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Case Report

Embolization for the treatment of large, complex fibroids in an outpatient setting: A report of 2 cases ^{☆,☆☆}

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ABSTRACT

Uterine leiomyomas are the most common benign pelvic tumors in premenopausal women, causing significant morbidity. Uterine fibroid embolization is a minimally invasive alternative to traditional open or laparoscopic surgeries for the management of symptomatic uterine leiomyoma. For large fibroids, hospitalization after treatment is often required. However, there are limited data on patients with large, complex uterine leiomyomas treated by embolization. This report of 2 cases describes 2 females with large, complex fibroids causing pain and decreased quality of life who were evaluated and treated with embolization in the outpatient setting. Each patient underwent transradial cannulation and uterine artery embolization under local anesthesia or conscious sedation and returned home without complication. For women wishing to preserve their uterus, uterine fibroid embolization is an effective nonsurgical alternative to hysterectomy and myomectomy in an outpatient setting. If standard protocols are followed, embolization by way of transradial artery catheterization is safe for the treatment of large, complex, symptomatic fibroids in the outpatient setting; however, additional studies with larger cohorts are warranted. Accessing the uterine arteries transradially reduces the risk of intra- and post-operative complications for patients, reduces their time spent in a hospital, and minimizes operating costs.

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Introduction

Uterine leiomyomas, or fibroids, are benign smooth muscle tumors of the myometrium layer [1]. Although most are asymptomatic, fibroids are the most common tumor of the female reproductive tract, with an estimated lifetime prevalence as high as 80% [2,3]. Fibroids are the leading cause of gynecological-related hospitalization in the United States, affecting patients' quality of life and daily functioning [4,5].

The exact pathogenesis of leiomyomas is relatively unknown. The genesis and proliferation are likely a combination of environmental factors, genetic predisposition, and imbalanced hormones, namely estrogen, and progesterone [6]. Risk factors include early menarche, race, genetic predisposition, and a high body mass index [2,7,8]. Symptoms include dysmenorrhea, dysuria, menorrhagia, reproductive dysfunction, as well as back, leg, and abdominal pain or pelvic pressure [2,4,9–13]. By obstructing the pelvic ureters, leiomyomas can cause renal impairment and renal failure [14]. Prevalence decreases during menopause and increases with reproductive age [15].

Traditional treatment for symptomatic fibroids includes hormone therapy, open myomectomy, laparoscopic myomectomy, and hysterectomy. Hysterectomies are unsuitable for patients wishing to preserve their uterus. Myomectomy preserves the uterus but has a high bleeding risk, high recurrence rate, and variable recovery times [16,17]. Hormone reduction therapy is unsuitable long-term and rarely considered an alternative to surgery [12,13]. Uterine fibroid embolization (UFE) is a minimally invasive alternative for the treatment of symptomatic fibroids [18,19]. By way of selective ischemia, UFE targets neovascularization, cutting off blood supply to the fibroid causing infarction and subsequent shrinkage within weeks to months serving as a definitive treatment.

Here, we present the successful treatment of multiple large uterine fibroids with embolization in the outpatient setting. We present uterine leiomyomas that were diagnosed and treated using UFE. Each patient consented to treatment and the publication of this report of 2 cases and was aware of the inherent risks, possible complications, and possible postoperative course. This report describes UFE as a suitable alternative for large, complex, symptomatic fibroids treated in the outpatient setting. This technique is safe and effective, reduces risk, improves recovery time, and minimizes costs.

Case presentations

Methods

UFE is a fluoroscopic guided endovascular intervention involving entry through the radial artery or contralateral femoral artery. In these cases, the radial artery was cannulated. Compared with femoral access, radial access improves comfort and enables patients to ambulate and recover at a faster rate [20]. Patients were sedated with conscious sedation and were

prepped and draped in the operating room using conventional sterile technique. Access was gained with ultrasound guidance using a 21-gauge arterial needle, guidewire, and 5-French sheath. Heparin 3000U IV was given to minimize intraoperative thrombotic issues after guidewire placement was confirmed. A 4-French Bernstein catheter was advanced over a 260-cm hydrophilic angled guidewire. The Bernstein catheter was exchanged for a 4-French PV Alternative 150-cm catheter for selective catheterization of the uterine arteries. An aortogram was performed to delineate the distal aortic and collateral vessels. The placement was confirmed with direct fluoroscopic angiography. Gelfoam was used for embolization, and angiography was used to document the cessation of blood flow. Technical success was defined as sufficient cessation of flow, lack of major deep vein thrombosis, appropriate embolic agent in the lesion, and no evidenced embolic material escape. Upon removal of the catheter, direct pressure was held on the site for 10-20 minutes. Each patient was awoken, sent to the recovery room in stable condition, and received a same-day discharge protocol.

Case 1

A 30-year-old female presented with pelvic pain, back pain, painful intercourse, lower abdominal cramping, heavy menstrual bleeding lasting greater than 1 week, and severe menstrual pain with anemia (hemoglobin reached 5 mg/dL). She complained of abdominal bloating, gassiness, distention, heaviness, abdominal pain, and urinary symptoms, including urinary frequency and the feeling of incomplete emptying. The patient had managed her symptoms conservatively for 2 years and regularly followed up with her gynecologist. On physical exam, she had a mild reducible supraumbilical hernia and mild vulvar varicosities. On duplex ultrasonography, she had mild uterine vascularity and four fibroids: a right subserosal fibroid measuring 7.7 cm × 7.8 cm × 7.8 cm, a right intramural fibroid measuring 4.4 cm × 4.2 cm × 2.4 cm, a fibroid pushing into the left side of the cervix measuring 6.3 cm × 6.9 cm × 6.1 cm, and a left subserosal fibroid measuring 5.4 cm × 6.4 cm × 6.5 cm. After a discussion of alternative therapies and nonsurgical management, the patient elected for angiography with possible embolization. On arteriogram, 2 small fibroids were seen emanating off branches close to the middle gluteal that were too high risk with a low likelihood of being the most symptomatic lesions. On the left side, a similar uterine branch was seen with a very large subserosal fibroid (Fig. 1). The vessel had sufficient length of unbranched artery to allow excellent seating of the catheter to minimize non-target embolization by the venturi effect. Successful embolization of two secondary branches of the left uterine artery was performed using Gelfoam with excellent fluoroscopic results, cessation of flow to the fibroid, and excellent flow through the proximal branches of the hypogastric including the cervicovaginal branches. The decision was made to reassess symptoms at follow-up to consider a second or third arteriogram with possible embolization of the remaining fibroids.

Follow-up showed improved symptoms with minimal spotting and improved urinary symptoms. The patient had heterogeneous echogenicity on duplex ultrasonography consistent with partial ongoing necrosis but no signs of contin-

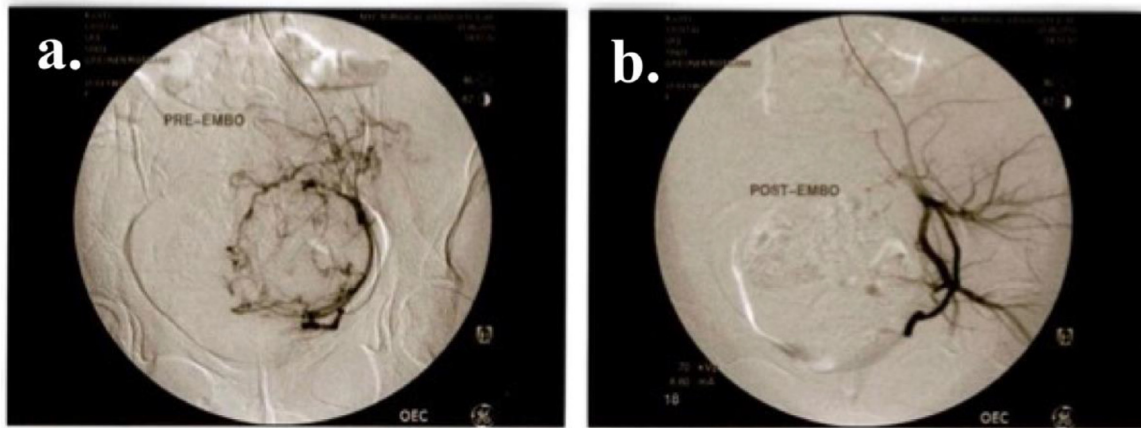


Fig. 1 – Arteriography of the dominant left fibroid in Case 1. (a) Left arteriography off the left uterine artery with a very large subserosal fibroid before embolization. (b) Left uterine artery arteriogram after embolization of the large subserosal fibroid.

ued pain or rhabdomyolysis. On a repeat pelvic sonogram at 8 weeks, the fibroid in question was no longer noted to have internal echogenic speckles; however, patient still had some symptoms consistent with her high fibroid burden.

On secondary embolization, the patient received a superior hypogastric plexus block, 6cc of 5% Bupivacaine, from a consulting physician without side effects prior to the procedure. A significant vessel was found on the right after subselective cannulation of secondary branches off the right uterine artery supplying a dominant fibroid that appeared larger than observed on duplex. Gelfoam was used to selectively embolize the vessel feeding the uterine fibroid. Post-embolization angiography revealed near-complete cessation of flow to the left-sided arterial vasculature with good runoff of surrounding vessels.

At 4 weeks, the patient reported improved cessation of symptoms without evidence of hematoma and intrauterine or intraperitoneal bleeding. At 8 weeks, she reported that her low back and pelvic pain and dyspareunia had resolved, and, unexpectedly, her urinary symptoms resolved. Given her overall improvement, we are managing conservatively without plans for future intervention.

Case 2

A 28-year-old woman with a known history of asthma, uterine fibroids, abnormal uterine bleeding, and a known history of a miscarriage 2 years prior with a desire for future pregnancy presented with pelvic symptoms. Symptoms included severe bloating, pelvic distention, severe menstrual bleeding, back pain, leg pain or sciatica, urinary frequency, pain during intercourse, constipation, lower abdominal pain, ovarian cramps, and uterine pain. The patient was previously told invasive options may limit future pregnancy, so she presented looking for less invasive options and a desire to preserve her fertility. Duplex ultrasonography revealed 3 prominent fibroids, the largest in the submucosa of the fundus, measuring 14.9 cm × 11 cm × 11 cm. A second on the left measured 5.2 cm × 4.0 cm × 4.6 cm, and a third abutting the cervix measured 3.2 cm

× 3.9 cm × 3.1 cm as seen on Fig. 2. The patient elected for fibroid embolization.

The uterine artery, as well as secondary and tertiary branches, was identified. The vessel feeding the fibroids was a branch of the uterine artery near the bifurcation of the common iliac (Fig. 3). To prevent iatrogenic embolization of the smaller first- and second-order uterine collaterals, large Embosphere HydroPearls ($800 \pm 75 \mu\text{m}$) selectively embolized the vessels feeding each fibroid. Angiography revealed near-complete embolization of the inferior arterial vasculature.

One-day post-operatively, the patient reported no pain or complication. Ultrasound showed a hyperechoic uterine mass, 9.0 cm × 9.2 cm × 10.2 cm as seen in Fig. 4, likely representing fibroid 1. The fibroids appeared significantly smaller and less vascularized. At 3 weeks, the patient reported a significant improvement in her symptoms, including mass effect and menorrhagia, and noted an improvement in quality of life and complete satisfaction with the results of her procedure.

Discussion

UFE is a safe and effective treatment for symptomatic fibroids. UFE preserves the uterus, may improve fertility, and allows for future reproduction [21,22]. Given the age of our 2 patients, and their future desire to conceive, this was a good alternative to traditional treatment options. Endovascular techniques also allow high-risk patients to opt for minimally invasive procedures in an outpatient setting when conservative treatment fails.

Here, each patient reported high satisfaction, improvement in symptoms, and satisfaction with the procedural experience without complications. It should be noted that uterine fibroids typically cause significant psychosocial stress among women, and treatment often improves emotional and physical symptoms [23].

UFE is safe, requires little downtime post-surgery, and can be offered to a wider group of symptomatic patients with good clinical and quality of life outcomes [24]. Risks include

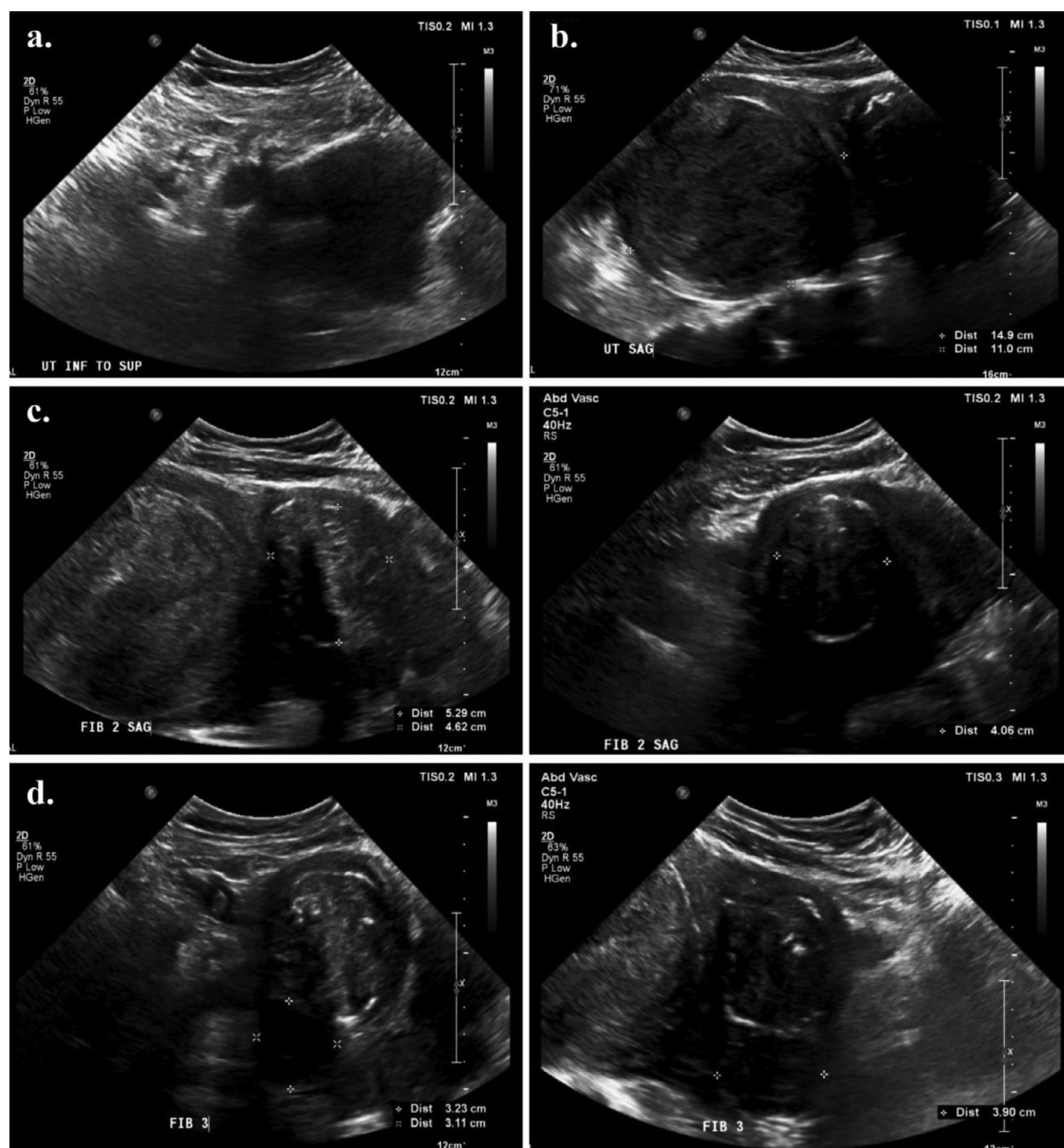


Fig. 2 – Duplex ultrasonography from Case 2 prior to treatment. (a) Ultrasonography of the uterus. (b) Fibroid 1 with x and y dimensions measured. (c) Fibroid 2 with x and y dimensions measured on the left and z dimensions measure on the right. (d) Fibroid 3 with x and y dimensions measured on the left and z dimensions measure on the right.

non-target embolization, arterial damage, contrast-induced nephropathy, groin hematoma, the expulsion of myoma, uterine necrosis/rupture, amenorrhea, and post-embolization syndrome [25,26]. Complications are mitigated by considering the location of the fibroid, size, symptomatology, and age of the patient. Contraindications include hyperthyroidism, pregnancy, active infection, and coagulation disorders [11,27]. The concern of complications for larger fibroids has slowed the widespread adoption of UFE. Some specialists restrict proce-

dural candidacy based on fibroid size alone [28]. Current literature on UFE for large fibroids is heterogeneous. Some report fibroids greater than 8 cm as a predisposing factor for clinical failure [29,30]. Some investigators, however, have reported no significant difference in UFE complications between various sizes and dimensions [9,31–34].

Limitations to this study include the heterogeneity of patients, symptoms, and the number, location, and size of uterine fibroids. Larger scale UFE papers exist, but few



Fig. 3 – Arteriography of the left uterine artery in Case 2. (a) Fluoroscopic imaging of the left uterine artery before embolization. (b) Right uterine artery after embolization.

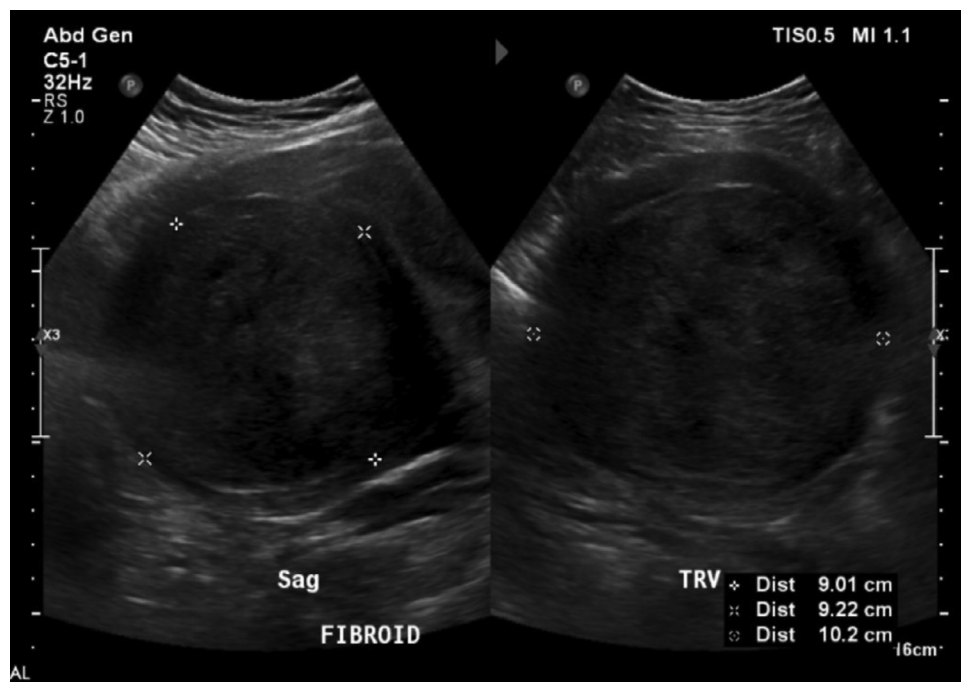


Fig. 4 – Duplex ultrasonography from Case 2 Post-op day 1 of fibroid 1. (a) Fibroid 1 with x and y dimensions measured on the left and z dimensions measure on the right.

show safe and effective interventions of large-size fibroids in an outpatient setting. Future work should focus on size requirements for outpatient safety and control for traditional open or laparoscopic techniques with larger cohorts. Future studies should focus on understanding what factors increase the risk of reintervention after uterine artery embolization [35].

Here, we present the successful treatment of large uterine fibroids in an outpatient setting. This report of 2 cases describes UFE as a suitable alternative to hysterectomy and myomectomy that is both safe and effective for relieving symptoms associated with large, complex fibroids with preservation of the uterus [36]. This technique improves recovery time for patients and minimizes costs.

Teaching points

- UFE offers an alternative definitive treatment for uterine leiomyomas, fibroids, preserving the uterus for future pregnancy.
- Embolization of large, complex fibroids is safe and effective in the outpatient setting; however, future studies with larger cohorts are warranted.
- Transradial cannulation and uterine artery embolization reduces the risk of operative complications following fibroid treatment allowing for same-day discharge and treatment in an outpatient setting.

Author contributions

Frank A. Cusimano and Martyna Czarnik reviewed all medical records and drafted and edited the manuscript. Glenys Hernandez and Anthony Watkins provided clinical expertise, oversight and aided in the drafting and editing of the manuscript. Adam Tonis and David A. Greuner treated the patient throughout their diagnoses, endovascular procedures, and surgical corrections and aided in the editing of the manuscript. All authors had access to the manuscript and equally edited and reviewed the manuscript.

Data availability

All data generated or analyzed during this study are included in this article. Further enquires can be directed to the corresponding author.

Disclaimer

The content of this article is solely the responsibility of the authors and does not necessarily reflect the position or policy of their employers and collaborating institutions.

Patient consent

Consent was obtained from all patients for treatment and publication of this case report.

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