



## Uterine Artery Embolization

- Uterine artery embolization (UAE) is recognized as a Level A (based on good and consistent scientific evidence) treatment option for the management of leiomyomas in carefully selected patients
- UAE is associated with a lower complication rate and more rapid recovery than open, non-laparoscopic myomectomy or hysterectomy
- Symptomatic relief is observed in 64-93% of women 3 months after UAE and in 91-92% one year after the procedure
- Prospective randomized trials have shown that 75-80% of women treated with UAE require no further treatment for at least 2 years
- Repeated UAE may be an option for those that require further treatment

Symptomatic uterine fibroids are estimated to occur in 25-50% of women of reproductive age, causing severe menstrual cramps, menorrhagia (which can result in anemia), reduced fertility, and/or symptoms of pressure, such as urinary frequency, a feeling of heaviness or bloating, or pain due to nerve compression. There are several treatment options for symptomatic fibroids, including myomectomy, hysterectomy, and uterine artery embolization (UAE). If bleeding is the primary symptom, treatment options also include hormonal therapy, or hysteroscopic resection or ablation.

UAE, also known as uterine fibroid embolization (UFE) has been used as a primary treatment in the management of symptomatic uterine leiomyomas since 1995. UAE has been shown to be a safe and effective treatment for fibroids of any size and the procedure compares favorably with the alternative surgical treatments, hysterectomy, or myomectomy. Following UAE, the rate of recovery is faster, the period in which medications are necessary to control pain is shorter (Table 1), and there are fewer complications compared to myomectomy or hysterectomy. UAE has also been shown to be more cost-effective compared to open (non-laparoscopic) surgical procedures, even accounting for the fact that some women will require further treatment at a later date. Recently, the American College of Obstetrics and Gynecologists has recognized UAE among Level A treatment options for the management of leiomyomas in carefully selected patients.

UAE results in necrosis and gradual shrinkage of the fibroid (Table 2). Clinical studies have documented that UAE alleviates symptoms of menorrhagia in 79-93% of treated women. Although relief from pressure symptoms is not immediate, various studies have documented relief in 64-93% of women 3 months after



**Figure 1.** Pre-treatment contrast sagittal T1 - fat saturation images shows large myometrial fibroid.

embolization and in 91-92% one year after the procedure. This time course corresponds to the reduction in the volume of fibroids, which results in a 42-44% reduction in median fibroid volume in 2-4 months and up to 83% in one year. Randomized prospective studies have shown that 75-80% of patients will not require further treatment for at least 2 years. If new fibroids develop, they may be treated with a repeat UAE or surgery.

**Table 1. Comparison of Some Secondary Endpoints of Fibroid Treatment**

	Laparoscopic Hysterectomy	Laparoscopic Myomectomy	UAE
Median hospital stay	<1 day	<1 day	Overnight
Duration of post-procedural pain medication	NA	9 days	5 days
Time until resumption of normal activity	2-4 weeks	~2 weeks	1-2 weeks
Incidence of amenorrhea age >45	100%	NA	8%
age <45	100%		2%

**Table 2. Outcome of Uterine Artery Embolization**

Outcome	Symptom	Percentage
<b>Symptom Relief</b>	Menorrhagia	83-92
	Pain	77-79
	Bulk-related symptoms	79-91
<b>Complications</b>	Amenorrhea	1-8*
	Infection	0.4-1
	Pain	0.7-1
	Vaginal hemorrhage	0.2-0.25
	Fibroid passage	2.5
	Prolapsed fibroid	0.2
	Chronic discharge	4
	Endometritis	0.5
	Pulmonary embolism	0.25
<b>Complication-related hysterectomy</b>		0.25-1.5%

\*Incidence of amenorrhea is highly age-dependent and most commonly occurs in women > 45 years.

Data from Raikhlin et al, 2007

The risks associated with UAE (Table 2) include those associated with any form of angiographic procedure, such as bleeding or infection at the puncture site, or adverse reactions to the contrast agents used. There is a small risk of the induction of menopause, especially in women over 45 years (Table 1). However, the effect of UAE on ovarian function does not appear to be different from myomectomy or hysterectomy.

In addition, up to 3% of individuals with sub-mucosal fibroids, may present with detachment of the fibroid. In most cases, the tissue is eliminated via the vagina but in some instances the extruded fibroid can obstruct the cervical os and patients require further treatment to avoid a serious endometrial infection. Although the risk of infection is very low (<0.1%), prophylactic antibiotics are routinely administered prior to the procedure to minimize this risk, and all patients must be carefully watched for signs of infection after the procedure. Note that confounding symptoms, including low-grade fever, elevated white blood cell count, nausea, vomiting, loss of appetite and malaise are seen in many patients during the first week after UFE as part of a post-embolization syndrome. It is also possible for embolization particles to lodge in a non-target site. For this reason, it is important to carefully evaluate the vascular anatomy and to ensure that the catheter is positioned accurately before administration of the embolic agent.

Because the fibroids are not surgically removed, it is not possible to confirm that the tissue is benign and not a leiomyosarcoma. However, the incidence of

leiomyosarcoma is very low, occurring in less than 0.001% of cases of apparent fibroids. In addition, the presence of malignant tissue may be recognized during follow-up imaging as unevenly growing residual tissue seen after a technically successful procedure.

### Patient Selection

Patients who consider UAE as an option are interested in conserving their uterus and avoiding surgery. Successful pregnancies have been reported to occur following UAE. However, it is theoretically possible that UAE may result in compromised endometrial perfusion, which may cause abnormal placentation in women not otherwise at risk. Therefore, women who are considering future pregnancy should discuss their options with their physician.

There are few absolute contraindications to UAE, including ongoing pregnancy, active infection, and suspicion of ovarian or uterine cancer. Relative contraindications include coagulopathy, severe allergy to contrast agents, renal impairment, immunocompromise, previous pelvic irradiation or surgery, and chronic endometriosis. Women who choose to undergo UAE will need a consultation referral to a vascular interventional radiologist, who will evaluate the patient in the interventional clinic. The best imaging modality to evaluate for size, location and vascularity of fibroids is MRI (Figures 1 and 2) with and without gadolinium that should ideally be performed before the clinic consult.

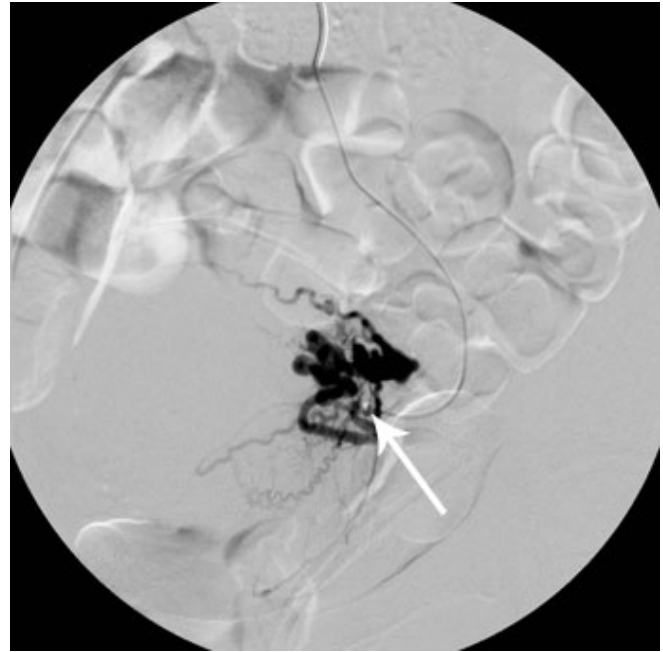


**Figure 2.** Follow-up delayed contrast sagittal T1 fat saturation MRI of same patient as in Figure 1, 17 months after UAE treatment, shows significant reduction in fibroid size.

### The Procedure

UAE is performed under conscious sedation and using local anesthetic at the site of catheterization. A catheter is introduced into the femoral artery and threaded into a uterine artery under the guidance of iodinated contrast agent and fluoroscopy (Figure 3). When the correct position of the catheter has been confirmed, embolization particles (tris-acryl gelatin microspheres) are slowly injected into the uterine artery, where they wedge in the smaller vessels blocking the flow of blood. Fluoroscopy is used to confirm that blood flow to the fibroids has been eliminated, before the contralateral uterine artery is treated.

After the procedure, the patient is kept in hospital overnight with a patient-controlled analgesia pump supplying narcotics. The pain is similar to bad menstrual cramps, and is well controlled with medication. Patients usually require oral pain medication for a few more days but are back to their normal routine activities in about one week. After two weeks, the patient returns to the vascular radiologist for follow-up and it is recommended that she see her gynecologist after 4-6 weeks. Follow-up MRI, to check the shrinkage of the fibroids (Figure 2), is recommended after 6 months.



**Figure 3.** Selective catheterization injection of the left uterine artery demonstrates vascular supply to fibroid during UAE procedure (arrow demonstrates the tip of microcatheter used for embolization).

### Scheduling

UAE is performed at the main MGH campus. Patients who are undergoing this procedure need to have a consultation referral to Vascular Imaging and Intervention from a gynecologist who can admit patients to MGH. Please call **617-726-8314** to arrange an appointment.

### Further Information

For further questions on uterine artery embolization, please contact **Gloria M. Salazar, M.D.**, MGH Department of Radiology, at **617-726-5518**. A brochure for patients is available on the MGH Department of Radiology website, at <http://www.massgeneralimaging.org/ufe>.

We would like to thank Dr. Salazar, vascular interventional radiologist, and John C. Petrozza, M.D., MGH Obstetrics and Gynecology Service, for their assistance and advice for this issue.

## References

(2008) ACOG Practice Bulletin. Obstetrics and Gynecology 112: 387-400

Goodwin, SC, Spies, JB, Worthington-Kirsch, R, et al. (2008) *Uterine artery embolization for treatment of leiomyomata: long-term outcomes from the FIBROID Registry*. *Obstet Gynecol* 111: 22-33

Hirst, A, Dutton, S, Wu, O, et al. (2008) *A multi-centre retrospective cohort study comparing the efficacy, safety and cost-effectiveness of hysterectomy and uterine artery embolisation for the treatment of symptomatic uterine fibroids*. The HOPEFUL study. *Health Technol Assess* 12: 1-248, iii

Hovsepian, DM, Ratts, VS, Rodriguez, M, et al. (2006) *A prospective comparison of the impact of uterine artery embolization, myomectomy, and hysterectomy on ovarian function*. *J Vasc Interv Radiol* 17: 1111-5

Raikhlin, A, Baerlocher, MO and Asch, MR. (2007) *Uterine fibroid embolization: CME update for family physicians*. *Can Fam Physician* 53: 250-6

The REST Investigators. (2007) *Uterine-Artery Embolization versus Surgery for Symptomatic Uterine Fibroids*. *N Engl J Med* 356: 360-70

Volkers, NA, Hehenkamp, WJ, Birnie, E, et al. (2007) *Uterine artery embolization versus hysterectomy in the treatment of symptomatic uterine fibroids: 2 years' outcome from the randomized EMMY trial*. *Am J Obstet Gynecol* 196: 519

©2008 MGH Department of Radiology

*Janet Cochrane Miller, D. Phil., Author*  
*Raul N. Uppot, M.D., Editor*