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Imaging and Vascular Embolization for Uterine Leiomyomas

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Expected Results and Complications

There is continuous shrinkage of leiomyomas at least up to 1 year after embolization, and the reported percentage of uterine or leiomyoma volume reduction varies according to the length of follow-up. Three months after UFE, the reported mean decrease of uterine volume is 27 to 46%^[26,46,47] and the reported mean decrease of leiomyoma volume is 40 to 44%.^[26,47] The reported mean reduction of leiomyoma volume is 31 to 59% after 6 months^[5,24,29] and 37 to 58% after 1 year.^[5,47]

Patients' satisfaction after UFE is high: 79 to 97% of patients report that they are pleased with their outcome, would choose the same procedure again, or would recommend UFE to other women.^[5,46-48]

Disappearance or improvement of menorrhagia is reported in 82 to 94% of patients.^[5,29,46-48] Reported improvement of bulk-related symptoms after UFE is 91 to 94%.^[46,47] Pain relief occurred in 79% of patients with menstrual pain in the series of Walker and Pelage^[48] and in 70% of women with pain as a presenting symptom in the series of McLucas et al.^[5]

Reported clinical failure rates vary and range from 6% in the series of Walker and Pelage^[48] to 19% in the series of Goodwin et al.^[32]

Although women who desire pregnancy have been excluded from earlier series, successful pregnancies after UFE have been reported.^[5,29,48,49] A multicenter study in 2001 included 139 patients who desired pregnancy after embolization.^[50] Of those, 52 patients were younger than 40 years and 7 women in this group had had successful past pregnancies before UFE. Fourteen women became pregnant after UFE. Of those, 10 women had normal term deliveries and 2 women were still pregnant at the end of the study.

Complications

The most feared complication is death, which has been reported three times in the world literature in more than 10,000 cases. In two cases, infection of an ischemic necrotic fibroid led to sepsis, multiorgan failure, disseminated intravascular coagulopathy, and ultimately the patient's death. The other patient died of a pulmonary embolism.^[51-54] The risk of death from a hysterectomy is 1 in 1000.^[55,56]

Angiographic complications include groin infection, pseudoaneurysm, arteriovenous fistula, arterial thrombosis, groin bleeding and hematoma, vascular damage, and contrast-induced renal failure. These complications are quite rare because most patients are not yet in the age group in which atherosclerotic peripheral vascular disease is a problem. There is one case of significant vascular damage in which a patient ultimately required a femoral-femoral bypass to repair an iliac occlusion secondary to a dissection.^[57] In another case, a patient developed bilateral iliac artery thrombosis during the embolization procedure and was treated with thrombolytic therapy in the intensive care unit for 2 days and hospitalized for a total of 4 days.^[58]

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Allergic reactions to medications or contrast material can occur. These can run the spectrum from hives to anaphylaxis. They can be managed according to well-established practice guidelines. Spies et al^[58] reported a 2.5% incidence of allergic reaction or rash in 400 patients.

Potential uterine complications of UFE include uterine perforation, uterine infection, fibroid sloughing, and sexual dysfunction. Uterine perforation worldwide has been reported in three cases.^[59] Pelvic infections not responding to antibiotics and requiring a hysterectomy occur in approximately one half of 1% of patients.^[28,58] Fibroid sloughing with passage out through the vagina is estimated to occur in about 3 to 7% of patients.^[60] The occurrence is thought to be more common with submucosal fibroids. This usually results in a good outcome if the fibroid can pass through the cervix. Sloughing tissue that does not pass may become infected and should be removed with a surgical procedure. Sexual dysfunction has been reported in one patient.^[61] Permanent amenorrhea associated with endometrial atrophy after UFE has been reported in one patient.^[62] There have also been single case reports of a vesicovaginal fistula,^[63] vesicouterine fistula,^[64] and labial necrosis after UFE.^[65] There have been four reports of UFE in an undiagnosed uterine sarcoma^[66,67] and two reports of uterine necrosis after UFE.^[68]

Nontarget organ embolization complications are predominantly related to the ovary. The collateral bed between the ovarian and uterine arteries may lead to nontarget embolization of the ovaries, which may cause infertility, amenorrhea, and menopause. Both transient and permanent amenorrhea has been reported in several studies, ranging from 2 to 15%. Spies et al^[47] reported amenorrhea at 3-month follow-up in 11 of 181 patients (6%). Seven cases were temporary and four were permanent. Pelage et al^[29] reported amenorrhea in 6 of 76 patients (8%), in 4 of whom were permanent. Pron et al^[69] reported that amenorrhea occurring after the procedure was highly age dependent, ranging from 3% in women younger than 40 to 41% in women age 50 or older. Chrisman et al^[70] reported the highest amenorrhea incidence (15%; 10 of 65). Spies et al^[71] studied ovarian function after UFE with serial follicle-stimulating hormone (FSH) in 63 patients and found age-related increases in FSH levels. None of the patients developed postembolization amenorrhea, but women older than 45 were found to have a 15% chance of increased basal FSH (>20 U/L) into the perimenopausal range.

There has also been one case of nontarget embolization of the gluteal artery on one side, leading to sciatic nerve injury and buttock claudication that was temporary and resolved over a 3-month period.^[57]

Because patients have to lie flat for 6 hours after the groin puncture, there is concern about deep venous thrombosis resulting in pulmonary embolism. Deep venous thrombosis may occur because the veins draining a large fibroid uterus are typically enlarged. After embolization, decreased venous flow could cause stasis and subsequent thrombosis. In addition, with the patient supine for 6 hours the large uterus may compress the draining veins of the pelvis, causing stasis and thrombosis. There is one case report of a death after UFE from a pulmonary embolus.^[52] Spies et al^[58] reported one case of a pulmonary embolus and one case of deep venous thrombosis in their series of 400 patients.

Rhabdomyolysis resulting in coagulopathy, electrolyte abnormalities, and renal failure is also of theoretical concern after UFE given the mass of necrotic muscle in the body after the procedure. This complication has not been reported to date.

The total radiation dose received by the women in a UFE is also of theoretical concern because the ovaries are directly in the field. This may have a bearing on future pregnancies. Ravina et al^[22] reported the radiation dose to be negligible. Nikolic et al^[72] studied 11 patients who had UFE and found that the estimated absorbed ovarian dose for UFE is an order of magnitude more than that for a barium enema or that for a hysterosalpingogram, but it is several orders of magnitude less than the pelvic radiation used for Hodgkin's disease. They concluded that the dose associated with UFE is unlikely to cause radiation injury to the patient or increase the risk related to the patient's fertility. It is, however, important to keep the radiation dose as low as possible to eliminate radiation-induced injuries.

Postembolization Syndrome

Postembolization syndrome has been well described in patients undergoing therapeutic embolization of the liver or kidney.^[73,74] It consists of nausea, anorexia, vomiting, fever, pain, and a leukocytosis. Postembolization syndrome occurs in all patients; however, in up to 15% of woman undergoing UFE it can be significant.^[75] Most patients experience moderate to severe cramplike pelvic pain after the procedure, which can be controlled with medications. This is due to the therapeutic infarction of the uterine fibroids. These symptoms are essentially the same as

those that occur during spontaneous infarction of a fibroid. We usually admit the patient overnight to provide adequate pain management with intravenous narcotics, but others have suggested that UFE can be performed on an outpatient basis provided there is close follow-up and support.^[76] Patients usually experience the worst pain within the first 24 hours, and the pain improves significantly over the next 3 days. In our experience, almost all patients resume normal activity 7 days after the procedure. It is important to distinguish postembolization syndrome from infection because the treatments are different. Postembolization syndrome includes negative cultures and a leukocytosis without a left shift.

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