

## Uterine artery embolisation for uterine leiomyomas

A Lawson,<sup>1</sup> MB BCh, FCRad (SA), MMed; C Cluver,<sup>2</sup> MB BCh, FCOG, MMed; J Olorogun,<sup>3</sup> FCOG (SA); D Legge,<sup>4</sup> FFRad (SA); M Patel,<sup>3</sup> FCOG (SA); S Beningfield,<sup>1</sup> FFRad (SA); S Dyer,<sup>3</sup> FCOG (SA)

<sup>1</sup> Department of Radiodiagnosis, Groote Schuur Hospital, Cape Town, South Africa

<sup>2</sup> Department of Obstetrics and Gynaecology, Tygerberg Hospital, Cape Town, South Africa

<sup>3</sup> Department of Obstetrics and Gynaecology, Faculty of Health Sciences, University of Cape Town and Groote Schuur Hospital, Cape Town, South Africa

<sup>4</sup> Department of Radiology, Tygerberg Hospital, Cape Town, South Africa

**Corresponding author:** A Lawson (drajlawson@gmail.com)

**Background.** Many forms of minimally invasive treatment have gained substantial popularity, both with the medical fraternity and the public. With the correct clinical indications and in skilled hands, uterine artery embolisation (UAE) has been accepted internationally as part of the standard of care that should be offered to patients with symptomatic uterine leiomyomas (fibroids).

**Objectives.** To introduce UAE as an effective and safe treatment option in patients with symptomatic fibroids in the Western Cape Provincial Service, South Africa.

**Methods.** *Setting:* Groote Schuur and Tygerberg hospitals, Western Cape. *Design:* Prospective observational multi-centre study. *Methods:* 36 women (mean age 38 years, range 30 - 47 years) with symptomatic fibroids were treated with UAE between November 2009 and February 2012. Pre-procedure magnetic resonance imaging (MRI) followed by a 6-month clinical follow-up plus MRI or an ultrasound scan were performed.

**Results.** The presenting symptoms were menorrhagia, dysmenorrhoea, pressure symptoms and intermenstrual bleeding. Three women were treated for primary infertility. Uterine artery sub-selection and embolisation was successful in all patients. Complications included low-grade pyrexia (3/36, 8.3%) and readmission (1/36, 2.8%). The average reduction in uterine volume at 6 months was 50%. At follow-up (mean 15 months, range 7 - 32), 91.7% (33/36) had complete symptomatic resolution and 83.3% (30/36) were 'completely satisfied'. Participants treated for primary infertility and concurrent adenomyosis did not receive any benefit from UAE.

**Conclusion.** Uterine artery embolisation is associated with a high clinical success rate. This study suggests that UAE should be offered as an attractive alternative to surgery in our practice.

*S Afr J OG* 2014;20(1):18-21. DOI:10.7196/SAJOG.798



Uterine leiomyomas (fibroids) can cause symptoms such as heavy bleeding, pain, pressure effects and reduced fertility. Hysterectomy or myomectomy has traditionally been the main treatment, but not all women are suitable for surgery and these surgical procedures carry risks of complications. Uterine artery embolisation (UAE) is a newer treatment option that works by blocking the blood supply to the uterus, thus shrinking the fibroids and reducing their effects. There is, however, some evidence that fertility outcomes (live births and pregnancy) may be better after myomectomy than after UAE.<sup>[1]</sup>

Following its introduction in 1995 as an alternative technique for treating fibroids, UAE<sup>[2]</sup> has become increasingly accepted as a minimally invasive, uterine-sparing procedure. More than 100 000 procedures have been performed during the past decade, mainly in the USA and Western Europe.

In 2004, the UK National Institute for Health and Clinical Excellence (NICE) guidelines stated that the procedure appeared to be safe for routine use and that the majority of patients obtained short-term symptomatic relief.<sup>[3]</sup> In a more recent Cochrane review (2012), Gupta *et al.*<sup>[1]</sup> stated that UAE appeared to have overall patient satisfaction rates similar to those for hysterectomy and

myomectomy, with shorter hospital stays, faster recovery times and a quicker return to routine activities.

There is a lack of data from South Africa on the local performance of UAE.<sup>[4,5]</sup> This paper reports on a pilot study of UAE in two major public academic hospitals in the Western Cape Province.

### Methods

The study was a prospective observational study based at Groote Schuur and Tygerberg hospitals, two level 3 academic institutions in the public health sector in the Western Cape. Inclusion criteria were women with symptomatic uterine fibroids who declined surgery, had risk factors for surgery such as obesity or medical co-morbidities, or objected to blood products. Patients were treated by a multidisciplinary team comprising infertility specialists, general gynaecologists and radiologists.

All participants underwent pre-procedure diagnostic pelvic magnetic resonance imaging (MRI) on a 1.5T magnet using rapid-acquisition, multi-planar, T2-weighted sequences. Total uterine and fibroid volumes were recorded by using the volumetric calculation for an ellipse, with tri-planar measurements multiplied by 0.5. The presence of adnexal or other uterine pathology such as adenomyosis was also reported.

UAE was performed in an interventional radiology suite under local anaesthesia and titrated narcotic analgesia. A right common femoral arterial puncture was initially performed, followed by arteriography of the pelvic vessels. The uterine arteries were sequentially catheterised with microcatheters (Boston Scientific Renegade Hi Flow), and non-absorbable polyvinyl alcohol particles (300 - 500  $\mu\text{m}$ ) were used as the embolic agents. Both uterine arteries were routinely embolised and all procedures were performed by the same interventional team. Post-embolisation analgesia was self-administered via a patient-controlled analgesic (PCA) narcotic infusion pump during the 48 hours of hospital admission.

Major complications were defined as those requiring a return to the emergency department, readmission, prolonged hospitalisation (beyond 48 hours) or surgical intervention.

Participants were seen at the gynaecological clinic for follow-up at 6 weeks and then again at 6 months, when post-procedure pelvic MRI was performed. All MRIs were reported by the same radiologist. A trans-abdominal ultrasound scan was performed if the MRI service was not accessible for the follow-up imaging. Patients who were unable to return for follow-up were interviewed telephonically.

Patient satisfaction was evaluated qualitatively as follows: women were considered to be 'satisfied' with UAE if they felt that they were relieved of their presenting symptoms; 'partial satisfaction' applied to women who remained mildly symptomatic; and women without major symptom improvement were assessed as 'dissatisfied'.

All patients signed informed consent, and independent institutional review board approval was obtained for the study from research ethics committees of the faculties of health sciences, University of Cape Town and Stellenbosch University.

## Results

Thirty-six women with symptomatic fibroids were recruited and treated with UAE between November 2009 and February 2012. The mean age was 38 years (range 30 - 47). The majority were black Africans ( $n=26$ ), seven were of mixed ethnicity, and three were white.

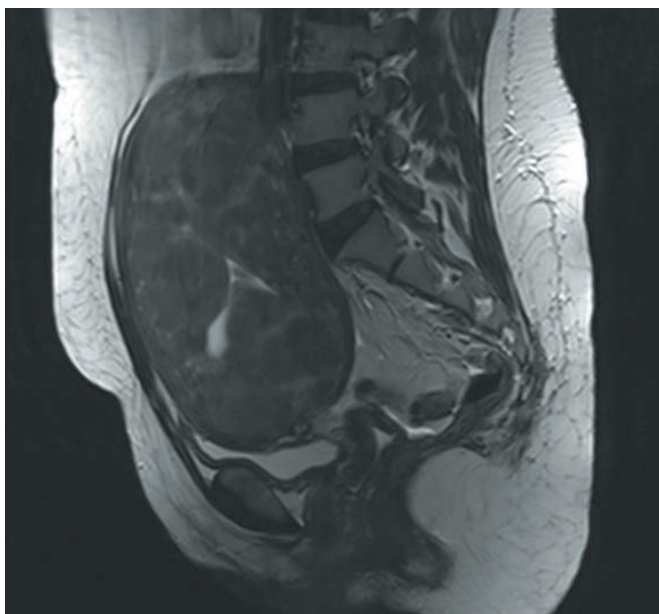


Fig. 1. Pre-embolisation sagittal T2-weighted magnetic resonance imaging scan of the pelvis demonstrating large multi-fibroid uterus.

The presenting symptoms were menorrhagia (26/36, 72.2%), dysmenorrhoea (18/36, 50.0%), pelvic pressure symptoms (13/36, 36.1%), intermenstrual bleeding (11/36, 30.6%) and infertility (3/36, 8.3%). Several patients had more than one complaint. Five patients (13.9%) had previously undergone myomectomy.

## Pre-embolisation imaging

The average uterine volume before embolisation was 1 625  $\text{cm}^3$  (range 613 - 5 506, normal uterine volume approximately 100  $\text{cm}^3$ ). The number of fibroids ranged from 5 to over 40 (Fig. 1). Individual fibroid magnetic resonance signal intensities were not reported, as the wide range of signal variation has previously been shown to have little predictive value in assessing successful embolisation.<sup>[6]</sup>

No adnexal disease was identified. Two patients had concomitant adenomyosis.

## Procedural outcomes

Thirty five patients had a single groin puncture (Figs 2 and 3). One patient required bilateral femoral punctures to access the respective uterine arteries. Uterine artery sub-selection was possible in all cases. One patient developed uterine artery spasm during the procedure, and despite intra-arterial chemovaso-dilation the vessel remained in spasm and adequate embolisation could not be achieved.

In five patients (13.9%) aberrant uterine supply via the ovarian arteries was demonstrated during the initial pelvic angiography. These vessels were not embolised.

## Complications

Four patients experienced low-grade pyrexia: in three cases this occurred immediately postoperatively, and one patient required readmission 2 weeks later. All four women were treated conservatively with intravenous antibiotics.

## Post-procedure imaging

Despite active follow-up, only ten patients returned at 6 months for post-embolisation MRI. Reasons for failing to return included



Fig. 2. Initial pelvic angiogram demonstrating bilateral, hypertrophied uterine arteries.

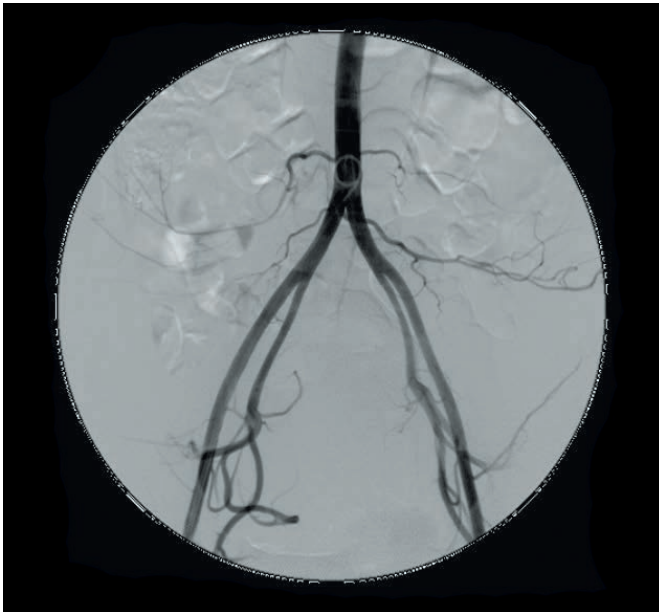


Fig. 3. Post-embolisation angiogram demonstrating occlusion of uterine arteries.

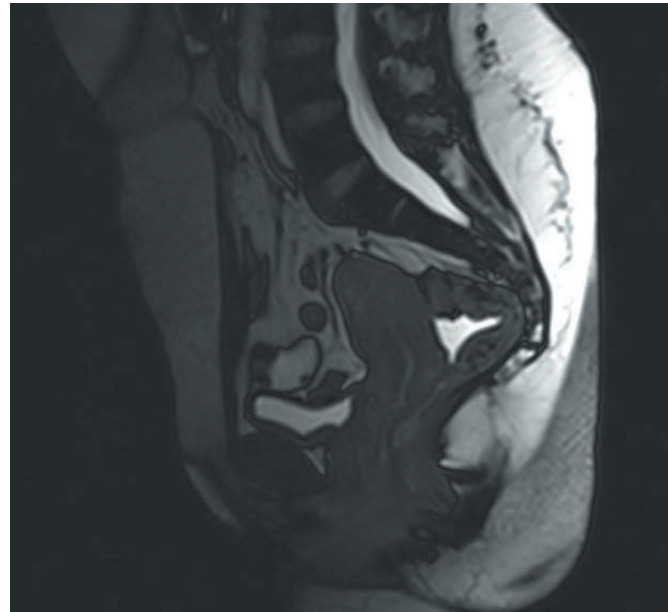


Fig. 4. Six-month follow-up sagittal magnetic resonance imaging scan demonstrating a normal endometrial stripe and markedly reduced fibroid burden.

patients leaving the region, patients actively electing not to attend because they were feeling better, and funding constraints.

The average uterine volume 6 months after UAE was 955 cm<sup>3</sup> (range 104 - 2 709). The average reduction in uterine volume determined by MRI at 6 months was 50%. All fibroids returned a homogeneously low T2 signal compared with the range of high, intermediate and low signals before embolisation (Fig. 4).

### Patient satisfaction

Patients were followed up for a mean of 15 months (range 7 - 32). Thirty women (83.3%) considered themselves 'satisfied'. Of the remainder, three were 'partially satisfied' and three were 'not satisfied'. In the 'partially satisfied' group, one woman required readmission for hysteroscopic resection of a sub-mucosal fibroid, and one reported persistent irregular menstrual bleeding despite overall improved well-being. The reason for 'partial satisfaction' in the third patient was unclear. This patient, who was concomitantly being treated for primary infertility, had a 56% decrease in uterine volume at 6 months, underwent an interval myomectomy, conceived spontaneously, and had had a normal delivery by the last follow-up visit.

The 'not satisfied' group comprised one patient suffering from primary infertility who had failed to conceive at the last follow-up, one who had an incomplete procedure because of intra-procedural vasospasm and remained symptomatic, and one who had concomitant adenomyosis. Although her uterine volume had decreased by approximately 50% at 6 months, she subsequently required hysterectomy for persistent menorrhagia.

### Discussion

Many forms of minimally invasive treatment have gained substantial popularity, both with the medical fraternity and the public. With the correct clinical indications and in skilled hands, UAE has been accepted by the international community as part of the standard of care that should be offered to patients with symptomatic fibroids. Preoperative diagnosis is of vital importance before carrying out

embolisation. This ensures directed treatment of symptomatic fibroids and excludes pathology that may mimic similar clinical presentations such as malignancy, adenomyosis or polyps. Every woman being considered for this technique should be assessed by both the radiologist and the gynaecologist to exclude other pelvic pathology and to decide whether the procedure is appropriate.<sup>[7]</sup>

In this study of 36 women with symptomatic fibroids, uterine artery sub-selection using microcatheters and embolisation was successful in all patients but one, who had refractory unilateral uterine artery vasospasm. The majority of patients were unable to attend for a follow-up post-embolisation MRI scan, thus limiting the objective documentation of fibroid volume and uterine size reduction. However, through a process of continued telephonic contact all patients were repeatedly interviewed during the course of the study.

The use of microcatheters reduces the need for bilateral femoral artery punctures and lowers the risk of uterine artery spasm and resultant inadequate embolisation. Sub-selection of uterine arteries and directed deposition of particulate embolic agents ensures an effective and targeted intervention, limiting the risk of inadvertent reflux of embolic agent beyond the target zone and along the ovarian arterial supply, which would pose a risk of premature ovarian failure. The ovarian arteries of the five patients who had such aberrant supply to the uterus were not embolised. None of these patients developed symptomatic recurrence.

While elimination of fibroid-related symptoms is the main objective of embolisation, fibroid shrinkage is an additional advantage.<sup>[7]</sup> Fertility improvement is less definite. As reported in other studies, our data show that there is a durable improvement in symptoms, with an over 80% overall satisfaction rating. Our patients, with a mean uterine volume of 1 625 cm<sup>3</sup> (range 613 - 5 506), demonstrated a decrease in uterine volume of approximately 50% at 6 months (the normal uterine volume is approximately 100 cm<sup>3</sup>). This reduction is similar to that in previously published work, with average reductions of between 50% and 60% at 12 months.<sup>[8]</sup>

At a median follow-up of 15 months (range 5 - 32), 30/36 patients were satisfied with the outcome of the procedure and

felt that their presenting symptoms had resolved completely. In the partially satisfied group, hysteroscopic resection of a retained fibroid and a myomectomy were required. Our results therefore reflect symptomatic improvement of menorrhagia and pressure effects similar to those of other reports (symptom improvement range 81 - 95%).<sup>[4,9-11]</sup>

Given the small study group of 36 women, percentages need to be interpreted with caution, but one major complication (a patient requiring readmission for intravenous antibiotic therapy) in 36 (2.7%) is in keeping with previous reports.<sup>[12]</sup> In a literature review by Martin *et al.*<sup>[12]</sup> in 2012, the reported incidence of post-embolisation syndrome was 2.8%. No emergency hysterectomies were performed. The FIBROID Registry (UAE Fibroid Registry for Outcomes Data, established by the Cardiovascular and Interventional Radiology Research and Education Foundation and the Society of Interventional Radiology in co-operation with the Duke Clinical Research Institute, with the purpose of assessing the procedure's durability, impact on fertility and quality of life and obtaining data that will allow researchers to compare UAE with other fibroid therapies) noted an in-hospital major complication rate of 0.66% and an overall 30-day major complication rate of 4.8%.<sup>[13]</sup> Most complications involved pelvic pain requiring a lengthened hospital stay.<sup>[9]</sup> Although post-embolisation pain occurred in all our patients, intravenous PCA narcotic infusion pumps were routinely provided to cater for the various degrees of pain tolerance. The course of pain after the procedure was the same as recorded in other studies.<sup>[14]</sup>

One of the three patients treated concomitantly for primary infertility in our series underwent myomectomy 8 months after UAE. Despite an overall uterine volume reduction of 56%, the residual fibroid bulk distorted the endometrial lining to such an extent that a pregnancy would not have been carried to term. She subsequently delivered a healthy baby. Although data on fertility after UAE are still limited, a few studies have documented reassuring findings that fertility remains feasible.<sup>[15]</sup> Patients who presented solely with infertility were not offered UAE.

An important consideration in evaluating the role of UAE is the cost of the procedure. This was not one of our prospectively captured outcome measures. Using the National Health Reference Price List and provincial hospital billing service, we calculated that in our institution UAE cost approximately R20 000 per patient. Hysterectomy or myomectomy costs were estimated at approximately R30 000, with savings of 33%.

Although hysterectomy remains the only definitive treatment option for fibroids, it is a major surgical procedure with a complication rate of 1 - 2% and invariably results in sterility.

Laparoscopic and trans-abdominal myomectomy are surgical alternatives, although a sub-analysis of the 5-year follow-up of patients on the 'REST' randomised controlled trial (UAE v. surgery for symptomatic uterine fibroids), showed that the prevalence of new fibroids was 60% in the myomectomy group as opposed to 7% in the UAE group.<sup>[16]</sup> This article describes the second study reporting prospectively on the outcome of UAE in South Africa.<sup>[4]</sup> Our cases had larger mean uterine volumes and longer follow-up times, but it was not a randomised trial and did not compare UAE results with surgical outcomes.

## Conclusion

The results of this pilot study strongly support UAE as a safe, effective and affordable treatment option for fibroids with low complication and failure rates. Careful pre-embolisation evaluation, both clinically and by imaging, together with appropriate technical expertise, remain important factors when offering UAE to patients.

- Gupta JK, Sinha A, Lumsden M, Hickey M. Uterine artery embolization for symptomatic uterine fibroids. *Cochrane Database Syst Rev* 2012;5:CD005073. [http://dx.doi.org/10.1002/14651858.CD005073.pub3]
- Ravina J, Ciraru-Vigneron N, Bouret J, et al. Arterial embolisation to treat uterine myomata. *Lancet* 1995;346(8976):671-672. [http://dx.doi.org/10.1016/S0140-6736(95)92282-2]
- 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. [http://dx.doi.org/10.1056/NEJMoa062003]
- Prollius A, de Vries C, Loggenberg E, et al. Uterine artery embolization for symptomatic fibroids. *Int J Gynaecol Obstet* 2004;84(3):236-240. [http://dx.doi.org/10.1016/j.ijgo.2003.09.006]
- Prollius A, de Vries C, Loggenberg E, du Plessis A, Nel M, Wessels PH. Uterine artery embolisation for symptomatic fibroids: The effect of the large uterus on outcome. *BJOG* 2004;111(3):239-242. [http://dx.doi.org/10.1046/j.1471-0528.2003.00019.x]
- Walker W, Pelage J, Sutton C. Fibroid embolization. *Clin Radiol* 2002;57(5):325-331. [http://dx.doi.org/10.1053/crad.2002.0945]
- Walker W, Pelage J. Uterine artery embolisation for symptomatic fibroids: Clinical results in 400 women with imaging follow up. *BJOG* 2003;109(11):1262-1272. [http://dx.doi.org/10.1046/j.1471-0528.2002.01449.x]
- Walker W, Barton-Smith P. Long-term follow up of uterine artery embolisation - an effective alternative in the treatment of fibroids. *BJOG* 2006;113(4):464-468. [http://dx.doi.org/10.1111/j.1471-0528.2006.00885.x]
- Worthington-Kirsch R, Spies JB, Myers ER, et al. The Fibroid Registry for outcomes data (FIBROID) for uterine embolization: Short-term outcomes. *Obstet Gynecol* 2005;106(1):52-59. [http://dx.doi.org/10.1097/01.AOG.0000165828.68787.a9]
- Pelage J-P, Cazejust J, Pluot E, et al. Uterine fibroid vascularization and clinical relevance to uterine fibroid embolization. *Radiographics* 2005;25(Suppl 1):S99-S117.
- Toor SS, Jaber A, Macdonald DB, McInnes MD, Schweitzer ME, Rasuli P. Complication rates and effectiveness of uterine artery embolization in the treatment of symptomatic leiomyomas: A systematic review and meta-analysis. *AJR Am J Roentgenol* 2012;199(5):1153-1163. [http://dx.doi.org/10.2214/AJR.11.8362]
- Martin J, Bhanot K, Athreya S. Complications and reinterventions in uterine artery embolization for symptomatic uterine fibroids: A literature review and meta analysis. *Cardiovasc Intervent Radiol* 2013;36(2):395-402. [http://dx.doi.org/10.1007/s00270-012-0505-y]
- Bulman JC, Ascher SM, Spies JB. Current concepts in uterine fibroid embolization. *Radiographics* 2012;32(6):1735-1750. [http://dx.doi.org/10.1148/rg.326125514]
- Worthington-Kirsch RL, Koller NE. Time course of pain after uterine artery embolization for fibroid disease. *Medscape Womens Health* 2002;7(2):4.
- McLucas B. Pregnancy following uterine artery embolization: An update. *Minim Invasive Ther Allied Technol* 2013;22(1):39-44. [http://dx.doi.org/10.3109/13645706.2012.689768]
- Ananthkrishnan G, Murray L, Ritchie M, et al. Randomized comparison of uterine artery embolization (UAE) with surgical treatment in patients with symptomatic uterine fibroids (REST Trial): Subanalysis of 5-year MRI findings. *Cardiovasc Intervent Radiol* 2013;36(3):676-681. [http://dx.doi.org/10.1007/s00270-012-0485-y]