



Article

Pregnancy following uterine fibroid embolization

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Abstract

Objective: This paper seeks to evaluate the ability to deliver term pregnancies following uterine fibroid embolization, and to identify impediments to pregnancy in the embolization procedure. **Study design:** Four physicians performed embolization procedures at various facilities. Patients were asked if fertility was an issue prior to embolization. We measured follicle-stimulating hormone levels before and after embolization. Clinical follow-up, six months following embolization was obtained by interview. Patients were questioned regarding attempts to conceive, menstrual history, and subsequent pregnancy. **Main outcome measures:** Complications were calculated upon the entire patient population, whether or not fertility was identified as a goal. Fertility risks from embolization were identified. We measured radiation exposure in a random consecutive group of 50 women undergoing embolization. All patients who conceived were asked the details of the pregnancy. **Results:** Four hundred women underwent uterine fibroid embolization between 1996 and 1999. One hundred and thirty nine patients stated a desire for fertility after embolization. Of these, 52 were < 40 years old. Seventeen pregnancies have been reported in 14 women. Five spontaneous abortions were observed. Ten women have had normal term deliveries and two women are currently pregnant. No perfusion problems, either during the pregnancy or labor, were reported. The average radiation dosage calculated for 50 women undergoing embolization was 14 rads. Four women under 45 years old suffered premature menopause (10/1000). Two women underwent hysterectomy as a complication of embolization (5/1000). **Conclusion:** The risks of infertility following embolization, premature menopause, and hysterectomy are small, as is the radiation exposure during embolization. These risks compare favorably with those associated with myomectomy. Fertility rates appear similar to patients undergoing myomectomy. No problems, either during pregnancy or delivery, have been

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observed after embolization. The course of pregnancy and delivery was normal after embolization with no maternal or fetal complications reported. These findings confirm results from other centers. Desire for future pregnancy is not a contraindication to fibroid embolization. © 2001 International Federation of Gynecology and Obstetrics. All rights reserved.

Keywords: Embolization; Fertility; Menorrhagia; Myomata

1. Introduction

Uterine fibroid embolization (UFE) is an established procedure that is effective in treatment of symptomatic uterine myomata [1–4]. Some authors have not recommended UFE for women considering future pregnancy [5]. In this paper, we examine our patient population with particular attention to complications, which would curtail fertility, and the outcomes of pregnancies for women who conceived after UFE.

2. Materials and methods

Women with menorrhagia or postmenopausal bleeding secondary to uterine myomata were accepted to undergo UFE. Although patients may have identified pregnancy loss associated with myomata, no patient was treated based on infertility as a symptom. No size restrictions, either on the individual myoma or the overall size of the uterus, were imposed. The study was conducted from 1996 to 1999. After initial success, [4,6,7], we offered UFE to women considering future pregnancy, starting in 1997. Evaluation of women prior to UFE is detailed in other papers [4,6]. Women desiring future fertility were counseled about the potential risks of UFE, including hysterectomy, radiation exposure, and premature menopause. As a standard practice and to ensure safe pregnancy, all women were advised to wait for 6 months after UFE before any attempt to conceive. We measured radiation exposure in a group of 50 women undergoing embolization at one facility. All women had measurements of follicle stimulating hormone (FSH) before and 6 months after UFE. Menstrual history after UFE was part of the clinical assessment at 6 months postprocedure. All patients were asked to notify

the authors if they became pregnant, or if they underwent any subsequent procedures or surgeries.

3. Results

During the study period, 400 women underwent UFE. The average age of patients was 41 and the range was 26–67. The average diameter of the largest myoma was 7.5 cm (1.2–19 cm) measured either by MRI or ultrasound. The average total uterine volume was 1389 ml (117–8804 ml). One hundred and thirty-nine women identified maintenance of fertility as a goal after UFE. We used 40 as a cutoff age to identify the fertility group. Fifty-two women who were < 40 years old, were included in the group who sought future fertility. Seven women in this group had successful past pregnancies before UFE. Eleven patients had undergone prior myomectomy. All of these patients had adhesions noted at the time of preUFE laparoscopy. No attempt was made to elicit other fertility factors, which might have prevented conception. However, 57 patients out of the total patient population of 400 desiring fertility, reported pregnancy loss prior to UFE, which had been attributed to myomas. Nine of the 10 women with term pregnancies, did so without additional aided reproductive techniques following UFE. One of the women had a previously identified anovulation and required assisted reproductive technology. Fourteen women reported 17 pregnancies (33%). Ten (20%) women have had normal term deliveries. Their pregnancies and outcomes are charted in Table 1.

One of the 10 term pregnancies was complicated by premature labor, placenta previa and abruptio placenta; the patient delivered at 32 weeks gestation. All other pregnancies went to

Table 1
Pregnancy outcomes

Record number	Outcome	Other comments
6178	NSD	
2664	CS	Cephalopelvic disproportion
6185	CS	Breech, pre-eclampsia
7747	NSD	
6988	Currently pregnant	8 Weeks
6189	NSD	
7750	Spontaneous abortion	Conception 2 months after UFE
7750	CS	Cephalopelvic disproportion
6197	Spontaneous abortion	6th week
6204	Spontaneous abortion	3rd week
6204	Currently pregnant	4 weeks
6162	Spontaneous abortion	5th week
6162	Spontaneous abortion	2nd trimester
5727	CS	Complete breech
2555	CS	Placenta previa, premature CS at week 32
6230	CS	Breech
7819	CS	Prior myomectomy

term without complications. No patient suffered intrauterine growth retardation during the prenatal period. Women undergoing cesarean section did so for obstetric indications. None of the patients reported any signs of fetal distress during labor, or problems with uterine integrity. Four spontaneous abortions were reported in the first 6 weeks of pregnancy. One of these patients conceived against our advise within the month after embolization. Another patient suffered spontaneous abortion at 16 weeks. The diameter of the largest myoma was measured in two women, 6 months postpartum. No fibroid exhibited regrowth after pregnancy.

Six women who were less than 45 years old (37–43) had normal FSH levels before UFE and menopausal levels 6 months after the procedure (9%). Within this group, four women became amenorrheic and experienced hot flushes, while two women continue to menstruate and do not exhibit symptoms of menopause.

Two women from the total population had total hysterectomy as a result of infection following UFE. One of these women did not have a preUFE



Fig. 1. MRI showing abscess within uterus prior to hysterectomy.

laparoscopy. The pathology report revealed chronic salpingitis. The second woman had a preUFE total uterine volume (TUV) of 7932 cm³ (average TUV of embolized uteri = 620.17 cm³) and required 10.75 vials of 300–500 poly vinyl alcohol particles (PVA) to occlude the uterine arteries (average number of vials for UFE in our series = 3.62). This patient did not respond to antibiotic therapy after an abscess within the uterus was noted on MRI prior to hysterectomy (Fig. 1).

We calculated radiation exposure for a random, consecutive group of 50 women undergoing UFE at a community hospital. During UFE, the women received exposure with both fluoroscopy and digital subtraction imaging. The average radiation exposure to the ovaries was approximately 0.9–1.1 rads/min using the GE Medical Systems Advantx Digital Processor. Average radiation exposure was 14 min (6–46 min), giving the women an average exposure of 14 rads (6–52 rads).

4. Discussion

Three possible impediments to fertility have been identified with UFE—premature menopause, hysterectomy, and radiation exposure. The mechanism concerning premature menopause following UFE is uncertain. Elevated FSH following UFE did not always indicate premature menopause. One woman had a slightly elevated FSH after UFE, but continued to have menses and did not experience hot flashes. Another woman had an elevated FSH 3 months after UFE, but then returned back to normal levels. She is menstruating regularly. Using FSH levels alone as a measure of premature menopause was not reliable. Four patients had elevated FSH levels prior to UFE, which then dropped to normal levels after embolization.

Operator effect might play a role in this occurrence. The technique of individual radiologists may be an important factor in the incidence of premature menopause. More aggressive occlusion may predispose to reflux of particles outside of the catheter to the ovarian arteries. Rates of premature menopause vary with different opera-

tors. This incidence has been reported in different articles as between (7–15%) [8–10]. The technique of individual radiologists, including the rate of injection and the thoroughness of occlusion may be a factor in the incidence of premature menopause. We noted a difference within our group between interventional radiologists in the particle load, the number of vials of PVA used per liter of uterus embolized (0.5–19).

Radiation exposure—fluoroscopy time and subsequent radiation exposure to women will vary with experience and skill level of the Interventional Radiologist. Additionally, it varies with the age and body type of the patient. The average radiation exposure of 14 rads/procedure does not indicate a significant dose of radiation [11]. Comparatively, the average radiation exposure for a hysterosalpingogram is 5 rads; for barium enema is 0.8 rads; and for a pelvic computerized tomograph is 3 rads [12,13].

The incidence of hysterectomy as a complication of UFE is quite low (5/1000), and probably confined to very large, vascular uteri in properly screened patients. Other studies with a higher percentage of post UFE hysterectomy (2–3%) [7,14] included a population with large myomas. One of our hysterectomies did fit into this large uterus category. The second hysterectomy had pathologic features of pelvic infection; had she presented for evaluation by our protocol, she would have been deferred pending treatment of her salpingitis.

Uterine fibroids are not known to cause infertility [15], but rather a causative factor of pregnancy loss [16,17]. Thus, when studying the population of women desiring fertility, careful study for other factors must be undertaken. Such a study was not possible within our population. We note that nine patients who conceived had a prior pregnancy (75%). Also, two had experienced pregnancy loss attributed to myomata. Other studies looking at myomectomy as a treatment for infertility have placed an age cutoff on the population studied. We acknowledge the somewhat arbitrary division of our population at 40 years old; however, we are aware of other factors, which complicate conception after this age. We compare our term pregnancy rate in women under 40 years

Table 2
UFE comparison to abdominal, laparoscopic and hysteroscopic myomectomies

Group	Myomectomy	Total patient group	Total pregnant patients	Term pregnancies	Pregnancy rate
Lissoni et al. [18]	Abdominal	8	3	2	25%
Sudik et al. [19]	Abdominal	67	37	31	46%
Acien et al. [20]	Abdominal	80	9	8	10%
Darai et al. [21]	Laparoscopic	70	17	11	16%
Darai et al. [22]	Laparoscopic	22	8	4	18%
Dubisson et al. [23]	Laparoscopic	21	7	7	33%
Bernard et al. [24]	Hysteroscopic	119	11	9	8%
McLucas et al.	Embolization	52	17	10	33%

old (33%), with those quoted for other forms of myomectomy as seen in Table 2.

After abdominal myomectomy, the term pregnancy rate ranged from (10–46%) [18–20]. Following laparoscopic myomectomy, the term pregnancy rate has been between 16 and 33% [21–23]. After hysteroscopic myomectomy, the term pregnancy rate has been described as 8–35% [24,25].

In comparing UFE to myomectomy as a fertility sparing procedure, we must include the known complications of myomectomy — adhesion formation, regrowth of new myomata, and conversion to hysterectomy [26]. In our group of women who had undergone prior myomectomy, all had moderate to severe pelvic adhesions noted at the time of preUFE laparoscopy. We note that nine patients (89%) successfully carried a pregnancy to

term without undergoing prior myomectomy, compared to one patient who conceived after myomectomy and UFE. Perhaps embolization will be offered as a primary procedure for patients desiring fertility if these statistics hold up in larger series. No woman reported regrowth of myoma after UFE. We have followed a group of 190 women for more than 2 years. This group has exhibited continual shrinkage of myomata beyond 6 months postUFE (Fig. 2).

In addition, two women underwent ultrasound at 6 months postpartum; and both studies exhibited continual shrinkage of myomata compared to studies done before conception. The permanence of myoma shrinkage postpartum is encouraging.

In our group of women who did conceive, nine out of 10 pregnancies proceeded normally.

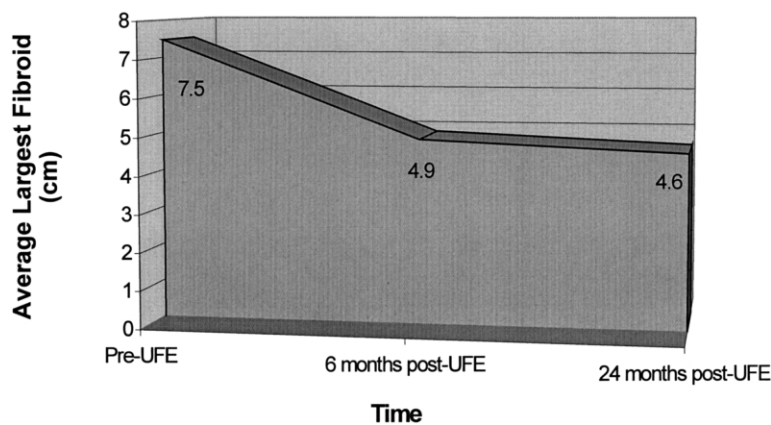


Fig. 2. Graph of continued myomata shrinkage.

Notably, no perfusion problems occurred either during pregnancy or labor, which would have declared themselves as intrauterine growth retardation or fetal distress. The mode of delivery included three vaginal births and seven Cesarean sections, three of which had a breech presentation while the other a disproportion–cephalopelvic. Residual fibroids predispose to breech presentation and dysfunctional labor [27,28]. Our group of 17 pregnancies is small, but does confirm other reports of successful pregnancy following embolization of the uterine arteries for other causes [29–31]. We know that women who underwent uterine artery ligation have experienced normal fertility [32]. Similarly, women embolized with gelfoam for postpartum hemorrhage have been described as having normal fertility [33]. Finally, other centers have reported uneventful pregnancies following UFE [29,34].

5. Conclusion

Pregnancy is a viable option for women undergoing UFE. Our (33%) term pregnancy rate in women less than 40 years old compares favorably with women who underwent myomectomy via a number of techniques. Our preliminary data suggest that fertility is further enhanced in women who underwent UFE as a first procedure for control of myomata. Because of the higher risk of hysterectomy in large uteri after UFE, we suggest that patients seek embolization in the early symptomatic stage of their disease. Women desiring fertility should be apprised of potential risks of UFE, including the small chance of premature ovarian failure (10/1000), and even a lower possibility of hysterectomy (5/1000) because of infection following UFE. Our pregnant women show no signs of fetal distress or growth retardation.

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