Chapter 41
Uterine Artery Embolization

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Evaluating the Patient

Collaboration with which specialty should be considered when evaluating a patient for UAE?	Gynecology. A multidisciplinary team approach is more likely to provide the patient with a thorough work-up and treatment plan.
What are symptoms associated with fibroids?	Heavy menstrual bleeding, pelvic pressure, pelvic pain, back pain, urinary urgency, urinary frequency, incontinence, and dyspareunia.

(continued)

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R. Chand et al. (eds.), *Essential Interventional Radiology Review*, https://doi.org/10.1007/978-3-030-84172-0_41

What is the preferred imaging modality to assess the patient for fibroids?	MRI; studies have shown MRI to be superior to ultrasound in accurately detecting fibroids, evaluating fibroid location, and demonstrating abnormal enhancement. MRI has better interobserver reproducibility when compared to other modalities. Contrast-enhanced MRI has the advantage of producing an MRA that may be helpful in planning for UFE. Procedural success is unlikely if there is little or no enhancement of the fibroids.
Why is abnormal MRI enhancement worrisome?	Pelvic malignancy can mimic fibroid disease and imaging differentiation between fibroids and leiomyosarcoma can be challenging due to their overlapping features. Abnormal enhancement, hemorrhage, and myxoid degeneration on an MRI can sometimes suggest an invasive/malignant component within a uterine mass.
What symptoms should cause you to consider a uterine malignancy?	Patients with weight loss, fatigue, other systemic symptoms, or rapid growth of a single fibroid should be treated with hysterectomy due to concern for uterine malignancy. Additionally, all patients over 40 years old with abnormal bleeding should undergo pap smear and endometrial evaluation (e.g., biopsy, hysteroscopy, dilation, and curettage) as part of the routine, pre-UFE workup for because endometrial carcinoma can coexist with fibroid disease and be a cause of menorrhagia.

Describe the post-UFE follow-up?	Follow-up typically consists of an IR clinic visit and MRI; however, timing and specifics are institution dependent. Quality-of-life data suggest that most patients are symptomatically improved at 3 months post-UFE and this interval for follow-up can be utilized. Normal gynecologic well-woman care with a gynecologist should be continued.

High Yield History

What clinical tests/ procedure results should be reviewed when seeing a patient in consultation for fibroid embolization?	(a) Laboratory data (e.g., PT/INR, creatinine, hemoglobin/hematocrit, platelets)
	(b) Pelvic examination
	(c) Results of pap smear within 1 year
	(d) Endometrial biopsy if treating menorrhagia, especially if older than 40 years old
	(e) Pelvic imaging
What other gynecologic disorders overlap with uterine fibroids?	Endometriosis and adenomyosis. Adenomyosis is well-identified on T2 imaging and requires patient counseling on the decreased likelihood of treatment success.
What should patients be counseled on if desiring future fertility?	There is a 2–3% chance of early menopause. Although UFE is likely to preserve the uterus, for women who desire future childbearing, the long-term effects on the menstrual cycle and capacity for reproduction are unknown.

Indications/Contraindications

What is the most common indication for UAE?	Symptomatic fibroids.
What are other indications for UAE?	(a) Adenomyosis
	(b) Prepartum/preoperative interventions
	(c) Postpartum hemorrhage
	(d) Inoperable gynecologic tumors
	(e) Uterine vascular malformations
What are contraindications for UAE?	(a) Leiomyosarcoma or suspected gynecologic malignancy
	(b) Current gynecologic infection
	(c) Active pregnancy
What is the primary symptom causing women to seek treatment for fibroids?	Menorrhagia.
What are the contraindications of UAE for patients with life-threatening hemorrhage?	There are no contraindications.

Relevant Anatomy

What division of the internal iliac (hypogastric) artery does the uterine artery arise from?	Anterior division.

What branch does the uterine artery directly arise from?	There is a wide variability in the origin of the uterine artery. Most commonly, the uterine artery is the first or second branch from the anterior division of the internal iliac artery.
What are the relevant segments of the uterine artery?	From proximal to distal, the uterine artery can be divided into descending, transverse, and ascending segments.
What small branches originate from the mid to distal uterine artery, typically from the transverse segment of the uterine artery?	Cervical-vaginal branches.
What is the common radiographic appearance of uterine arteries?	Hypertrophied tortuous corkscrew configuration coursing medially in the pelvis.
What is a common collateral blood supply to fibroids?	Ovarian arteries, which arise from the abdominal aorta inferior to the renal arteries and superior to the inferior mesenteric artery (between L2 and L3).
What is the classification of fibroids by location?	*Submucosal*: protrude into the endometrial cavity *Intramural*: within the myometrium *Subserosal*: protrude out of the serosal surface, covered by parietal peritoneum *Pedunculated*: attached to the uterus by a stalk *Cervical*: located in the uterine cervix

Relevant Materials

What embolic material is most commonly used for fibroids?	Particles such as trisacryl gelatin microspheres (Embosphere®) or polyvinyl alcohol particles (PVA).
What embolic material is most commonly used for uterine/vaginal hemorrhage?	Gelfoam slurry or pledgets
	Coils
	n-Butyl-2-cyanoacrylate (NBCA;glue)
What size catheters are typically used to select the uterine artery?	4 or 5-Fr catheters or larger lumen microcatheters.
Why do some interventionalists prefer microcatheters over 4- or 5-Fr catheters?	A microcatheter occupies a smaller percentage of the cross-sectional area of the uterine artery and is softer with a more flexible tip, which may reduce the likelihood of catheter-induced spasm.

General Step by Step

What access sites are commonly used?	Unilateral common femoral artery
	Bilateral common femoral arteries
	Unilateral radial artery
Why are pelvic angiograms performed?	To map the uterine arteries.

What is the most helpful view to identify the uterine artery?	Ipsilateral anterior oblique.
Where should the catheter tip be positioned for treatment?	Transverse portion of the uterine artery, and distal to cervico-vaginal branches to prevent non-target embolization.
What is the goal of treatment?	Slow flow or near stasis in the uterine artery. The goal is not to cause complete stasis or occlude the entire artery.
Which uterine arteries are treated?	Bilateral uterine arteries are embolized in order to achieve ischemia and infarction of uterine fibroids. Unilateral uterine artery treatment is likely to result in clinical failure because the blood supply to the uterus has a variety of collateral pathways.
When should aortography for ovarian arterial supply be performed?	Disproportionately small uterine arteries
	Spasm of the uterine artery, requiring different approach
	Non-perfused tissue on uterine angiography
	Repeat embolization procedures
What are expected MRI findings post fibroid embolization?	T1 signal intensity should increase relative to the myometrium due to increased methemoglobin from coagulative necrosis. There should be no internal enhancement. There should also be decreased size and T2 signal intensity. With the onset of liquefaction, T2 signal intensity will increase.

Complications

What are some methods of reducing post-UAE pain?	Pretreatment with nonsteroidal anti-inflammatory medications several days before
	Intra-procedural superior hypogastric nerve block
	Intraarterial lidocaine or Toradol injection
	Post-procedure anti-inflammatory medications and analgesics like a PCA pump
What should be considered in a post-UAE patient presenting with inflammatory peritonitis?	Pedunculated fibroid detaching from the uterus and falling into the pelvis
	Uterine infection/perforation/abscess formation
What should be considered in a post-UAE patient presenting with persistent vaginal discharge, tissue passage, and/or menstrual cramping?	Fibroid passage through the cervical os.
Which type of fibroid is most at risk for fibroid passage?	Pedunculated large submucosal fibroid. Most will pass uneventfully, though there is risk of cervical obstruction and infection, potentially requiring surgery.
How is fibroid passage managed?	Observation +/− antibiotics
	Dilation and curettage
	Hysteroscopic resection
	Manual extraction
	Hysterectomy

Which subtype of fibroid has the potential risk of detachment from the uterus following infarction?	Pedunculated subserosal fibroid, especially with stalk diameter <2 cm.
What is post-embolization syndrome?	Clinical symptoms including low grade fever, nausea, malaise, and loss of appetite.
What is the treatment for post-embolization syndrome?	Supportive management including pain management and fluids.
What are the 2 most common complications of UFE?	Permanent amenorrhea; 1–5% of women go into early menopause, which is more common in women older than 45 years old Prolonged vaginal discharge
What is the effect of UAE on fertility?	Studies have not been clear as to the risk of infertility after UFE, though; many patients have gone on to have normal pregnancies.

Landmark Research

Moss, JG et al. Uterine-artery embolization versus surgery for symptomatic uterine fibroids. NEJM. 2007; 356:360–370.

- Randomized, multi-center study that compared the efficacy and safety of UAE to standard surgical methods for treatment of symptomatic fibroids.
- UFE is less painful at 24 hours with shorter hospital stays and quicker return to work.
- No difference in quality of life scores at 12 months.
- No difference in adverse events.
- UFE more likely to need re-intervention.

Hehenkamp, W et al. Uterine Artery Embolization vs Hysterectomy in the Treatment of Symptomatic Uterine Fibroids (EMMY Trial): Peri- and Postprocedural Results

From a Randomized Controlled Trial. American Journal of Obstetrics and Gynecology. 2005 Nov;193(5):1618–29.

- Randomized controlled trial to evaluate the safety or UAE compared to hysterectomy.
- UAE is similar to hysterectomy with a lower major complication rate and with a reduced length of hospital stay.
- Higher readmission rates after UAE.

Goodwin SC, Spies JB, Worthington-Kirsch R, Peterson E, Pron G, Li S, Myers ER. Fibroid Registry for Outcomes Data (FIBROID) Registry Steering Committee and Core Site Investigators. Obstetrics and Gynecology. 2008 Jan;111(1):22–33.

- To assess long-term clinical outcomes of UAE across a wide variety of factors including long-term symptom control, patient satisfaction, rates of recurrence and need for re-intervention
- UAE results in a durable improvement in quality of life.

Common Questions

What is the natural history of fibroids?	Involution following menopause.
When should leiomyosarcoma be considered in postmenopausal women?	Rapid fibroid enlargement and/or abnormal enhancement.
What are other treatment options for fibroids and adenomyosis that should be discussed with the patient?	Medical therapy
	Conservative surgery
	Hysterectomy
	High Intensity Focused Ultrasound

How does treating from the uterine artery cause fibroid infarction without infracting the normal uterus?	Fibroids have a more robust vascular supply compared to normal myometrial tissue and this allows normal myometrial tissue to remain viable and not become infarcted.