
- Non-Surgical treatment
  - Infrared photocoagulation, elastic band ligation, Sclerotherapy
- Surgical 10% of cases
  - Open hemorrhoidectomy, anopexy, Elective doppler guided hemorrhoidal artery ligation

Endovascular Embolization

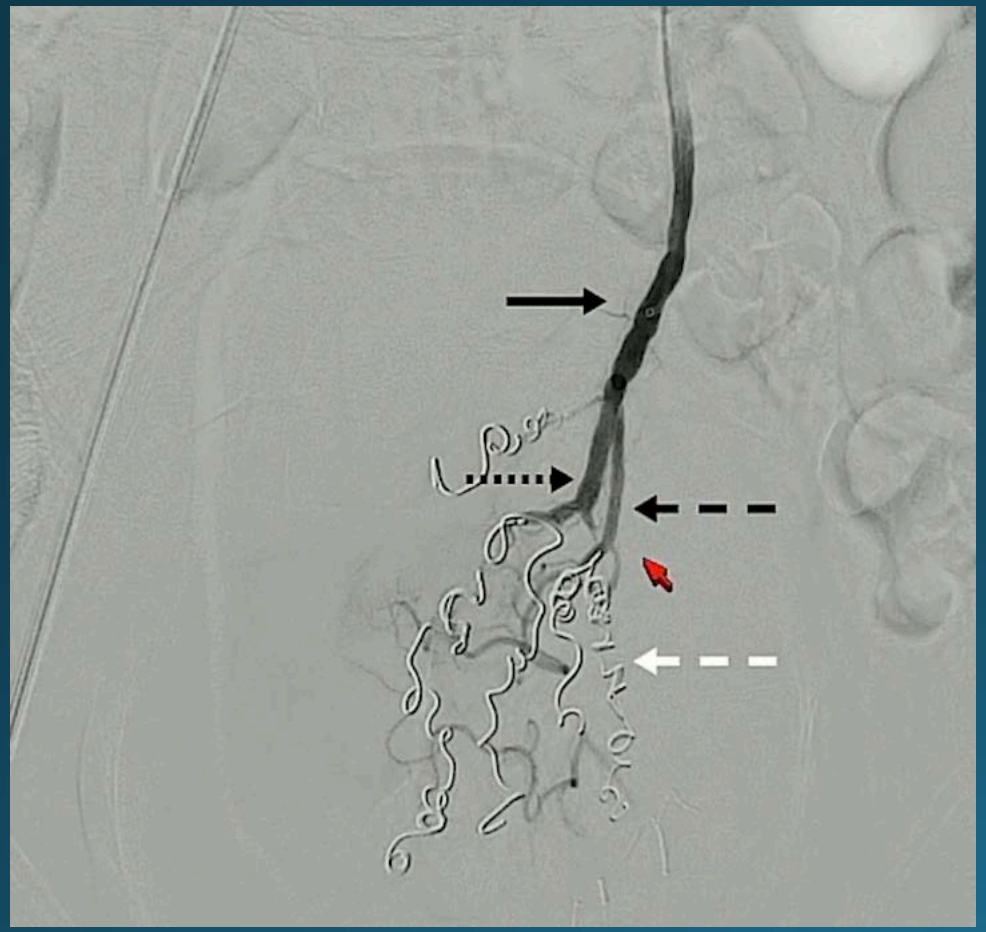
- Compared to DG-HAL
  - Enormous advantage of identifying all hemorrhoidal arterial branches
  - Avoids anal and rectal trauma
  - Grade 1-3 internal hemorrhoids

Emborrhoid Procedure



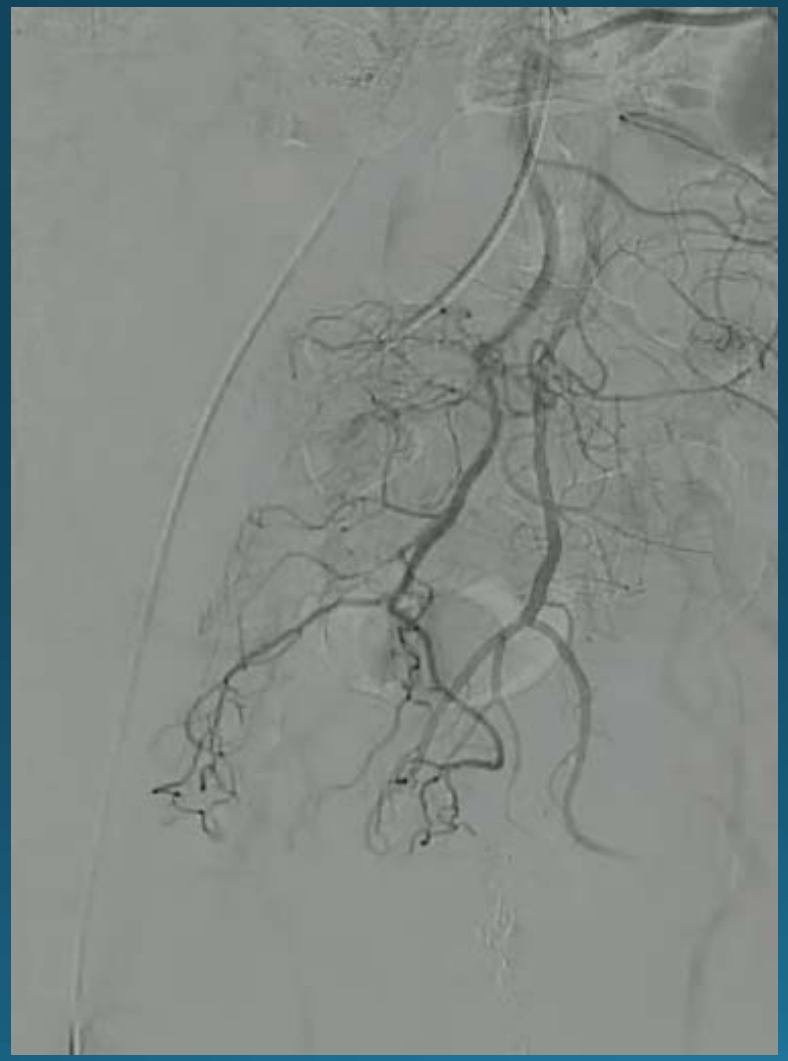


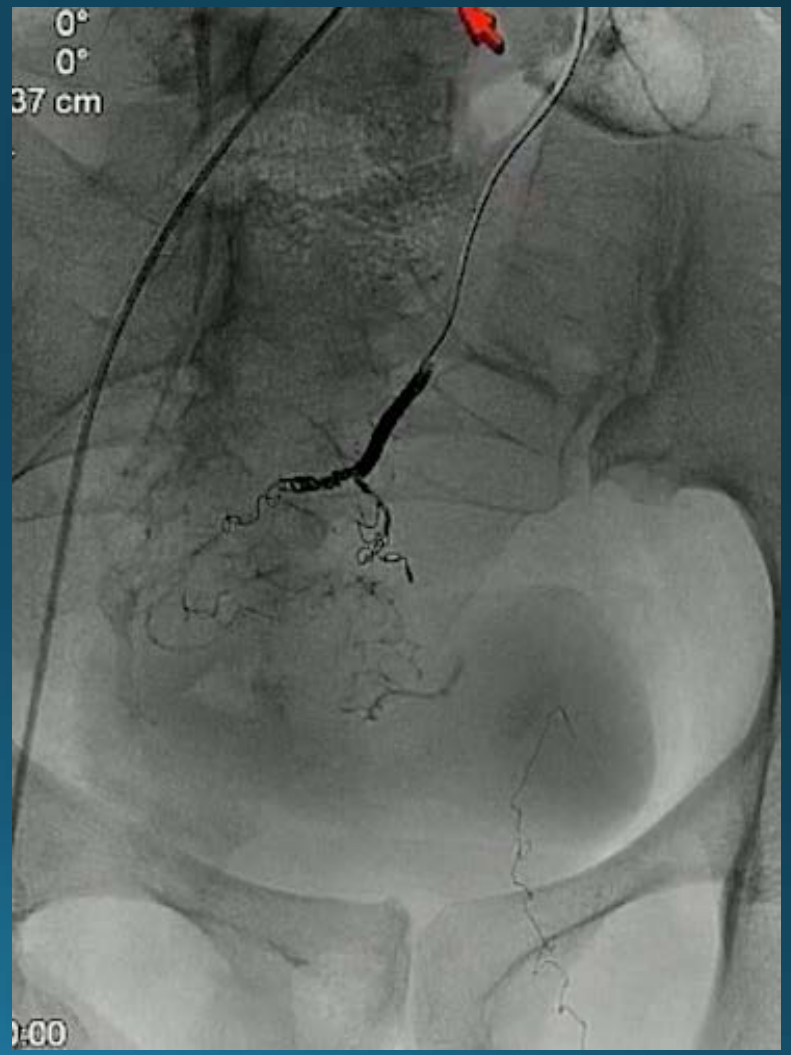
Emborrhoid Procedure



Emborrhoid Case

- 37 yo female with internal hemorrhoids and bleeding/pain for 10 years
- Successful embolization of superior rectal artery.
- Pain and bleeding free for past 12 months





Data

- Meta-Analysis 362 patients
- 12 months follow up
- Mean clinical success 78.9%
- Significant reduction in French bleeding score
- No post operative pain or ulceration

Embolization vs Hemorrhoidectomy

- Prospective randomized CT
- 33 patients
- Grade 2-3
- Pain medication use higher in Surgery group vs embolization 28.92 doses vs 2.4
- Pain score during first bowel movement 6.08 Surgery vs 0 in embolization

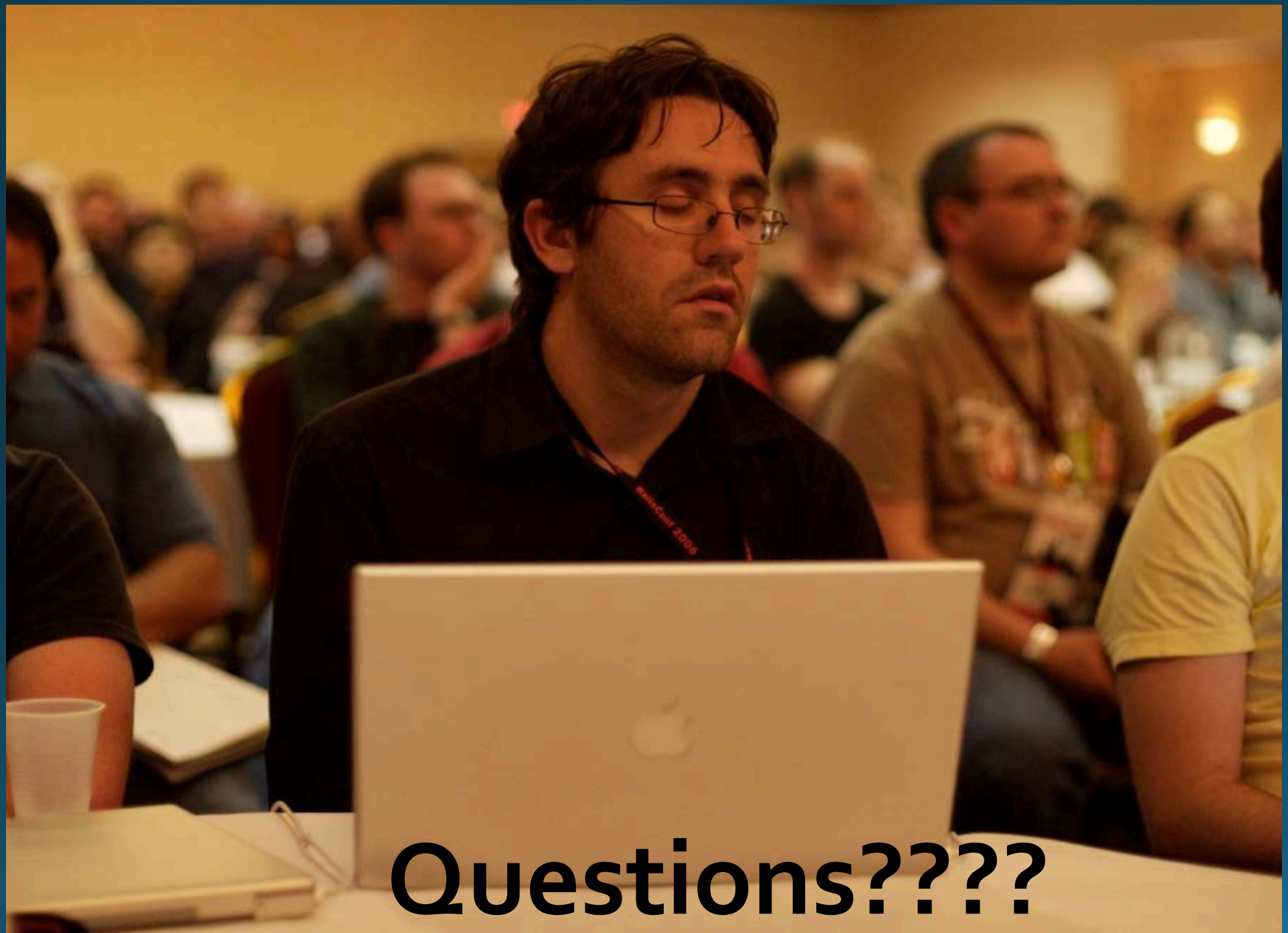

Embolization of the Superior Rectal Arteries versus Closed Hemorrhoidectomy (Ferguson Technique) in the Treatment of Hemorrhoidal Disease: A Randomized Clinical Trial

Priscila Mina Falsarella, MD • Felipe Nasser, PhD • Breno Boueri Affonso, MD • ...
Sergio Eduardo Alonso Araújo, PhD • Rodrigo Gobbo Garcia, PhD • Marcelo Katz, PhD • Show all authors

Published: January 30, 2023 • DOI: https://doi.org/10.1016/j.jvir.2023.01.022 • Check for updates

Embolization vs Surgery

- 83.3% resolution of rectal bleeding
- No difference in outcomes between the two options
- Embolization showed significant lower pain levels


Questions????