

Role of Uterine Artery Embolization in Heavy Menstrual Bleeding

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Uterine Fibroids

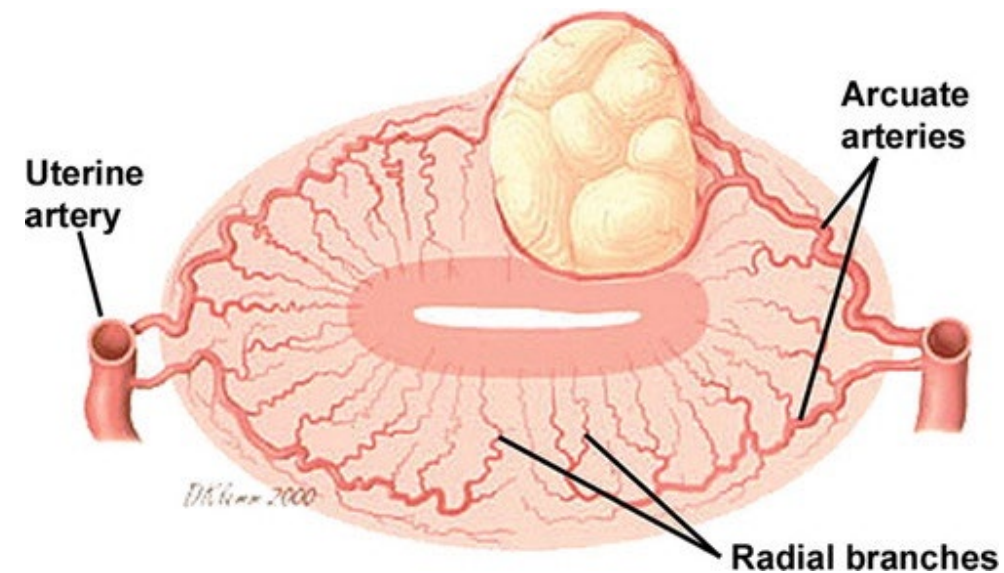
- ▶ Most common tumor of the reproductive tract in women
 - ▶ Occurring in over one-half of American women of reproductive age(1)
 - ▶ Symptomatic fibroids typically cause menorrhagia-heavy & longer menstrual cycles
 - ▶ Bleeding lasting longer than 7 days or requiring more than seven sanitary pads per day
 - ▶ Bleeding between menstrual periods (metrorrhagia) is less typical and raises the possibility of other diagnoses, such as a cervical lesion, endometrial polyp, or carcinoma.
 - ▶ Other symptoms: pain, pelvic pressure, and reproductive problems such as infertility and increased rates of cesarean section (2)
 - ▶ Fibroid-induced infertility is defined as infertility due to structural distortion of the uterus or reproductive tract due to submucosal fibroids

1. Day Baird D, Dunson DB, Hill MC, Cousins D, Schectman JM. High cumulative incidence of uterine leiomyoma in black and white women: ultrasound evidence. **Am J Obstet Gynecol** 2003;188(1): 100–107.

2. Parker WH. Etiology, symptomatology, and diagnosis of uterine myomas. **Fertil Steril** 2007;87(4): 725–736.

Uterine Artery Embolization

- UAE for fibroids was first performed in the US by McLucas and Goodwin from UCLA Medical Center in 1996
- ▶ Uterus sparing, minimally invasive procedure
- ▶ Performed with moderate intravenous sedation
- ▶ Minimally invasive endovascular procedure
 - ▶ Access: Radial or common femoral artery
- ▶ UAE is a widely accepted alternative to hysterectomy and myomectomy, with approximately 25,000 UAE procedures performed annually Worldwide (2)



1. Bulman JC, Ascher SM, Spies JB. Current concepts in uterine fibroid embolization. Radiographics. 2012 Oct;32(6):1735-50. doi: 10.1148/rg.326125514. PMID: 23065167.

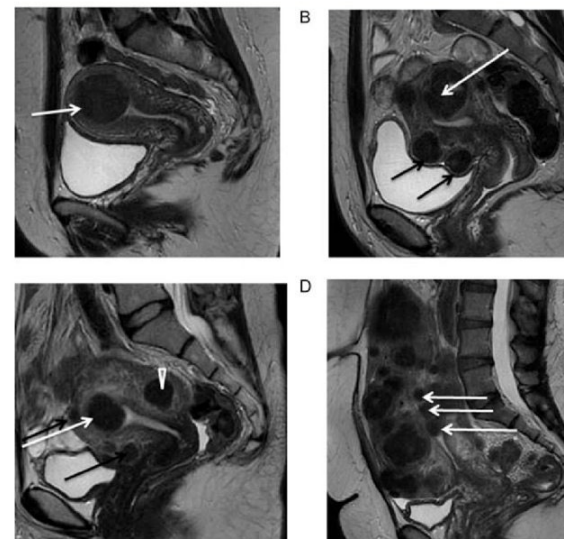
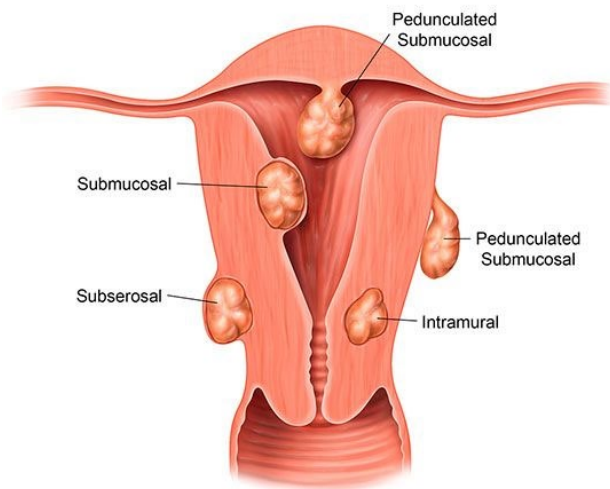
2. Goodwin S.C, Spies J.B, Worthington-Kirsch R, et al. Uterine artery embolization for treatment of leiomyomata: long-term outcomes from the FIBROID Registry. Obstet Gynecol. 2008; 111: 22-33

UAE Pre-procedure Assessment

- ▶ Gynecologic history: reproductive history, interest in future pregnancy, prior gynecologic conditions and surgeries, and a menstrual history
 - ▶ Menorrhagia most common symptom:
 - ▶ Heavy or prolonged bleeding (“gushing”) lasting longer than 7 days or requiring more than seven sanitary pads per day
- ▶ General medical history to identify comorbidities
- ▶ Physical examination

UAE Pre-procedure Assessment

- ▶ Imaging: MRI and US
- ▶ Types of fibroids that can be treated with UAE:
 - ▶ Both single and multiple fibroids
 - ▶ All fibroid locations (submucosal, intramural, and subserosal) are eligible for embolization



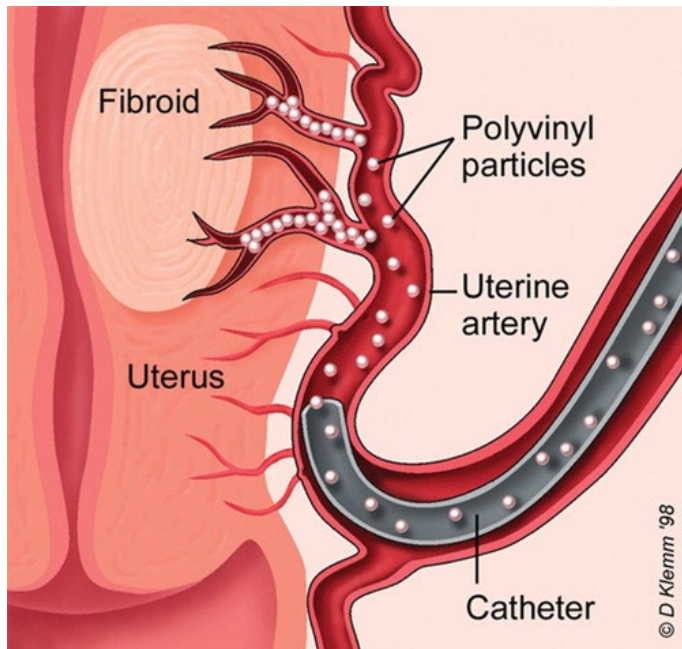
1. Donnez J, Dolmans MM. Uterine fibroid management: from the present to the future. *Hum Reprod Update*. 2016 Nov;22(6):665-686. doi: 10.1093/humupd/dmw023. Epub 2016 Jul 27. PMID: 27466209; PMCID: PMC5853598.

2. Allahbadia, G., & Merchant, R. (2014). Ultrasound imaging of uterine fibroids: Evaluation and management. In B. Rizk & E. Puscheck (Eds.), *Ultrasonography in Gynecology* (pp. 122-131). Cambridge: Cambridge University Press. doi:10.1017/9781139342544.013

UAE Pre-procedure Assessment

- ▶ Absolute contraindications:
 - ▶ Current viable pregnancy
 - ▶ Current uterine or adnexal infection
 - ▶ Suspected uterine, cervical, or adnexal malignancy (unless the procedure is being performed for palliation or as an adjunct to surgery).

Uterine Artery Embolization



Procedure:

Sedation: Monitored anesthesia care/ moderate intravenous sedation

Access: CFA or left radial artery

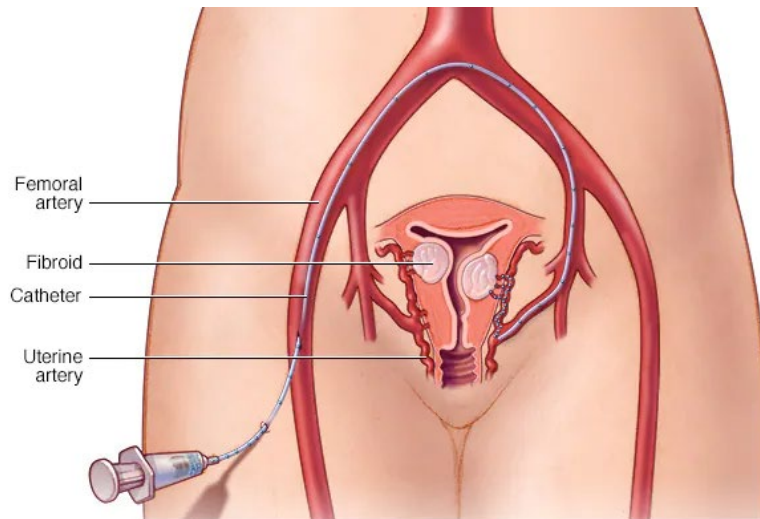
Endovascular access:

- Under fluoroscopy, the left internal iliac (hypogastric) artery is accessed with a catheter. The base catheter or a microcatheter are then used to catheterize the uterine artery. After uterine arteriography, embolic material is injected into the uterine artery to occlude the vessels of the fibroid.
- This procedure is repeated in the contralateral uterine artery as well, since blood supply to a fibroid is rarely unilateral

1. Bulman JC, Ascher SM, Spies JB. Current concepts in uterine fibroid embolization. Radiographics. 2012 Oct;32(6):1735-50. doi: 10.1148/rg.326125514. PMID: 23065167.

2. Goodwin S.C, Spies J.B, Worthington-Kirsch R, et al. Uterine artery embolization for treatment of leiomyomata: long-term outcomes from the FIBROID Registry. Obstet Gynecol. 2008; 111: 22-33

Uterine Artery Embolization



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Procedure:

- Aim of embolization is **not** to occlude the main uterine artery, but to occlude the vessels that supply the fibroid while sparing the vessels supplying normal uterine tissue as much as possible.
- **Unknown exact underlying physiology that allows UAE to result in infarction of the fibroids with preservation of normal uterine tissue.**
- Vessels of the perifibroid plexus might have a lower resistance than vessels supplying normal tissue; in addition, fibroid tissues are much more sensitive to anoxia than normal myometrium.

1. <https://www.mayoclinic.org/tests-procedures/uterine-artery-embolization/about/pac-20384713>

2. Worthington-Kirsch RL. Uterine artery embolization: state of the art. *Semin Intervent Radiol.* 2004;21(1):37-42. doi:10.1055/s-2004-831403

Uterine Artery Embolization



Procedure:

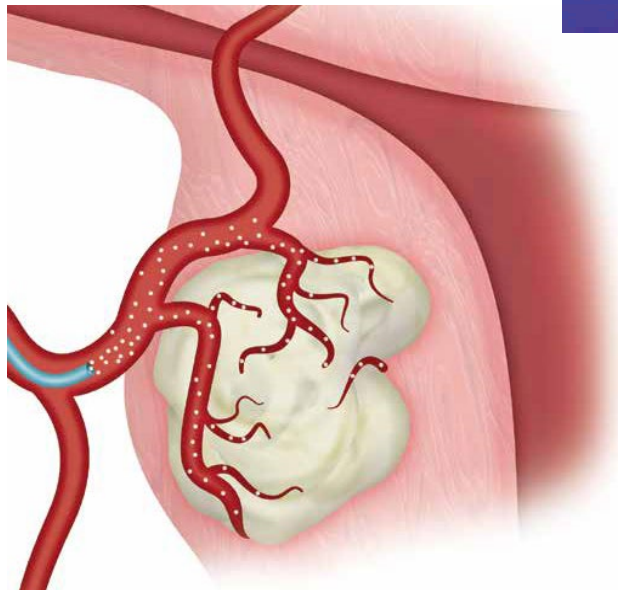
- Embolization performed with small particles which results in mechanical obstruction in the uterine artery-- stagnant antegrade blood flow

- Agents commonly used:

- trisacryl gelatin microspheres (**Embosphere**, Merit Medical Systems, South Jordan, Utah)

- Range in size (operator preference): TGAM 500–700 μm or 700–900 μm in diameter

- Polyvinyl alcohol particles (**PVA**; Contour, Boston Scientific, Natick, Mass; or Ivalon, Cook, Bloomington, Ind)



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UAE Post-Procedure Care

- ▶ Patient can be sent home the same day after 2-4 hour recovery period
- ▶ Post-embolization syndrome:
 - ▶ Appropriate pain control (opiod prescription; NSAIDs (Toradol); antibiotics (Cipro)
 - ▶ If admitting patient due to higher level pain/ cramping—usually 1 overnight stay
 - ▶ PCA pump

1. Worthington-Kirsch RL. Uterine artery embolization: state of the art. *Semin Intervent Radiol.* 2004;21(1):37-42. doi:10.1055/s-2004-831403

2. Dariushnia SR, Nikolic B, Stokes LS, Spies JB; Society of Interventional Radiology Standards of Practice Committee. Quality improvement guidelines for uterine artery embolization for symptomatic leiomyomata. *J Vasc Interv Radiol.* 2014 Nov;25(11):1737-47. doi: 10.1016/j.jvir.2014.08.029. Epub 2014 Oct 23. PMID: 25442136.

UAE Outcomes

- ▶ UAE is **technically successful in 95 to 99%** of cases (1)
- ▶ It is **successful in controlling menorrhagia in 85 to 95% of patients**, and in controlling bulk symptoms in 80 to 90% of patients (1)
- ▶ **3 -6 months post UAE, overall uterine volume reduction is typically 40 - 60%,**
 - ▶ **Dominant fibroid volume reduction is typically 50 - 75%. (1)**
- ▶ Reduction in overall uterine and leiomyoma volumes becomes noticeable several weeks after embolization and **continues for 3–12 months (2)**

1. Worthington-Kirsch RL. Uterine artery embolization: state of the art. *Semin Intervent Radiol.* 2004;21(1):37-42. doi:10.1055/s-2004-831403

2. Dariushnia SR, Nikolic B, Stokes LS, Spies JB; Society of Interventional Radiology Standards of Practice Committee. Quality improvement guidelines for uterine artery embolization for symptomatic leiomyomata. *J Vasc Interv Radiol.* 2014 Nov;25(11):1737-47. doi: 10.1016/j.jvir.2014.08.029. Epub 2014 Oct 23. PMID: 25442136.

UAE Outcomes

- ▶ Early studies showed technically successful procedures with menorrhagia control in 90%–92% of patients after 12 months and improvement in bulk symptoms in 88%–96% of patients at 12 months (1-3)
- ▶ Embolization versus hysterectomy (**EMMY**) trial:
 - ▶ multicenter randomized control trial in the Netherlands that compared UFE with hysterectomy in 177 women
- ▶ Randomized Trial of Embolization versus Surgical Treatment for Fibroids (**REST**) trial:
 - ▶ multicenter randomized control trial in the United Kingdom in which 149 women were randomly assigned to surgery (myomectomy or hysterectomy) or embolization

1. Hutchins FL, Worthington-Kirsch R, Berkowitz RP. Selective uterine artery embolization as primary treatment for symptomatic leiomyomata uteri. **J Am Assoc Gynecol Laparosc** 1999;6(3):279–284.

2. Spies JB, Ascher SA, Roth AR, Kim J, Levy EB, Gomez-Jorge J. Uterine artery embolization for leiomyomata. **Obstet Gynecol** 2001;98(1):29–

3. Walker W, Green A, Sutton C. Bilateral uterine artery embolisation for myomata: results, complications and failures. **Min Invas Ther & Allied Technol** 1999;8(6):449–454.

UAE Outcomes

▶ **EMMY trial and REST trial:**

- ▶ Both the REST and EMMY studies reported similar symptom relief, quality of life, and patient satisfaction in both treatment arms
- ▶ REST trial found that UFE was associated with quicker recovery but more reintervention than surgery
- ▶ Both UFE and surgery improved symptoms and quality of life at 1- and 5-year follow-up, with no significant difference in quality-of-life improvement between the two groups at 5 years
- ▶ In the first 2 years after treatment, the EMMY investigators found that quality of life measures substantially improved for both groups, with no significant differences
- ▶ Recovery was faster after embolization (2 day hospital stay avrg) and that there was less pain after embolization compared to surgery (6 day hospital stay avrg)

1. Hehenkamp WJ, Volkers NA, Donderwinkel PF et al.. Uterine artery embolization versus hysterectomy in the treatment of symptomatic uterine fibroids (EMMY trial): peri- and postprocedural results from a randomized controlled trial. **Am J Obstet Gynecol** 2005;193(5):1618–1629.

2. 31 Edwards RD, Moss JG, Lumsden MA et al.. Uterine-artery embolization versus surgery for symptomatic uterine fibroids. **N Engl J Med** 2007; 356(4):360–370.

3. Moss JG, Cooper KG, Khaund A et al.. Randomised comparison of uterine artery embolisation (UAE) with surgical treatment in patients with symptomatic uterine fibroids (REST trial): 5-year results. **BJOG** 2011;118(8):936–944.

4. Hehenkamp WJ, Volkers NA, Birnie E, Reekers JA, Ankum WM. Symptomatic uterine fibroids: treatment with uterine artery embolization or hysterectomy—results from the randomized clinical Embolisation versus Hysterectomy (EMMY) Trial. **Radiology** 2008;246(3):823–832.

UAE Outcomes

▶ **UAE and future pregnancy:**

▶ Society of Interventional Radiology Guidelines (1):

Pisco et al (45) retrospectively examined the pregnancy outcomes of 72 patients after UAE (nearly 90% were younger than 40 y of age) and found that there were 33 live births among 56 pregnancies (59%), and the rates of spontaneous abortion, preterm labor, caesarean section, and placenta previa were lower than in the largest series of pregnancy outcomes after UAE (46).

In a review of 44 women under the age of 40 years who underwent UAE, McLucas (47) reported a 48% pregnancy rate, which is comparable to that seen with myomectomy, and, in those pregnancies, there were no issues with intrauterine growth restriction.

However, none of these studies provides sufficient data to definitively guide practice recommendations for patients.

UAE Outcomes

▶ **UAE and future pregnancy:**

▶ Society of Interventional Radiology Guidelines (1):

For those patients without previous surgical interventions, with resectable leiomyomas, and with a reasonable likelihood of pregnancy based on other factors such as age, myomectomy may be preferred. However, given the weak evidence that favors myomectomy, patient preference for therapy should be respected, as long as the patient is well informed about our current knowledge of this issue.

For those with previous myomectomy, there are no reproductive outcomes from high-quality studies, and, given the difficulty of repeat surgery, embolization may be preferred.

The quality of the evidence to support the use of myomectomy to improve fertility is also very weak, without any data from randomized trials. Therefore, the uncertainty of outcomes from myomectomy should be included in the discussion with the patient.

For those who are poor surgical candidates because of comorbidity, body habitus, or extent or location of leiomyomas, uterine embolization is an acceptable choice for those seeking to become pregnant.

UAE Complications

- ▶ In three major studies reported to date, the clinical outcomes of UAE are similar to or better than the outcomes of surgery for control of symptoms
- ▶ Complication rates are comparable between UAE and surgery, with UAE having fewer serious complications
- ▶ UAE consistently outperforms surgery in terms of duration of hospitalization, time to return to work, and time to return to normal activity levels

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Uterine Artery Embolization versus Abdominal Myomectomy: A Long-term Clinical Outcome Comparison

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Results

The retrospective cohort included 185 patients, of whom long-term follow-up was completed by 89 patients (48.1%), 48 being treated with UAE, and 41 with myomectomy. Follow-up ranged from 50 to 83 months. A higher but not statistically significant number of patients received repeat interventions after abdominal myomectomy (14%) versus UAE (8%; $P = .204$). Significantly higher symptom severity score improvements were seen in patients treated with UAE versus abdominal myomectomy (34 vs 31; $P = .02$). UAE recipients were less likely to attempt to get pregnant ($P = .02$), but those who did had a 66.7% success rate compared with 58.8% for patients who underwent myomectomy. Similar numbers of patients between groups were satisfied with the procedure ($P = .57$), reported effectiveness of symptom relief ($P = .43$), and would recommend the procedure to others ($P = .37$).

Conclusions

UAE results in long-term clinical success with outcomes comparable or superior to those of abdominal myomectomy.

UAE Complications

- ▶ Large series of UAE cases have shown rates of significant complications in the range of 1 to 3%

Complication	Rate (%)
Venous thromboembolism	0.25
Fibroid expulsion	5
Ovarian failure and amenorrhea	7.5
Other complications*	...

- ▶ Fibroid expulsion, which can result in substantial pain, vaginal discharge, bleeding, and infection.
- ▶ Ovarian failure = amenorrhea
 - ▶ In the FIBROID Registry, this occurred in 7.5% of patients (5), with the overwhelming majority of cases occurring in women over 45 years of age. It is believed to be caused by occlusion of ovarian vessels via tubal branches fed by the uterine arteries

UAE

Thank you!