



Uterine Arterial Embolization for the Management of Leiomyomas

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Abstract

Background: Leiomyoma is the common benign tumor of the female genital tract. The traditional treatment is hysterectomy, myomectomy or medical therapy by hormonal manipulation. Uterine arterial embolization, a recognized treatment for acute pelvic hemorrhage, has recently been applied to the management of non-acute uterine hemorrhage due to leiomyoma.

Objectives: To describe our experience with uterine arterial embolization for the management of uterine fibroid.

Methods: Uterine arterial embolization was performed in nine patients with leiomyomas in whom medical therapy failed and who sought to avoid surgery.

Results: Follow-up ultrasound examination after 2 months revealed an average reduction in fibroid volume of 38%. There were no early or long-term complications.

Conclusions: Uterine arterial embolization appears to be effective and safe in the management of symptomatic leiomyomas. It is a promising alternative to myomectomy or hysterectomy and warrants further investigation in this setting.

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Leiomyoma is the most common benign tumor of the female genital tract, occurring in more than one-fifth of all white women aged over 40 years, and with even greater frequency and earlier occurrence in black women. Hemorrhage is the most frequent complication and is associated with submucosal and interstitial myomata. The enlargement of the uterus also causes pain, heaviness and discomfort.

The traditional treatment of leiomyoma is hysterectomy or myomectomy. Recently, laparoscopic techniques with the use of lasers or coagulation probes were introduced. Medical therapy by hormonal manipulation with gonadotropin-releasing hormone agonists is also used, usually pre-operatively to reduce fibroid size [1]. Uterine arterial embolization, a recognized treatment for acute pelvic hemorrhage, has recently been

applied to the management of non-acute uterine hemorrhage due to leiomyomas in order to reduce fibroid size [2,3]. We describe our experience with this promising procedure and discuss its technical aspects.

Materials and Methods

Since February 1999, transvaginal ultrasound studies and examination by an experienced gynecologist in our institution identified nine patients aged 44–63 years (mean 47 years) with menorrhagia and bulk-related symptoms (frequency of urination, sensation of pressure, sensation of mass) due to leiomyoma. These patients had been treated unsuccessfully by hormonal manipulation with gonadotropin-releasing hormone agonist, and all of them strongly opposed surgery and removal of the uterus. None of the patients had additional gynecological problems.

We did not propose endovascular treatment when a surgical operation was justified for an associated lesion or condition (adnexal mass, uterine prolapse, stress incontinence) or when sonographic examination showed submucosal, subserosal or pedunculated leiomyomas. The main reason for not embolizing pedunculated fibroids is the potential risk of post-procedural torsion

Sedation and analgesia

Uterine arterial embolization was performed under epidural anesthesia in two patients and under sedation with a combination of intravenous midazolam and pethidine in seven patients. The patients were monitored with pulse oximetry and electrocardiography. Antibiotic cover was routinely provided (cefazolin sodium 1 g administered intravenously).

Embolization procedure

The procedure was performed in a radiological interventional suite equipped with a Phillips Integris 3000 digital screening unit. Vascular access was obtained via the common femoral artery. A single arterial puncture was made with a 19 gauge needle (Cordis, Johnson and Johnson, Berk, UK), and a 5F gauge

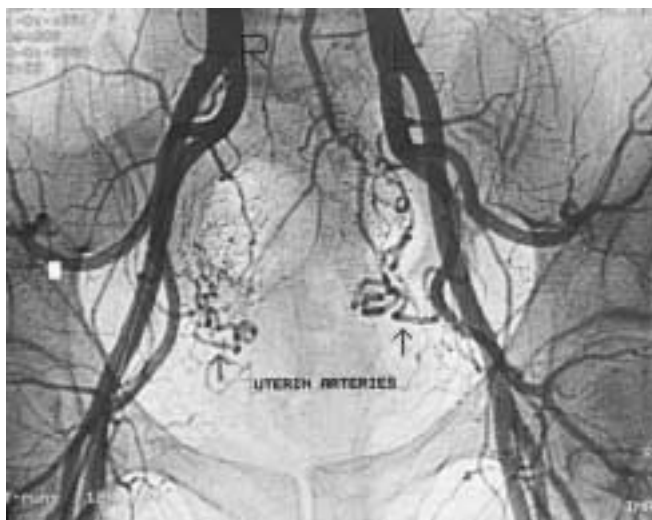


Figure 1. Mapping arteriographic image obtained after aortic injection of contrast material shows bilaterally enlarged and tortuous right and left (arrows) uterine artery.

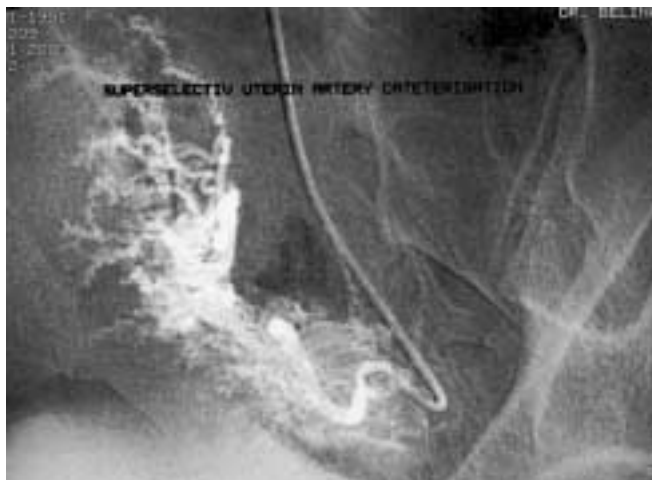


Figure 2. Arteriographic images obtained after superselective injection of contrast material into the left uterine artery.

pigtail catheter (Cordis) was introduced into the distal abdominal aorta. Flush aortography was performed with ultravist 370 (Schering AG, Germany) to define the pelvic arterial anatomy [Figure 1].

A 5F arterial sheath (Cordis) was then inserted, and the contralateral common iliac artery was cannulated with a 5F Cobra 1 catheter (Cordis). The uterine artery was cannulated superselectively [Figure 2] via the anterior division of the internal iliac artery. A secure position was established at approximately 4–5 cm within the artery, but not beyond the origin of the major branches supplying the fibroid. Embolization was performed with polyvinyl alcohol particles (Boston Scientific, USA) measuring 350–500 μ , until the antegrade flow ceased [Figure 3]. The ipsilateral internal iliac artery was cannulated with a 5F Cobra 1 catheter after a Woltman loop construction. The uterine artery was entered, and the embolization procedure was repeated.

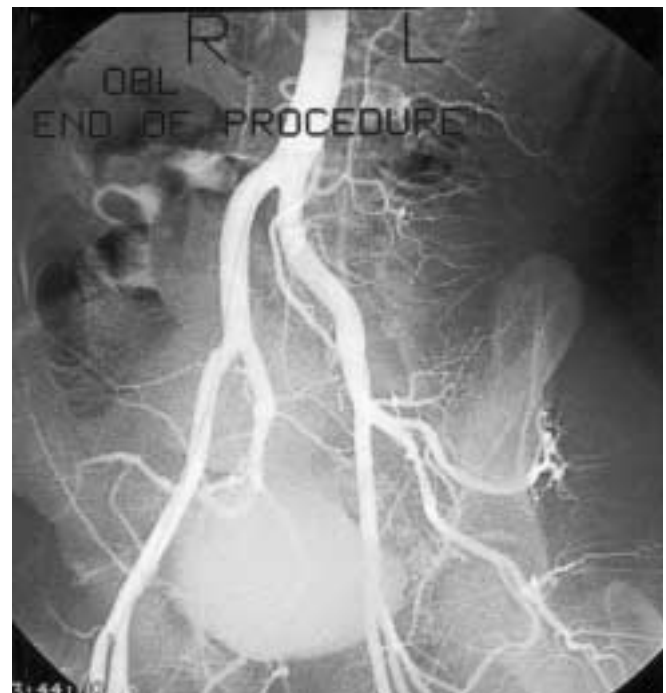


Figure 3. Post-procedural arteriographic image obtained after aortic injection of contrast media shows no visible flow into either uterine artery.

Follow-up

Follow-up ultrasound examination was performed 2 months after embolization with a 3.5 MHz abdominal probe. The percent reduction in uterine fibroid volume was calculated by measuring the uterine longitudinal, transverse and antero-posterior axes.

Results

Immediate outcome

All patients had pain and cramping, similar to that in spontaneous infarction of uterine myoma or after embolization of other solid organs. In seven patients, morphine sulfate was available as a patient-controlled analgesic for the first 12–24 hours. After discharge from the hospital, patients took oral paracetamol for a few days.

Six patients were discharged on the first post-procedural day. Two required hospital stays of longer than 24 hours for pain control, and one was discharged after the third day.

Follow-up

Follow-up data were available in six patients. The mean reduction in fibroid volume on ultrasound at 2 months after embolization was 38% (range 9.5–85%). There were no complications related to embolization and no technical failures.

Discussion

Uterine arterial embolization is an established, safe and effective treatment for the acute uterine hemorrhage that accompanies a number of conditions [4–8]. Recently, it has

also been found to be a useful straightforward procedure for managing symptoms attributable to uterine myoma [9–12]. Because the vascular anatomy in the myomatous uterus remains relatively normal, the uterine arteries are usually enlarged and torturous [13] [Figure 1]. The enlargement of the uterine arteries makes catheterization easier, but their increased tortuosity can diminish this advantage. Management is possible by the co-axial technique.

It is impractical to selectively catheterize individual vessels supplying only leiomyomas, mostly because there are far too many branches to make the procedure efficient and time saving. It is also difficult to determine whether any one vessel supplies a leiomyoma rather than normal myometrium. Embolization of the entire uterine artery distribution affords a global treatment for every myoma in the uterus. As uterine fibroids are hypervascular tumors, the embolization causes ischemia to the myoma while the uterus is being preserved by the many collateral vessels in the pelvis.

There are only a few reported series of fibroid embolization in the medical literature [9–12,14]. The size of the polyvinyl alcohol particles varies from 500 to 700 in the study of Goodwin et al. [9] to 150–600 in the study of Ravina et al. [12,15]. Goodwin and coworkers consider that the large size was the reason for both the complication rate and the reduced successes in their series [9]. We used a combination of medium-sized particles of 350–500 similar to those employed by Burn et al. [16]. Though Goodwin attributed this lower success rate to the larger size of their particles, the outcomes were similar in all these studies. The mean reduction in leiomyoma size in our series during the first 2 months after embolization was 38%, which is close to the 46% reported by Worthington-Kirsch and colleagues [14], and the 43% reported by Burn et al. [16].

On clinical follow-up, outcome was satisfactory in most patients. Post-procedural pain control during hospitalization using a therapeutic protocol including analgesics and narcotic agents was excellent in all patients.

Uterine arterial embolization for leiomyomas has several advantages. It is a minimally invasive procedure that is performed with local anesthesia and obviates the need for surgery. Post-embolization pain can be severe and we recommend a patient-controlled opiate pump. However, the procedure is well tolerated and is associated with a shorter recovery time than surgery in most cases. It also apparently preserves uterine function (normal menses) and fertility [15,17]. Nonetheless, further studies are needed to confirm these findings. Uterine arterial embolization is also applicable in patients with such contraindications to surgery as severe ischemic heart disease or poor lung function. A final clinical advantage is that in the event of failure, the full range of therapeutic options is still available. Indeed, surgery, if necessary, will be easier and safer because of the pre-operative embolization [11].

We conclude that uterine arterial embolization shows great promise as a primary treatment of symptomatic leiomyomas and bears several advantages over traditional therapies. The

procedure is well tolerated, reduces hospital stay, has the potential to preserve fertility, and permits single-session treatment of uterine leiomyomas.

References

1. Sutton CJ. Treatment of large uterine fibroids. *Br J Obstet Gynaecol* 1996;103:494–6.
2. Bradly EA, Reidy JF, Forman RG, Jarosz J, Braude PR. Treatment of uterine artery embolisation to treat large uterine fibroids. *Br J Obstet Gynaecol* 1998;105:235–40.
3. Hutchins FL. Abdominal myomectomy as a treatment for asymptomatic uterine fibroids. *Obstet Gynecol Clin North Am* 1995;22:781–9.
4. Pas SO, Glickman M, Schwartz PE, Pingoud E, Berkoviz R. Embolization of pelvic arteries for control of postpartum hemorrhage. *Obstet Gynecol* 1980;55:741–58.
5. Rosenthal DM, Colapinto R. Angiographic arterial embolization in the management of postoperative vaginal hemorrhage. *Am J Obstet Gynecol* 1985;151:227–31.
6. Yamashita Y, Harada M, Yamamoto H, Miyazaki T, Takahashi M, Miyazaki K, Okamura H. Transcatheter arterial embolisation of obstetric and gynaecologic bleeding efficacy and clinical outcome. *Br J Radiol* 1994;67:530–4.
7. Gilbert WM, Moore TR, Resnik R, Doemeny J, Chin H, Bookstein JJ. Angiographic embolization in the management of hemorrhagic complication of pregnancy. *Am J Obstet Gynecol* 1992;166:493–7.
8. Greenwood CH, Glickman MG, Schwartz PE, Morse SS, Denny DF. Obstetric and nonmalignant gynecologic bleeding treatment with angiographic embolization. *Radiology* 1997;164:155–9.
9. Goodwin SC, Vedantham S, McLucas B, Forno AE, Perrella R. Preliminary experience with uterine artery embolization for uterine fibroids. *J Vasc Intervent Radiol* 1997;8:517–26.
10. McLucas B, Goodwin SC, Vedantham S. Embolic therapy for myomata. *Minim Invasive Ther Allied Technol* 1996;5:336–8.
11. Ravina JH, Bouret JM, Fried D, Benifla JL, Daral E, Pennehouat G. Value of preoperative embolization of uterine fibroma: report of multicenter series of 31 cases. *Contracept Fertil Sex* 1995;23:45–9.
12. Ravina JH, Herbreeau D, Ciraru-Vigeneron V, Bouret JL, Houdast E, Aymard A, Meriand JJ. Arterial embolisation to treat uterine myomata. *Lancet* 1995;346:671–2.
13. Sampson JA. The blood supply of uterine myomata. *Surg Gynecol Obstet* 1912;14:215–34.
14. Worthington-Kirsch RL, Popky GL, Hutchins FL. Uterine arterial embolization for the management of leiomyomas: quality of life assessment and clinical response. *Radiology* 1998;208:625–9.
15. Ravina JH, Vigneron NC, Aymard A, Ciraru-Vigneron N. Pregnancy after embolization of uterine myoma: report of 12 cases. *Fertil Steril* 2000;73(6):1241–3.
16. Burn P, Mccall J, Chinn R, Healy J. Embolisation of uterine fibroids. *Br J Radiol* 1999;72:159–61.
17. Ravina JH, Aymard A, Ciraru-Vigneron N, Ledreff JH, Hdart E, Aymard A, Meriand JJ. Arterial embolization of uterine myoma: results a propos of 286 cases. *J Gynecol Obstet Biol Paris* 2000;29(3):272–5.

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