

# Long-term follow up of uterine artery embolisation—an effective alternative in the treatment of fibroids

WJ Walker,<sup>a</sup> P Barton-Smith<sup>b</sup>

<sup>a</sup>Radiology Department <sup>b</sup>Obstetrics & Gynaecology Department, Royal Surrey County Hospital, Guildford, Surrey, UK  
Correspondence: Mr P Barton-Smith, Obstetrics & Gynaecology Department, Royal Surrey County Hospital, Egerton Road, Guildford, Surrey GU2 7XX, UK. Email p.barton-smith@surrey.ac.uk

Accepted 18 January 2006.

**Objectives** To evaluate the long-term efficacy and complications of uterine artery embolisation (UAE) for treatment of symptomatic uterine fibroids.

**Design** A prospective observational study.

**Setting** A district general hospital and two private hospitals in the southeast of England.

**Population** Women with symptomatic fibroids who had been offered surgical options for treatment.

**Methods** Postal questionnaire follow up at 5–7 years to assess long-term clinical effects among women who had undergone UAE.

**Main outcome measures** The questionnaire was subdivided into sections dealing with menstrual flow, amenorrhoea and menopause, fibroid-related symptoms, fertility, vaginal discharge, sexual function, subsequent treatments for fibroids and satisfaction with the procedure.

**Results** A total of 258 women were identified as being between 5 and 7 years post-UAE and suitable for long-term follow up in October 2004. One hundred seventy-two completed questionnaires were analysed (67% response rate). Seventy-five percent of women still had either a return to normal or an improvement in menstrual flow compared with how they were prior to UAE. More than 80% of fibroid-related symptoms were still resolved or improved. Sixteen percent of women required further treatment for fibroids. Premature menopause directly following UAE occurred in only one woman in the study group. Eighty-eight percent of women were satisfied with the outcome of the procedure at 5–7 years and would choose it again or recommend it to others.

**Conclusions** These findings show that UAE is of benefit to women wishing to avoid hysterectomy and it carries a low risk of complications.

**Keywords** Artery, embolisation, fibroids, myoma, uterine.

Please cite this paper as: Walker W, Barton-Smith P. Long-term follow up uterine artery embolisation—an effective alternative in the treatment of fibroids. BJOG 2006; 113:464–468.

## Introduction

Arterial uterine artery embolisation (UAE) has been available for more than 25 years, initially as a technique for controlling abdominal and pelvic haemorrhage.<sup>1–4</sup> Its use in the treatment of uterine fibroids by embolising the uterine arteries is more recent. The first series was published in *The Lancet* in 1995.<sup>5</sup> We have previously published a series of procedures, with a median follow up of 16.7 months, demonstrating that in most cases, the uterus shrank by an average of 67%,<sup>6</sup> paralleling the symptomatic improvement seen. We have also shown that fibroid embolisation was effective for subserous, interstitial and submucous fibroids, irrespective of size or number of fibroids present.<sup>7</sup> The major advantage of fibroid embolisation over other procedures is that it has the

potential to affect all fibroids at one procedure, compared with myomectomy for cases of multiple fibroids, where it is difficult to remove every fibroid.<sup>8</sup> Other studies with favourable outcomes have been published.<sup>9,10</sup> Here we present long-term clinical follow-up data on 172 women at 5–7 years post embolisation.

## Methods

We decided to examine long-term outcome 5–7 years post-UAE. All women who fell within this time span were sent a questionnaire based on our own unvalidated questionnaire used in our previous study of 400 patients.<sup>6</sup> The main topics included menstrual bleeding, amenorrhoea, fibroid-related symptoms, fertility, vaginal discharge, sexual function,

subsequent treatment for fibroids, quality of life and satisfaction with the original UAE procedure. Questions regarding menstrual bleeding, fibroid-related symptoms, vaginal discharge and sexual function were subjective. One hundred seventy-two women returned completed questionnaires. The answers were entered into an Excel database for analysis.

Approval for this study was obtained from the hospital ethics committee, and all women gave written informed consent.

The indications for study entry, management and treatment of the women are described in the previous study.<sup>6</sup> After UAE, the interventional radiologist oversaw follow up. Four of the women received unilateral UAE. The remaining 168 all underwent a bilateral procedure. Eleven women required more than one session to complete the procedure. Imaging and clinical evaluation were carried out both pre- and post-UAE. The details and analysis of the preprocedure and mid-term postprocedure results (mean follow up 16.7 months) are also reported in the original article.<sup>6</sup>

## Results

### General

Two hundred fifty-eight women fell within the long-term follow-up period, of 5–7 years, in October 2004. Completed questionnaires were received from 172 women (67%). Four women replied that they did not wish to participate, and one woman was subsequently found to have died from an unrelated road traffic accident.

### Demographics

The mean age of women in the sample was 43 years. Nineteen percent were older than 50 years, 22% between 45 and 50 and 58% between 30 and 44 years old. Eighty-seven percent were white women, while 8% were black women.

### Menstrual flow and change in symptoms

Changes in menstrual flow and fibroid-related symptoms are shown in Tables 1 and 2.

### Amenorrhoea/menopause

One hundred sixty-four out of 172 women were premenopausal at the time of their procedure. Onset of menopause post-UAE was defined as the absence of menstruation for at least 1 year at the time of filling in the questionnaire. Eight women had no further menstruations immediately after UAE and entered menopause. Seven of these women were  $\geq 45$  years of age (range 45–56) and represented 11% of all women  $\geq 45$  years who were treated.

Only two women became menopausal before age 40 (1.2%). They were treated at ages 38 and 36 and became menopausal at ages 43 and 39, respectively. It is unclear if there was a relationship between UAE and early onset of

menopause in these two cases, but they represent about 1% of the study sample, and the likelihood in the general population of menopause before age 40 is also about 1%.

### Vaginal discharge

Eighty-three women (48%) complained of vaginal discharge post-UAE. Of the women who had discharge, 31 of the 83 women (37%) said the discharge was continuous, 38 described it as cyclical (46%), 26 said it was offensive (31%), 16 said it interfered with their sex lives (19%) and 58 described the discharge as a minor irritant (71%). Out of the whole sample of 172 women, 9 found it a major problem (5%). Only one woman found the discharge so distressing that they would have preferred a hysterectomy. Fifty out of 172 women described passing fibroid material (29%) and 9 reported passing a whole fibroid (5%). This experience was generally accompanied by pain and bleeding and occurred a mean of 6.5 weeks post-UAE (range 2 days to 20 weeks). Onset of discharge generally occurred within 2 weeks of UAE.

### Sexual function

One hundred twenty women out of 172 answered questions about the quality of their sex lives (70%). Sixty-four women (53%) reported no change, 31 (26%) said it had improved and 12 (10%) reported a deterioration. Of those women who complained of deterioration, four cited uterine pain and three cited vaginal discharge as the reasons.

### Subsequent treatment for fibroids

Twenty-eight women (16%) have subsequently undergone other procedures to deal with their fibroids since UAE. Nine had hysterectomies, six had myomectomies (one woman had two separate myomectomies), nine had hysteroscopic resections of fibroids (one woman also had an ablation procedure) and three had hysteroscopies for vaginal discharge. One woman had *E. coli* septicaemia that developed rapidly after UAE, necessitating hysterectomy at 2 weeks post-UAE.

### Satisfaction with UAE

Women were asked whether or not the quality of their lives had changed for the better since UAE, whether they would still choose to have it again and whether or not they would recommend it to others. Finally, they were asked to give an overall level of satisfaction with the procedure. The results are shown in Table 3.

## Discussion

Our study of 172 women, who were between 5 and 7 years post-UAE, shows very satisfactory subjective improvement in menstrual flow and fibroid-related symptoms. This is associated with a low risk of complications, a high satisfaction

**Table 1.** Changes in menstrual flow post-UAE

Menstrual flow	Number of women (%)
Amenorrhoea	8 (5)
"Normal" flow	96 (56)
Reduced but heavier than normal	32 (19)
No change	4 (2.3)
Heavier than before	1 (1.6)
Longer than before	3 (1.7)
Reduction only temporary*	32 (19)

The responses are women's subjective views of their menstrual flow 5–7 years post UAE.

\*The mean duration of improvement among the 19% who had a temporary improvement in menstrual flow was 32 months (range 3–72 months).

rate and only a 16% risk of requiring a subsequent procedure for fibroids.

Demographically, our trial involved only 8% of black women. This is less than that in other studies.<sup>10–13</sup> This may be significant as there is some indication that infective complications might be more common in black women due to the higher incidence of pelvic inflammatory disease.

With regard to improvement in menstrual flow, studies by Spies *et al.*<sup>9</sup> and midterm results by Goodwin *et al.*<sup>10</sup> showed marked sustained improvement. The Ontario multicentre study reported an 83% improvement in menstrual flow.<sup>11</sup> Our long-term statistic of 75% either improved or returning to normal periods demonstrates that although there is a small drop in the improvement percentage, this remains high in the long term.

The cause of failure is likely to be multifactorial. Many of our initial 200 women did not receive magnetic resonance imaging (MRI) scans, and adenomyosis, which is an important cause of failure,<sup>14</sup> may have been missed. Inadequate fibroid infarction and subsequent regrowth is another possibility. This is usually due to inadequate particulate embolisation at the time of the procedure, often resulting from arterial spasm reducing flow in the uterine arteries, or tortuous vessels causing difficulty in catheterisation. We are now treating

these women with a repeat embolisation. In addition, we now use dynamic postprocedure MRI scans to ensure that we have adequately infarcted all fibroid tissue within the uterus. A final cause of failure is collateral flow. The most common culprits are the ovarian arteries. This situation is more likely to occur after previous myomectomy.<sup>15</sup> Where only one ovarian artery is involved, ovarian artery embolisation can be targeted to the uterine branches. In other cases, particles may be refluxed via the uterine arteries into the ovarian arterial fibroid branches. Cervical fibroids may be fed from vaginal arteries as well as uterine arteries and may cause failure in these cases.

A feared complication of UAE in the past was ovarian failure. We have shown that this is a rare event in women younger than 45 years as has been demonstrated in other papers.<sup>16,17</sup>

Improvements in fibroid-related symptoms excluding menorrhagia are similar to those from other trials showing that these subjective improvements are maintained in the long term. It is interesting to note that constipation resolved or improved in 66%. This is difficult to explain, but it would appear that large fibroids might be a factor.

Conventional advice has been that UAE is not indicated for women wishing to become pregnant.<sup>18</sup> Twenty-four pregnancies resulted among the 172 women in this study. An analysis of those is contained in our separate publication of 26 pregnancies following UAE.<sup>19</sup> There are two other main studies considering pregnancy and UAE: the results from the Canadian multicentre trial<sup>20</sup> and the McLucas *et al.*<sup>21</sup> study. All the studies have shown a promising success rate following UAE, and there is no evidence to suggest that UAE is not indicated in women suffering from fibroid-related infertility. We suggest that women may be offered UAE after failed myomectomy, where myomectomy may be difficult, or for women who reject a surgical option.

Vaginal discharge is a very important complication of UAE. It is common and usually due to shedding of fibroid material into the endometrial cavity. In this paper, and a further more comprehensive study by our group, discharge appears to be persistent in approximately 5% of women.<sup>22</sup> Surprisingly, this complication is hardly mentioned in other papers. It may be

**Table 2.** Changes in fibroid-related symptoms post-UAE

Symptom	Number	Resolved, n (%)	Improved, n (%)	No change, n (%)	Worse, n (%)
Dysmenorrhoea	119	66 (55)	33 (28)	16 (13)	4 (3)
Sciatica	50	32 (64)	9 (18)	6 (12)	3 (6)
Abdominal swelling	149	69 (46)	67 (45)	8 (5)	5 (3)
Constipation	53	18 (34)	17 (32)	18 (34)	0 (0)
Pressure/discomfort	121	79 (65)	33 (27)	8 (7)	1 (1)
Urinary frequency	105	55 (52)	30 (29)	16 (15)	4 (4)

**Table 3.** Satisfaction with UAE at 5–7 years

	<b>Very satisfied</b>	<b>Satisfied</b>	<b>Dissatisfied</b>	<b>Very dissatisfied</b>	<b>No answer</b>
Overall satisfaction, <i>n</i> (%)	104 (60)	48 (28)	5 (3)	2 (1)	13 (8)
	<b>Yes</b>	<b>No</b>	<b>Unsure</b>	<b>No answer</b>	
Would choose again, <i>n</i> (%)	151 (88)	12 (7)	1 (1)	8 (5)	
Would recommend, <i>n</i> (%)	149 (87)	1 (1)	1 (1)	21 (12)	
	<b>Better</b>	<b>Not improved</b>	<b>No answer</b>		
Quality of life, <i>n</i> (%)	146 (85)	8 (5)	18 (11)		

that we have designed our questionnaire with a view to pursuing treatment of discharge. The majority of these women can be cured by hysteroscopic resection of dead fibroid material.<sup>22</sup> Unfortunately, women treated in the early days of our experience were not treated as aggressively as in our current practice. We now encourage treatment in the small group of 5% with chronic discharge. In our previous paper concerning vaginal discharge, we described an important MRI sign of this condition where a small section of the necrotic fibroid semi-liquefies and communicates with the endometrial cavity. Vaginal discharge is also a cause of deterioration of sexual satisfaction.

All the major studies show a high level of patient satisfaction with UAE.<sup>10–13,23</sup> In our series, 87% said that they would recommend the procedure to others. It is our experience that women who request UAE often are adamantly against surgery and passionately motivated for the procedure to succeed. However, the continued high level of satisfaction after more than 5 years of follow up would be likely to mitigate any placebo effect or bias.

Sixteen percent of our women had a subsequent surgical intervention. Obviously, hysterectomy indicates a failure of UAE but other surgical interventions may succeed because of UAE. In some cases, large fibroids that are difficult to remove surgically may be killed and shrunk by embolisation. They then become more amenable to surgery. Our gynaecologists have easily hysteroscopically removed infarcted submucous fibroids that had wholly or partially prolapsed the uterine cavity following UAE. In many cases, the fibroids have been very large and would have constituted a major surgical challenge.

Recurrence of fibroids after UAE is almost certainly due to inadequate initial embolisation. This may result from vascular spasm restricting particle flow. In other cases, it is due to the occurrence of new fibroids in women with aggressive disease. If all the fibroid material is not killed, and estrogen stimulation continues, the fibroids will regrow and symptoms will recur. Increasingly, in these cases, we are carrying out a second embolisation, usually with MRI evidence of complete fibroid

infarction after the second procedure. Therefore, it is likely that a number of our failures related to menorrhagia, compression syndrome or dysmenorrhoea were due to initial underembolisation. In our current practice, these could have been successfully treated with a second UAE that would have reduced our hysterectomy and myomectomy rates.

Finally, with regard to our overall complication and failure rates, over the years, we have progressively tried to improve and modify our embolisation technique and the way we assess and look after our women postprocedurally. We no longer partially or wholly occlude the main uterine arteries that could theoretically cause an element of global uterine ischaemia. The end points of our embolisation procedures are more reliable. The use of postprocedure MRI can confirm totality of fibroid infarction. We can now more reliably diagnose and treat adenomyosis. Thus, we now would anticipate an even higher success rate and reduced complications compared with the women presented in this series.

## Conclusions

Our results show that fibroid embolisation as we were performing it 5–7 years ago is a viable alternative to hysterectomy. It carries high success and low complication rates that are sustained in the long term. We anticipate even better future results with our current technique.

## Acknowledgement

We would like to thank Rose Nielsen, research assistant to Dr Walker, for her tireless and meticulous collection of the data used to produce these results. ■

## References

- 1 Walker WJ, Goldin AR, Shaff MI, Allibone GW. Per catheter control of haemorrhage from the superior and inferior mesenteric arteries. *Clin Radiol* 1980;31:71–80.
- 2 Heaston DK, Mineau DE, Brown BJ, Miller FJ Jr. Transcatheter arterial embolization for control of persistent massive puerperal hemorrhage

- after bilateral surgical hypogastric artery ligation. *AJR Am J Roentgenol* 1979;133:152–4.
- 3 Walker W. Successful internal iliac artery embolisation with glue in a massive case of obstetric haemorrhage. *Clin Radiol* 1996;51:442–4.
  - 4 Pelage JP, Le Dref O, Mateo J, Soyer P, Jacob D, Kardache M, *et al*. Life-threatening primary post partum haemorrhage. Treatment with emergency selective arterial embolisation. *Radiology* 1998;208:359–62.
  - 5 Ravina JH, Herbretau D, Ciraru-Vigneron N, Bouret JM, Houdart E, Aymard A, *et al*. Arterial embolisation to treat uterine myomata. *Lancet* 1995;346:671–2.
  - 6 Walker WJ, Pelage JP. Uterine artery embolisation for symptomatic fibroids: clinical results in 400 women with imaging follow up. *BJOG* 2002;109:1262–72.
  - 7 Watson GM, Walker WJ. Uterine artery embolisation for the treatment of symptomatic fibroids in 114 women: reduction in size of the fibroids and women's views of the success of the treatment. *BJOG* 2002;109:129–35.
  - 8 McLucas B, Adler L. Re: leiomyoma recurrence after uterine artery embolization. *J Vasc Interv Radiol* 2004;15:773–4; author reply 774–5.
  - 9 Spies JB, Cooper JM, Worthington-Kirsch R, Lipman JC, Mills BB, Benenati JF. Outcome of uterine embolization and hysterectomy for leiomyomas: results of a multicenter study. *Am J Obstet Gynecol* 2004;191:22–31.
  - 10 Goodwin SC, McLucas B, Lee M, Chen G, Perrella R, Vedantham S, *et al*. Uterine artery embolization for the treatment of uterine leiomyomata midterm results. *J Vasc Interv Radiol* 1999;10:1159–65.
  - 11 Pron G, Bennett J, Common A, Wall J, Asch M, Sniderman K, *et al*. The Ontario Uterine Fibroid Embolisation Trial. Part 2. Uterine fibroid reduction and symptom relief after uterine artery embolisation for fibroids. *Fertil Steril* 2003;79:120–7.
  - 12 Spies JB, Scialli AR, Jha RC, Imaoka I, Ascher SM, Fraga VM, *et al*. Initial results from uterine fibroid embolization for symptomatic leiomyomata. *J Vasc Interv Radiol* 1999;10:1149–57.
  - 13 Pron G, Cohen M, Soucie J, Garvin G, Vanderburgh L, Bell S. The Ontario Uterine Fibroid Embolization Trial. Part 1. Baseline patient characteristics, fibroid burden, and impact on life. *Fertil Steril* 2003;79:112–19.
  - 14 Ahn C, Lee WH, Sunwoo TW, Kho YS. Uterine arterial embolisation for the treatment of symptomatic adenomyosis of the uterus. *J Vasc Interv Radiol* 2000;11(Suppl):192.
  - 15 Pelage JP, Walker WJ, Le Dref O, Rymer R. Ovarian artery: angiographic appearance, embolization and relevance to uterine fibroid embolization. *Cardiovasc Intervent Radiol* 2003;26:227–33.
  - 16 Goodwin SC, Bonilla SM, Sacks D, Reed RA, Spies JB, Landow WJ, *et al*. Reporting standards for uterine artery embolization for the treatment of uterine leiomyomata. *J Vasc Interv Radiol* 2001;12:1011–20.
  - 17 Chrisman HB, Saker MB, Ryu RK, Nemcek AA Jr, Gerbie MV, Milad MP, *et al*. The impact of uterine fibroid embolization on resumption of menses and ovarian function. *J Vasc Interv Radiol* 2000;11:699–703.
  - 18 Committee on Gynecologic Practice, American College of Obstetricians and Gynecologists. Uterine artery embolization. *Obstet Gynecol* 2004;103:403–4.
  - 19 Carpenter TT, Walker WJ. Pregnancy following uterine artery embolization for symptomatic fibroids: a series of 26 completed pregnancies. *BJOG* 2005;112:321–5.
  - 20 Pron G, Mocarski E, Bennett J, Vilos G, Common A, Vanderburgh L, *et al*. Pregnancy after uterine embolisation for leiomyomata: the Ontario multicentre trial. *Obstet Gynecol* 2005;105:67–76.
  - 21 McLucas B, Goodwin S, Adler L, Rappaport A, Reed R, Perrella R. Pregnancy following uterine fibroid embolization. *Int J Gynaecol Obstet* 2001;74:1–7.
  - 22 Walker WJ, Carpenter TT, Kent AS. Persistent vaginal discharge after uterine artery embolization for fibroid tumors: cause of the condition, magnetic resonance imaging appearance, and surgical treatment. *Am J Obstet Gynecol* 2004;190:1230–3.
  - 23 Worthington-Kirsch RL, Popky GL, Hutchins FL Jr. Uterine arterial embolization for the management of leiomyomas: quality-of-life assessment and clinical response. *Radiology* 1998;208:625–9.