Uterine Artery Embolization (UAE / UFE)

ADVANCES · OUTCOMES · COLLABORATIVE CARE FOR FIBROIDS AND ADENOMYOSIS

Azher Iqbal MD
Assist clinical professor of Radiology and Surgery
Medical director
Buffalo Vascular care
Depew NY

Buffalo Vascular Care

buffalovascularcare.com
6337 Transit Rd, Depew • (716) 852-1977

Disclosures

- I am a practicing Vascular Interventional Radiologist and **routinely perform the procedures discussed** in this presentation.
- I have **no financial relationships** with device manufacturers or pharmaceutical companies that influence the content of this talk.

Fibroids & Adenomyosis: Epidemiology & Overlap

- Fibroids: lifetime prevalence up to 70–80%; peak 35–45 y; higher burden in Black women
- Adenomyosis: 20–35%; increasingly recognized with MRI
- Coexistence common (≈15–57%); increases bleeding severity and complexity
- Both share hypervascularity and inflammatory drivers amenable to UAE

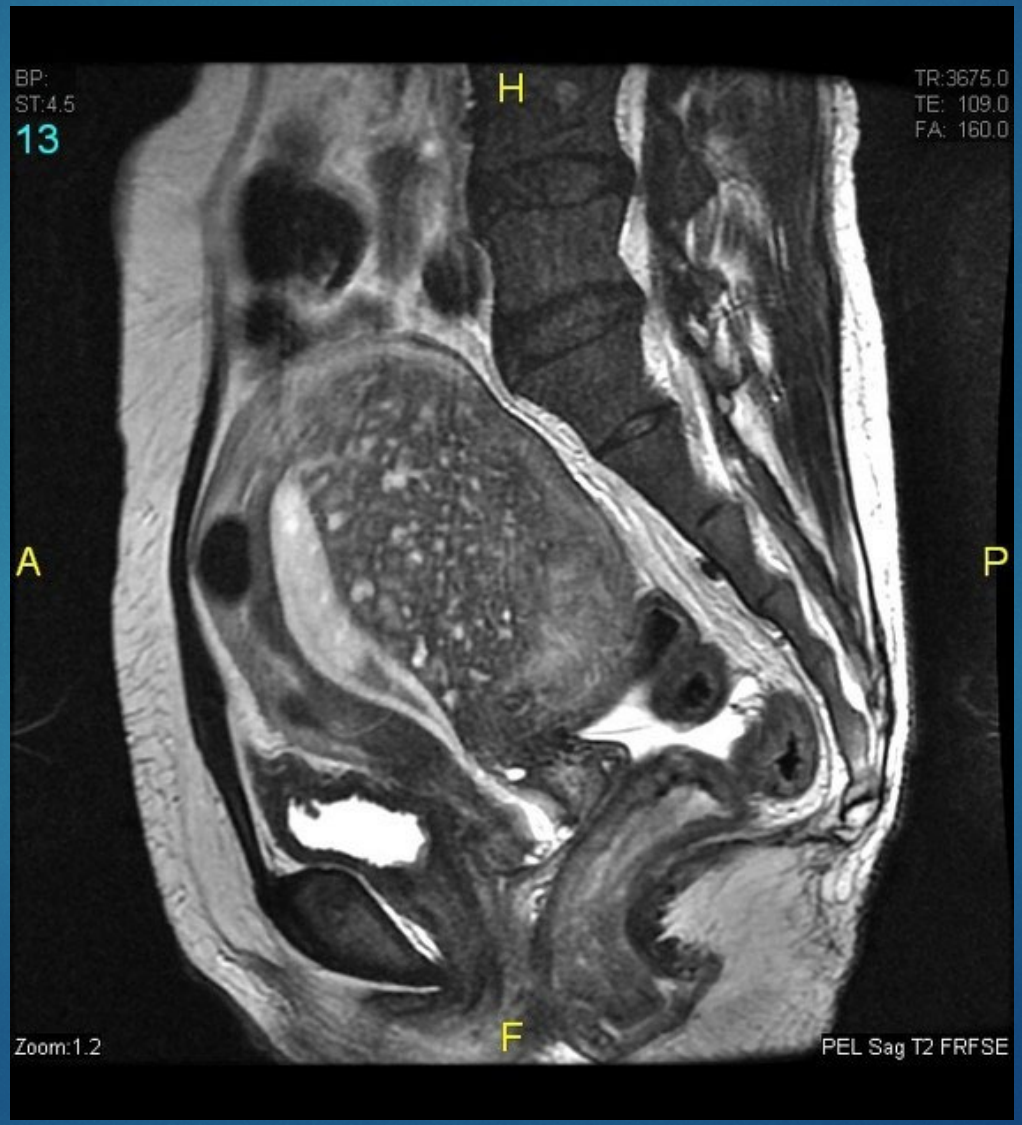
References: Okolo 2008 · Kim Radiology 2021 · de Bruijn Eur Radiol 2022

ADENOMYOSIS

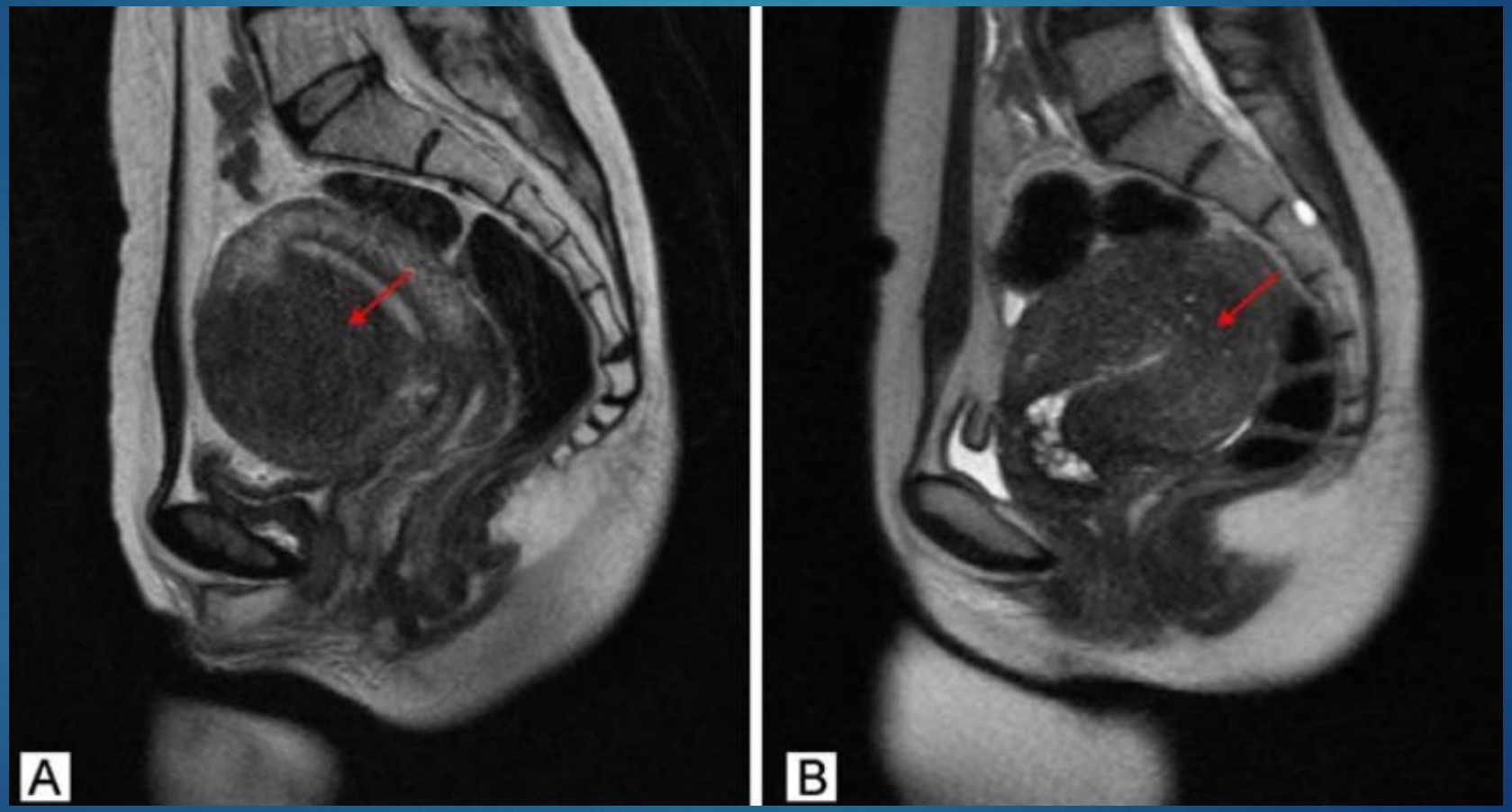
Uterine adenomyosis is a **benign but infiltrative gynecologic condition** in which the **endometrial glands and stroma (the tissue that normally lines the uterus)** grow **abnormally into the myometrium**, the **muscular wall of the uterus**.

The ectopic endometrial tissue **responds to hormonal cycles**, leading to repeated bleeding within the muscle layer.
This triggers **chronic inflammation, hypertrophy, and thickening** of the uterine wall, resulting in an **enlarged, tender uterus**.
Commonly coexists with uterine fibroids or endometriosis.

Adenomyosis



Adenomyosis Pattern

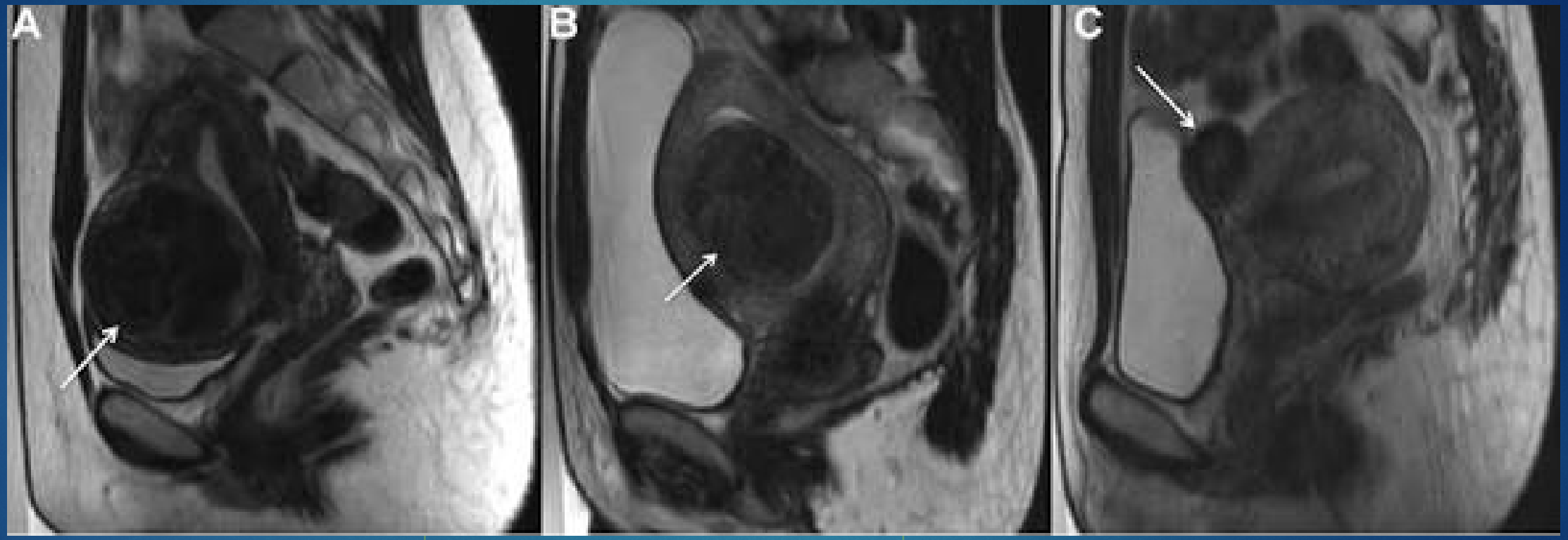


FIBROIDS

Uterine fibroids are **benign smooth muscle tumors** of the **myometrium (uterine wall)**, composed of **smooth muscle cells and fibrous connective tissue**. They are the **most common pelvic tumors in women of reproductive age**.

Fibroids arise from a **single mutated smooth muscle cell** that undergoes **clonal expansion** under the influence of **estrogen and progesterone**.
Growth is **hormone-dependent** and may regress after menopause.
They are **noncancerous** but can distort uterine anatomy and affect fertility or cause bleeding.

Fibroid Pattern

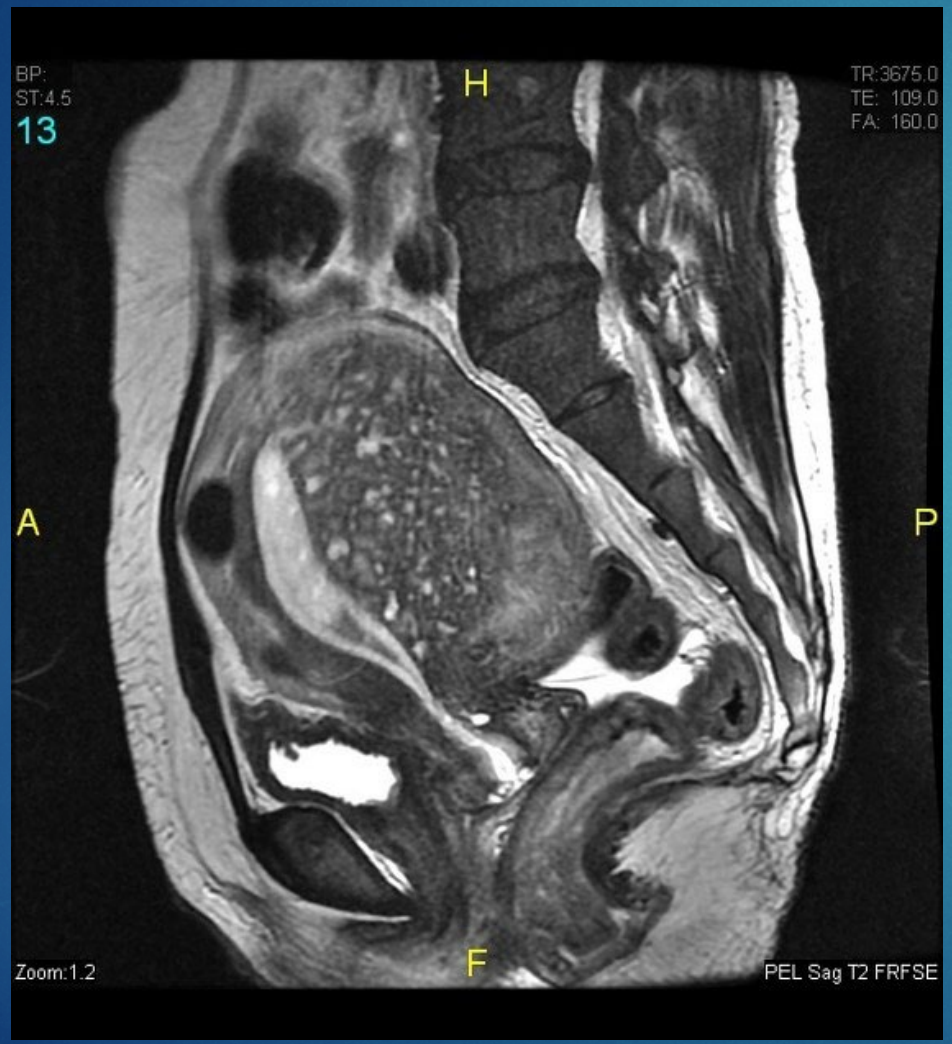


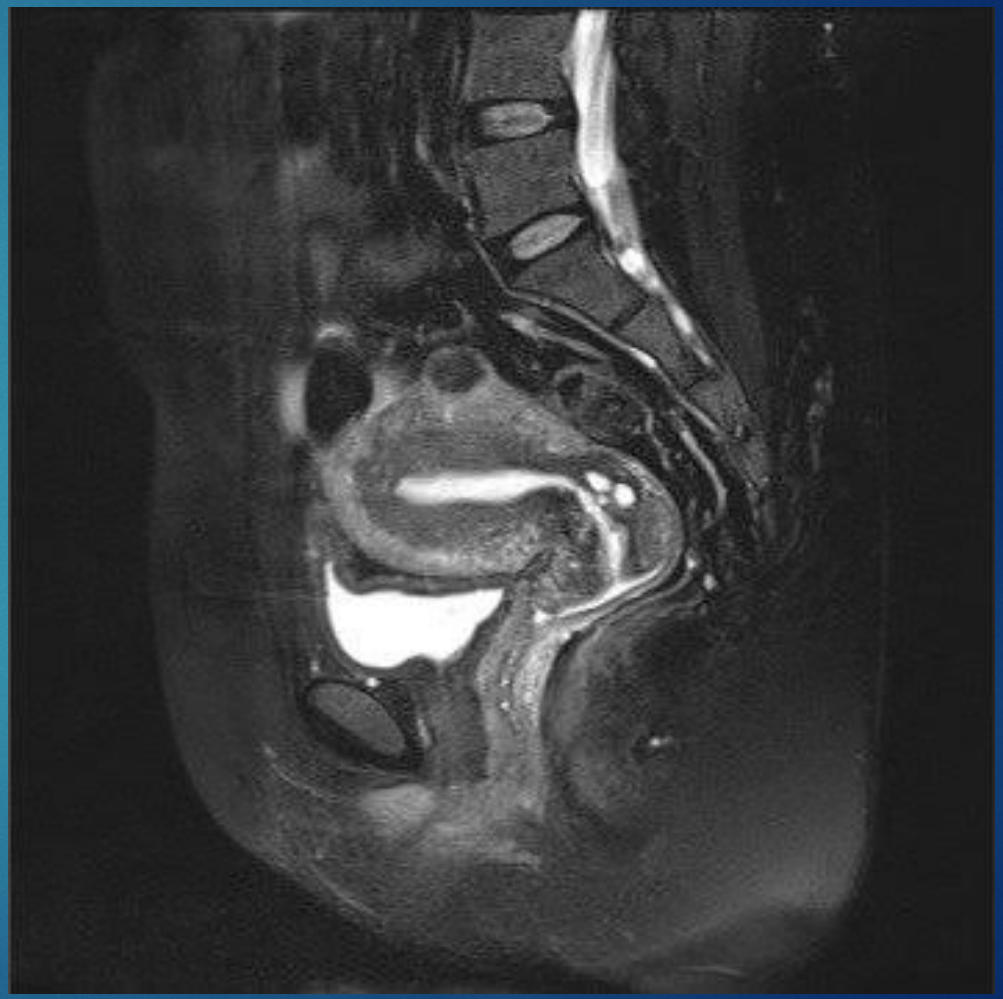
Fibroid Pattern

Fibroid Pattern pedunculated

Fibroid Pattern mass effect

Adenomyosis and Fibroid





Where UAE Fits on the Treatment Spectrum

- Conservative: lifestyle, NSAIDs, hormonal therapy, LNG-IUD
- Minimally invasive: **UAE** — uterus-preserving, definitive symptom control
- Surgical conservative: myomectomy (hysteroscopic/laparoscopic)
- Definitive surgery: hysterectomy

References: ACOG PB 228 (2021) · SIR QI 2022 · REST Lancet 2007

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What is Uterine Artery Embolization (UAE)?

Image-guided, catheter-based occlusion of uterine arteries to reduce abnormal vascularity

Outpatient, uterus-preserving, recovery ≈ 1 week

Access: femoral or radial; calibrated microspheres delivered under fluoroscopy

References: Spies Radiology 2021 · Siskin JVIR 2020 · SIR QI 2022

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Why UAE Works for Fibroids

Selective ischemia of fibroid end-arteries → necrosis → shrinkage

Typical embolic size:
500–700 µm targeting arteriolar level → preserves myometrium

Symptom relief 80–90%; uterine volume ↓ 30–50%, fibroid volume ↓ 40–60%

Durable results; repeatable if needed

References: REST Lancet 2007 · EMMY · Spies Radiology 2021 · SIR QI 2022

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Why UAE Works for Adenomyosis

Targets pathologic neovascularity within myometrium; reduces cyclic bleeding

Reduces inflammatory mediators → early pain relief (weeks)

MRI: JZ thickness and uterine volume typically ↓ 20–45%

Technique tweak:

smaller particles **200–500 µm** for distal penetration

References: Kim Radiology 2021 · de Bruijn Eur Radiol 2022 · Siskin JVIR 2020

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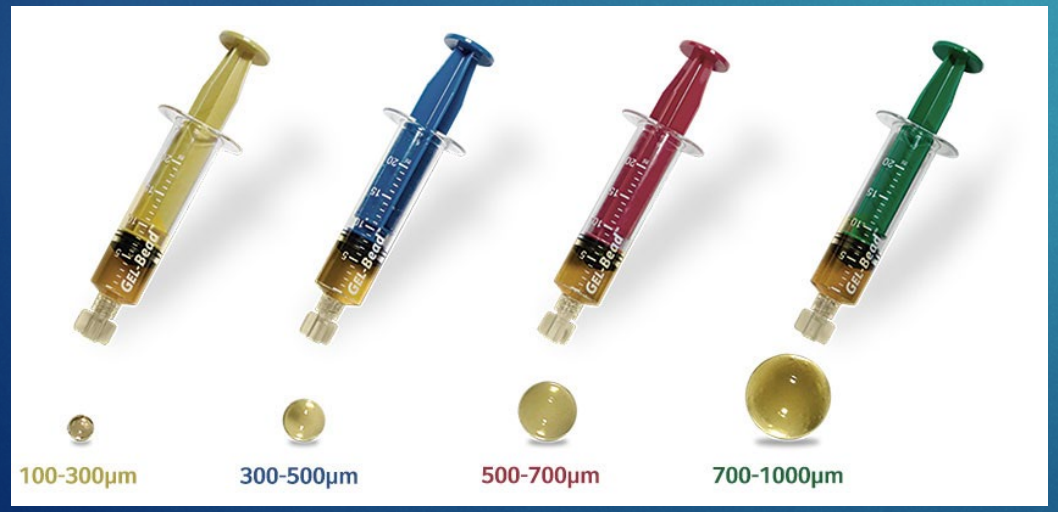
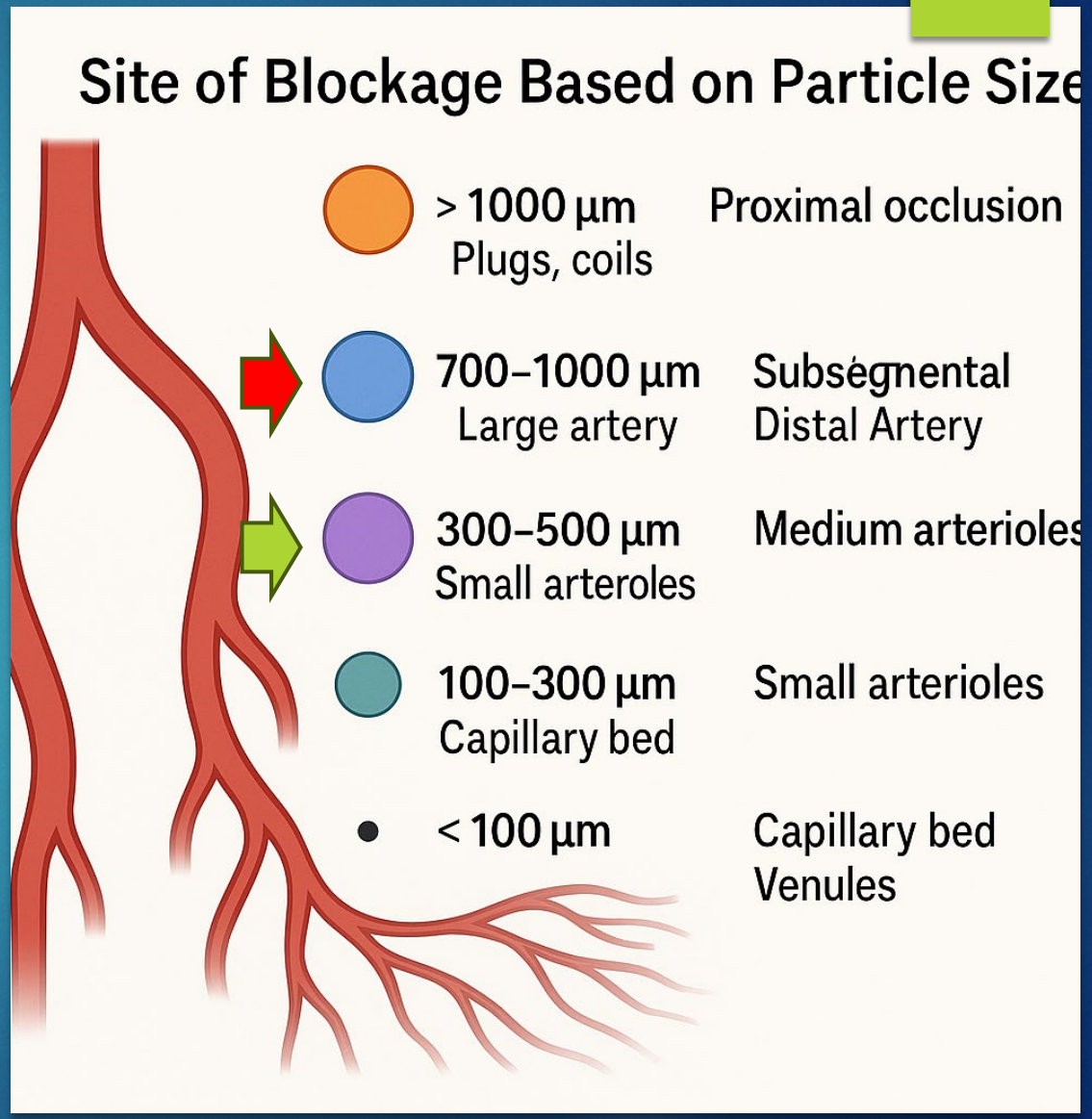
METHOD TO MADNESS

- Fibroid vs
- Adenomyosis





Evidence Snapshot UAE

- Fibroids: RCTs/registries → symptom control 80–90%; volume reduction 40–60%
- Adenomyosis: durable pain/bleeding relief 75–85% at ≥3 years
- Mixed disease: outcomes comparable to fibroid-only UAE

References: Spies Radiology 2021 · Kim 2021 · de Bruijn 2022 · Carrafiello 2021

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Comparative Effectiveness

UAE vs Myomectomy: similar symptom control; UAE = shorter recovery & fewer transfusions

UAE cost ≈ 40–50% less than surgery; outpatient same-day discharge typical

Re-intervention at 5 y ≈ 15–20% (new fibroids)

References: REST Lancet 2007 · Hehenkamp NEJM 2019 · Spies Radiology 2021

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Fertility: treatment choice

References: Kim Radiology 2021 · de Bruijn 2022 · Carrafiello 2021 · ACOG PB 228

Fertility After UAE vs Myomectomy (Fibroids)

Pregnancy after UAE ≈ 40–69% (pooled ~50–55%); live birth ~45–60% (<40 y)

Miscarriage post UAE: 22–27% (age-driven) – (normal 10-20%)

Compared with myomectomy: mixed evidence; matched cohorts similar; older RCTs favor myomectomy slightly

Fibroid burden: >6 myomas lower pregnancy after myomectomy; UAE competitive in multi-fibroid cases

References: Spies Radiology 2021 · Hehenkamp NEJM 2019 · Toor AJR 2012 · ACOG PB 228

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Fertility After UAE vs Myomectomy (Fibroids)

- **When is Myomectomy Favored?**
- Future pregnancy desired **and** fibroids distort the uterine cavity (submucosal/intramural with cavity involvement) → **better fertility outcomes** (PubMed +1)
- **Limited number** of fibroids (≈ 1–5) that are surgically accessible and can be removed while preserving uterus
- **Large but localized** fibroids where surgical removal is feasible and safe

Fertility After UAE vs Myomectomy (Fibroids)

- **When UAE Is Favored or Considered**
- **Fertility not a priority** and patient prefers a **minimally invasive** approach
- **Multiple or diffuse fibroids** (e.g., > 8–10 or widely scattered) where surgery is difficult (PMC +1)
- **High surgical risk** or strong preference to avoid major surgery
- **Significant bleeding/bulk symptoms** and willing to accept possible re-intervention later

Adenomyosis & Fertility — Decision Tree

Step 1: Is Future Pregnancy a High Priority?
• Yes → Proceed to Step 2
• No / Uncertain → UAE for symptom control (fertility impact uncertain)

Step 2: Disease Pattern on MRI / TVUS
• Focal adenomyoma, surgically accessible → Adenomyomectomy (uterus-sparing)
• Diffuse / multifocal or large uterus → UAE for uterine preservation & symptom relief (fertility data limited)

Step 3: Patient & Clinical Modifiers

• Higher surgical risk / prefers minimally invasive → Favor UAE (with fertility caveats)
• Younger, good ovarian reserve / ART planned → Favor Surgical optimization (adenomyomectomy if feasible)
• Coexisting fibroids / endometriosis → Multidisciplinary plan (REI, GYN, IR)

Key Principle:
No universal guideline—individualize decisions based on fertility goals, anatomy, and expertise'
REFER TO FERTILITY SPECIALIST TEAM.

Sources: Asian Society of Endometriosis & Adenomyosis (2023); SOGC 437 (2023); ESHRE GPR (in development); CVIR Endovasc 2023; ACOG AUB framework.

Fertility Adenomyosis & Mixed Fibroid Disease Post UAE Pooled data meta-analysis

Adenomyosis: pregnancy ≈ 39–40%; live birth ≈ 30–35%; better in focal disease.

Mixed (fibroids + adenomyosis): pregnancy ≈ 35–45% with endometrium preserved.

Technique: smaller particles (200–500 µm); careful endpoint to protect myometrium

Surgery context: focal adenomyomectomy rates vary widely; diffuse disease fares worse

References: Kim Radiology 2021 · de Bruijn 2022 · Carrafiello 2021 · ACOG PB 228

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Comparative Effectiveness: Fibroids
UAE vs Myomectomy vs Hysterectomy

Outcome	UAE	Myomectomy	Hysterectomy
Symptom relief	≈ 85–90 %	≈ 85–90 %	100 % (removal)
Recovery time	1 week	2–6 weeks	4–8 weeks
Hospital stay	Outpatient / same-day	2–3 days	3–5 days
Transfusion rate	< 1 %	5–10 %	10–20 %
Recurrence / re-intervention (5 y)	15–20 %	10–25 %	N/A
Cost	≈ 40–50 % less	Higher	Highest
Fertility impact	Variable (≈ 50 % preg rate)	Favorable	Eliminated

References: REST Lancet 2007 · Hehenkamp NEJM 2019 · Spies Radiology 2021 · ACOG PB 228 (2021)

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So Where UAE Fits on the Treatment Spectrum?

- Conservative: lifestyle, NSAIDs, hormonal therapy, LNG-IUD
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Guideline Snapshot: SIR & ACOG Recommendations

- SIR: established image-guided therapy; OB-GYN collaboration and outcomes tracking.
- ACOG PB 228 (2021): appropriate for uterine preservation with counseling re: fertility data.
- NICE (UK): UAE as standard alternative to myomectomy for symptomatic fibroids.

References: SIR QI 2014/2022 · ACOG PB 228 (2021) · NICE IPG 367

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Our Workflow & Collaboration: Integrated Care Model

- IR-led end-to-end procedure related care responsibility:
  - Consult → MRI → outpatient UAE → structured follow-up
- Follow-up cadence: 24 h (T)→ 3–4 d (T)→ 10 d → 3 mo → 6 mo + MRI
- Complications:
  - Primarily managed by IR; rare mechanical/surgical issues co-managed with OB-GYN
- Continuity: patient returns to OB-GYN for lifelong care; self-referred patients reconnected

References: SIR QI 2022 · ACOG PB 228 (2021)

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Patient Management: Pain, Expectations & Post-UAE Course

Pre-procedure: expectation setting; PES is expected, not a complication

Peri-procedural: midazolam + fentanyl; ketorolac 30 mg IV; ondansetron; cefazolin; fluids

Post-home: NSAIDs ± short opioid; hydration; red flags: fever >101.5°F, foul discharge

Menstruation may skip 1–2 cycles; discharge ≤2 wks; fibroid expulsion 3–5% (submucosal)

References: SIR QI 2014/2022 · Worthington-Kirsch JVIR 2020 · Kim Radiology 2021

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Safety & Follow-Up

Follow-up:

24 h call → 3–4 d call → 30 d → 3 mo → 6 mo MRI

PES 3–5 days → expected course

Infection ~0.5–1%; major complications <1%

Amenorrhea, transient 10–15%

Ovarian failure ~1–3% (<45 y rare)

Fibroid expulsion 3–5%

Seldom needs D&E

References: SIR QI 2022 · Hehenkamp NEJM 2019 · Spies Radiology 2021 · Toor AJR 2012

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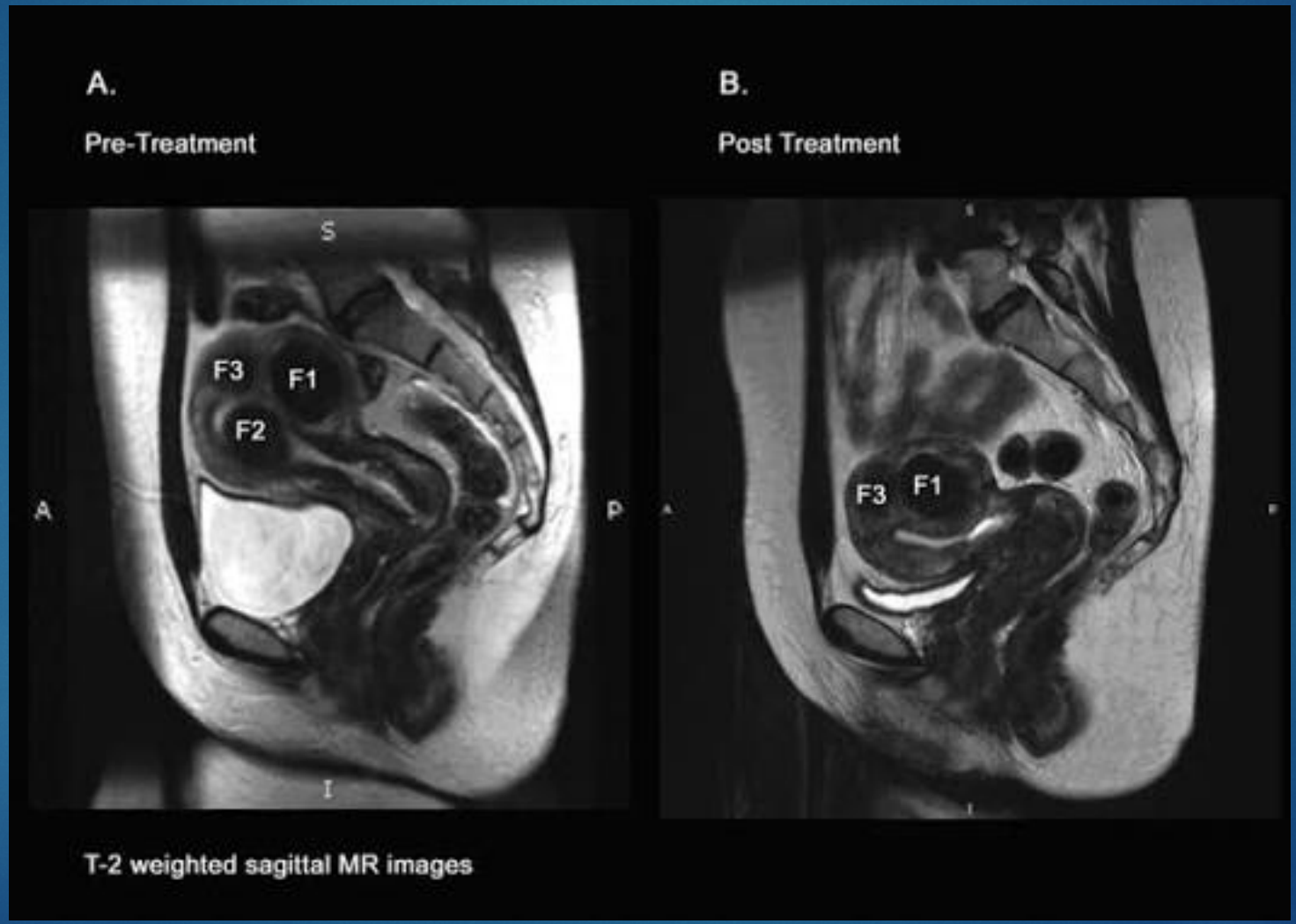
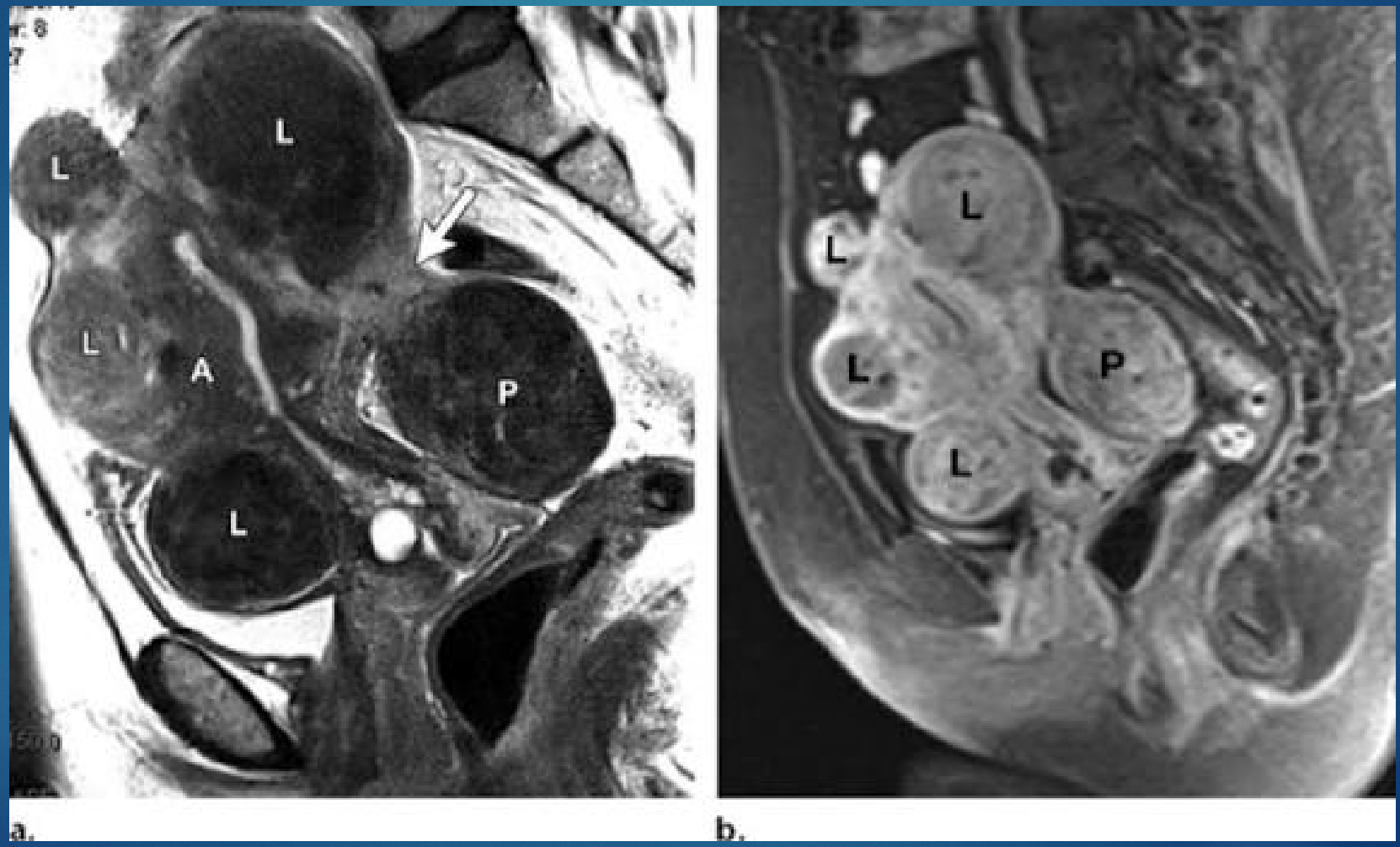
Fibroid: pre and post UAE



Fibroid and ademomyosis pre and post UAE



Expanded Indications for UAE

- Symptomatic fibroids (multiple/large/recurrent) and adenomyosis (diffuse or focal)
- Mixed fibroid + adenomyosis presentations — common and responsive
- Select cases: postpartum hemorrhage, cesarean scar bleeding
- Fertility preservation when surgery is undesired or high-risk (shared counseling)

References: SIR QI 2022 · Kim Radiology 2021 · de Bruijn 2022 · ACOG PB 228

Future Directions

- Refined embolics; drug-eluting particles
- Adjunct anti-inflammatory/hormonal strategies
- MRI perfusion mapping for personalized endpoints
- AI for candidate selection and outcome prediction; shared dashboards

References: SIR QI 2022 · Kim Radiology 2021 · Spies Radiology 2021

SUMMARY: The Clinical Burden

- Fibroids and adenomyosis are leading causes of heavy bleeding and pelvic pain
- >200,000 hysterectomies/yr in the U.S. for benign disease
- Awareness and access to minimally invasive alternatives remain limited
- Close collaboration between IR and OB/GYN is essential to expand access

References: Okolo 2008 · Kim Radiology 2021 · SIR QI 2022

Treatment Continuum — Fibroids & Adenomyosis

- Lifestyle & Observation: Watchful waiting, diet, exercise, iron supplementation
- Medical Therapy: Hormonal (OCPs, IUDs, progestins), GnRH agonists/antagonists, tranexamic acid
- Image-Guided Minimally Invasive (IR): Uterine Artery Embolization (UAE / UFE) — uterus-sparing, outpatient, effective for fibroids & adenomyosis
- Conservative Surgical: Myomectomy — hysteroscopic, laparoscopic, or open
- Definitive Surgical: Hysterectomy — definitive cure, ends fertility

- UAE bridges the gap — durable symptom relief without major surgery.

- Adapted from ACOG Practice Bulletin No. 228 (2021) and SIR Clinical Practice Guidelines (2023).

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- Cell: (716) 713-1861

Case Presentation: Fibroids and Adenomyosis

Patient: 41-year-old G5P4 female with no significant past medical history.

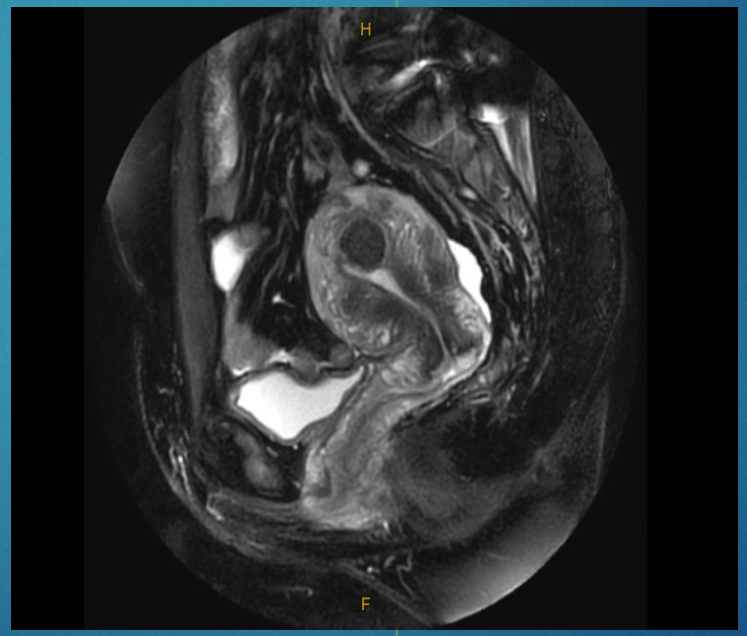
History: Heavy, irregular periods with clots and gushing; urinary frequency.

MRI Imaging (1/26/24): Enlarged uterus with multiple intramural fibroids (largest 20 mm) and focal adenomyosis.

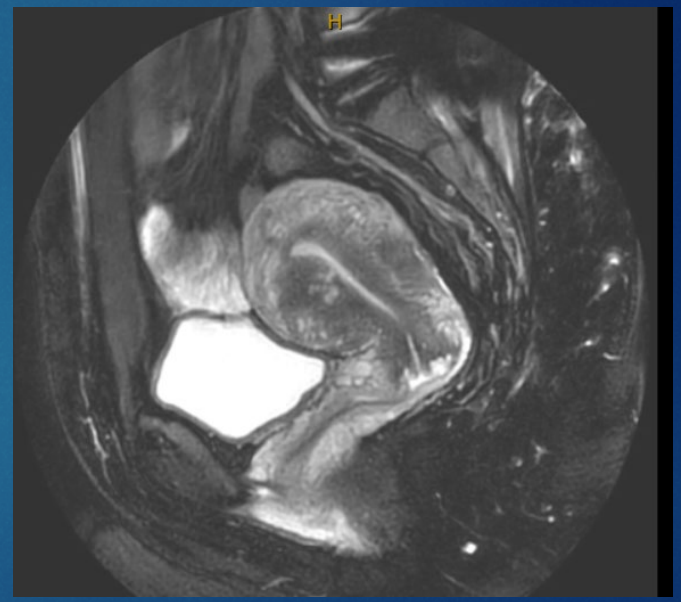
Outcome

- Excellent result post-UAE.
- Resolution of pre-procedure symptoms.
- Significant improvement in quality of life.

Pre UAE



Post UAE



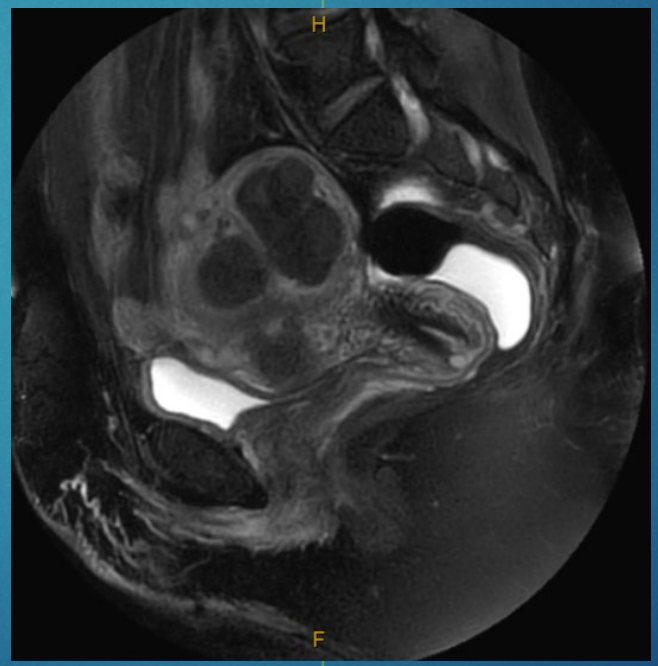
Case Presentation: Fibroids

Patient: 44-year-old African American female, G2P2. Long history of heavy menstrual bleeding (since menarche) who had Endometrial ablation in 2021 – temporary improvement

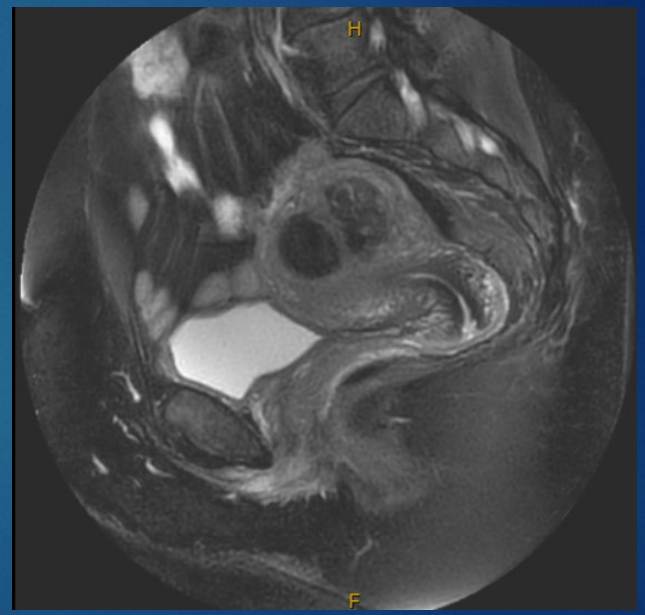
Symptoms :Heavy bleeding (10–13 days, gushing, clots) Pelvic pain, cramping, back pain radiating to leg. Urinary incontinence with coughing. Recurrent UTIs (3 in past year)Anemia requiring iron infusions

Outcome
Normal, controlled menstrual flow. Resolution of pelvic pain and heaviness. Improved urinary control. No recurrent UTIs. Marked improvement in quality of life

Pre UAE



Post UAE



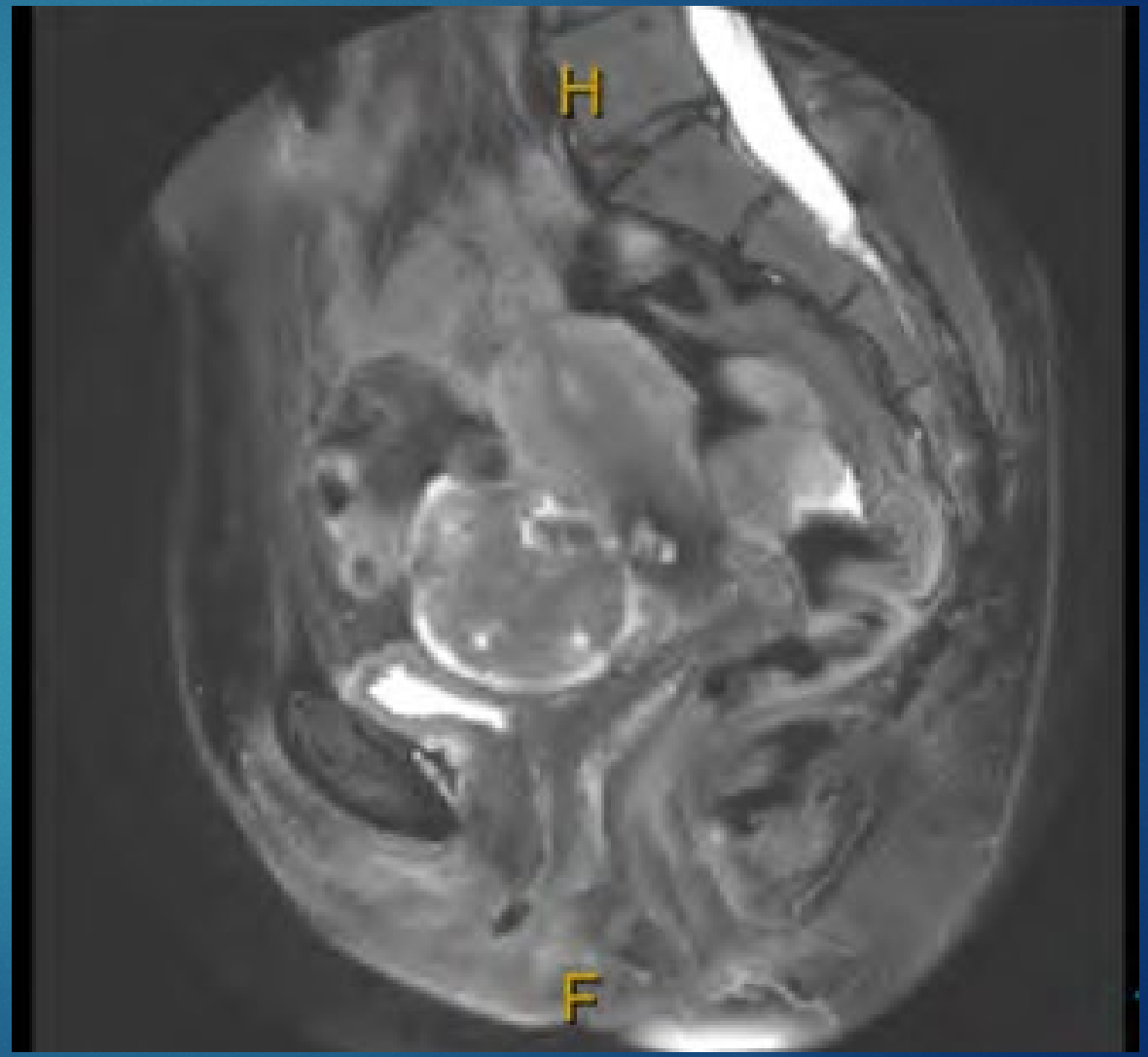
Atypical Fibroid

Patient: 40-year-old G5P4 female with interstitial cystitis.

Presentation: Reports progressively heavy menstrual bleeding with gushing and clots, partially improved with tranexamic acid. Mild back pain.

Findings: MRI of pelvis showed atypical fibroid morphology.

Plan: Due to atypical features, case discussed with GYN referred for specialized GYN treatment.



Summary & Key Takeaways

UAE: safe, effective, uterus-preserving for fibroids and adenomyosis.

Mechanisms: targeted arterial occlusion + inflammatory modulation.

Collaboration: IR manages procedure/recovery; OB-GYN resumes lifelong care.

Patient value: short recovery, outpatient convenience, high satisfaction.

References: SIR QI 2022 · ACOG PB 228 · Spies Radiology 2021

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References

- Spies JB et al. Radiology 2021; Kim MD et al. Radiology 2021; Hehenkamp WJ et al. NEJM 2019;
- de Bruijn AM et al. Eur Radiol 2022; Carrafiello G et al. CVIR 2021; Siskin GP et al. JVIR 2020;
- SIR QI Guidelines (JVIR 2014, reaffirmed 2022); ACOG Practice Bulletin 228 (2021);
- Worthington-Kirsch RL et al. JVIR 2020; Toor SS et al. AJR 2012.