

CLINICAL SCIENCE

Pregnancy after uterine arterial embolization

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OBJECTIVE: To evaluate pregnancy outcomes, complications and neonatal outcomes in women who had previously undergone uterine arterial embolization.

METHODS: A retrospective study of 187 patients treated with uterine arterial embolization for symptomatic uterine fibroids between 2005-2008 was performed. Uterine arterial embolization was performed using polyvinyl alcohol particles (500-900 μm in diameter). Pregnancies were identified using screening questionnaires and the study database.

RESULTS: There were 15 spontaneous pregnancies. Of these, 12.5% were miscarriages ($n=2$), and 87.5% were successful live births ($n=14$). The gestation time for the pregnancies with successful live births ranged from 36 to 39.2 weeks. The mean time between embolization and conception was 23.8 months (range, 5–54). One of the pregnancies resulted in twins. The newborn weights ($n=14$) ranged from 2.260 to 3.605 kg (mean, 3.072 kg). One (7.1%) was considered to have a low birth weight (2.260 kg). There were two cases of placenta accreta (12.5%, treated with hysterectomy in one case [6.3%]), one case of premature rupture of the membranes (PRM) (6.3%), and one case of preeclampsia (6.3%). All of the patients were delivered via Cesarean section.

CONCLUSION: In this study, there was an increased risk of Cesarean delivery. There were no other major obstetric risks, suggesting that pregnancy after uterine arterial embolization is possible without significant morbidity or mortality.

KEYWORDS: Uterine Artery Embolization; Fibroids; Pregnancy; Outcomes; Myoma.

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INTRODUCTION

Uterine artery embolization (UAE), which has been described in numerous reports since 1995, is a recognized treatment for symptomatic uterine fibroids.¹ The technical goal is to deliver particulate material (typically polyvinyl alcohol [PVA] particles or gelatin-coated polymer microspheres) into both uterine arteries to induce ischemic alterations to the myomas without causing permanent damage to the uterus.²⁻⁴

Despite many studies that have assessed uterine myomas and infertility, the mechanism underlying their detrimental reproductive effects remains to be determined. Similarly, studies evaluating the effects that UAE may have on subsequent fertility and pregnancy have yielded conflicting and limited data.^{5,6}

Although there are valid concerns regarding the effects of UAE on women who wish to retain fertility, pregnancy after this procedure is well documented. Pregnancy after UAE has been described in case reports, a review article,⁷ retrospective

series,⁸⁻¹⁰ and a retrospective cohort study that compared UAE and laparoscopic myomectomy.¹¹

A retrospective analysis by Walker and McDowell found 56 completed pregnancies in a series of 1200 patients who underwent UAE. This cohort included 108 women who attempted pregnancy, and 30.5% of these pregnancies were categorized as successful. The authors noted that 14 of the women with successful pregnancies had failed myomectomies and had been offered a hysterectomy as their only option before undergoing UAE.¹²

The main purpose of this study is to present the pregnancy outcomes and complication rates of UAE.

Population

Between July 2005 and December 2008, we performed 187 consecutive UAEs. Fifteen pregnant patients from this population are included in this review.

All of the patients provided informed consent to participate in this study, and the Local Ethics Committee approved the related protocol. This study was supported by the Department of Gynecology and the Department of Image Diagnosis of the Federal University of São Paulo. There was no external sponsor.

The clinical diagnosis of myoma was confirmed by ultrasonography. The indications for UAE were as

follows: menorrhagia subjectively reported by the patient as increased or prolonged menstrual blood loss that caused dysfunction in daily life, pelvic pain, compressive symptoms in the urinary/gastrointestinal tract, and infertility related to fibroids. All of the patients wanted to maintain their fertility and desired a conservative treatment.

A patient's desire to preserve fertility was not an exclusion criterion. The pregnancies were documented by interviews performed during follow-up.

The exclusion criteria for UAE were as follows: subserosal and submucosal fibroids, pelvic infections, gynecologic malignancy, an undiagnosed pelvic mass outside of the uterus, unexplained abnormal menstrual bleeding, coagulopathy, a history of pelvic irradiation, a FSH level > 40 IU/L, and adenomyosis indicated by magnetic resonance imaging. Patients with intramural fibroids with submucosal components were also excluded.

The patients were treated with prophylactic antibiotics (1 g of oral azithromycin on the day before the procedure and 2 g of intravenous cefalotin about sixty minutes before the procedure). The analgesia was epidural or intradural. Selective catheterization of the uterine arteries was performed bilaterally and guided by angiography. A 4-F or 5-F catheter was introduced into the right femoral artery and advanced over the aortic bifurcation and into the contralateral internal iliac artery to identify the origin of the uterine artery. UAE was performed with PVA particles (500-900 μm in diameter). The material was continually injected until the cessation of circulation was confirmed via angiography. This procedure was performed on both uterine arteries. The patient preparation, anesthesia and analgesia details, procedure information, and discharge information were recorded.

RESULTS

A retrospective study of 187 women treated over a period of 3.5 years was performed. The mean patient age was 34.3 years (range, 26-40 years). Of the 187 women who underwent UAE, 75 had been seeking to become pregnant at some point, and 15 of these 75 women became pregnant at least once. However, their outcomes were variable.

The characteristics of the pregnancies are shown in Table 1. In the 187 women who underwent UAE, there were 15 spontaneous conceptions. The mean time between embolization and conception was 23.8 months (range, 5-54 months). One pregnancy occurred in the first year, 8 occurred in the second year, and 6 occurred in the third year following embolization.

These 15 pregnancies resulted in 14 live births, with 2 early miscarriages. The pregnancies lasted at least 36 weeks, with only one pre-term delivery. One of the pregnancies resulted in twins.

All 13 pregnancies were delivered by Cesarean section due to the obstetricians fearing complications from the pregnancies uterine artery embolizations. The indications for a Cesarean section were as follows: the decision of the attending obstetrician, risk avoidance in patients who had long and painful histories of trying to conceive, an older primiparous patient with preeclampsia, a history of prior myomectomy, a macrosomic fetus, and a labor induction that had previous failed.

The weights of the newborns ranged from 2260-3605 g. No cases exhibited chronic or acute fetal distress, and there was no impairment of vitality.

Abnormal placental implantation (placenta accreta) occurred in two patients, and one case terminated in a puerperal hysterectomy. There was one case of premature membrane rupture at 29 weeks, which lasted until a Cesarean section delivery at 36 weeks.

Comment

The efficacy of UAE has been published in the Cochrane Database. This meta-analysis documented that UAE results in a shorter hospitalization time and a reduction in blood loss (85% compared to pretreatment) and uterine size (30-49% compared to pretreatment).⁴ However, maintenance of fertility after UAE is still controversial. Until now, the impact of this treatment on fertility has not been established.^{13,14}

Theoretically, UAE may contribute to difficulties during embryonic implantation or the maintenance of pregnancy by decreasing the vascularity of the uterine myometrium and endometrium. In fact, embolization particles have been identified in structures adjacent to leiomyomas (e.g., myometrium, parametrium, and mesovarium) after UAE.¹⁵

Data are insufficient to conclude that UAE is a safe option for women who wish to retain their fertility.¹⁶ Normal pregnancy and delivery can be achieved after UAE for uterine leiomyomata, as has been shown for postpartum hemorrhages. Comparing pregnancy outcomes after UAE with leiomyomata is complicated by the size and location of the myomata and the fact that non-subserosal leiomyomas reduce fertility.¹⁷ UAE pregnancy outcomes are reduced most severely when submucosal myomas cause endometrial distortion. Reports have not documented the number of women who have attempted pregnancy after embolization; therefore, cycle conception and fecundity rates cannot be calculated.¹⁸ In this series, we do not associate complication rates with their direct impacts on fertility, such as ovarian insufficiency.

One study reported 29 pregnancies in 671 women who had undergone UAE. The authors reported that 27% of these pregnancies ended in miscarriage, with two terminations and one ectopic pregnancy. Of the 16 deliveries that occurred after 24 weeks, first- and second-trimester bleeding occurred in 40% and 33% of these deliveries, respectively, and 25% had preterm deliveries. The Cesarean section rate was 88%. Thirteen percent of the women had spontaneous preterm membrane ruptures, and the rate of primary postpartum hemorrhage was 20%. The mean birth weight of the term babies was 3.39 kg, and none required admission into the neonatal intensive care unit. There was one case of fetal growth restriction.¹⁹

Another retrospective analysis was undertaken to evaluate the incidence and outcomes of pregnancies after UAE for symptomatic uterine fibroids. Fifty-six completed pregnancies were identified in approximately 1200 women. Of the 108 patients that were attempting to become pregnant, 33 became pregnant, and 58.9% of the pregnancies had successful outcomes. Premature delivery occurred in 18.2% of these cases, and 30.4% of the pregnancies miscarried. Of the 33 deliveries, 72.7% were delivered by Cesarean section. There were 18.2% cases of postpartum hemorrhage. Compared with the general obstetric population, the authors found a significant increase in Cesarean

Table 1 - Pregnancy characteristics.

N	age (y)	uterine volume pre-treatment (cm ³)	uterine volume after treatment (cm ³)	time to conception (months)	time of pregnancy (weeks)	delivery	complication	birth weight (g)
1	40	449	189	22	39w	CS	none	3120
2	32	557	146	54	38w2d	CS	placenta accreta (postpartum hemorrhage)	3110
3	33	548	233	26	36w	CS	PRM	2260
4	34	337	142	48	38w4d	CS	placenta accreta (postpartum hemorrhage)	2860
5	33	340	87	14	37w5d	CS	none	2775
6	37	573	278	13	<10w	-	miscarriage	-
7	26	465	200	32	39w2d	CS	none	3605
8	29	570	235	21	38w1d	CS	none	2950
9	38	959	457	29	38w	CS	none	2970
10	39	450	188	15	<10w	-	miscarriage	-
11	35	330	113	30	39w	CS	none	2935
12	34	420	188	19	38w6d	CS	none	3450
13	34	564	240	5	37w	CS (twin)	none	2610/2570
14	36	610	230	14	38w2d	CS	none	2980
15	35	580	220	15	38w4d	CS	none	3360

CS – Cesarean section.

PMR - premature membranes rupture.

section deliveries and increases in preterm deliveries, postpartum hemorrhages, and miscarriage that were associated with lower pregnancy rates.¹²

Instances of placental alterations after UAE, such as placenta previa, placenta accreta, and abruptio placentae, have been reported in the literature.^{10,19} There were two cases of abnormal placental implantation in our patient series.

The frequency of spontaneous abortion is known to increase with maternal age, ranging from a rate of 18% in the late 30s to 34% in the early 40s in the general population. The 13.3% spontaneous abortion rate in our series does not appear to be higher than the general population rates. Relatively high rates (41.2%) of early miscarriages after laparoscopic uterine artery coagulation were observed by Chen et al.²⁰

Only one of the 15 live newborns in our study had a low birth weight, and the gestation time reached 36 weeks for all of the mothers. In contrast, preterm delivery rates ranging from 10% to 42.8% have been recorded in other studies.^{10,19}

A high rate of pregnancy complications was not observed in our study, probably because a limited embolization (of only the tumor vessels) was performed. However, the degree of dominant fibroid ischemia after UAE, which is very important, was over 50% in every patient.

This study is a report on pregnancies following embolization for uterine fibroids. Although the sample size is small, when using a relatively new procedure such as UAE, it is important to identify complications that could make pregnancy more hazardous. When interpreting the findings from this study, it must be remembered that this cohort is not typical of the general obstetric population.

The number of deliveries in this study was too small to allow us to make any recommendations on delivery management or draw conclusions. However, the pregnancy rate reported here adds to the growing number of reported cases of pregnancy after uterine artery embolization as a

treatment for fibroids and suggests that it may be appropriate to reconsider the contraindication for this procedure in younger women who wish to preserve their fertility. Randomized controlled trials comparing myomectomy and embolization in a younger population desiring pregnancy are necessary.

REFERENCES

- Ravina JH, Herbreteau D, Ciraru-Vigneron N, et al. Arterial embolization to treat uterine myomata. *Lancet*. 1995;346:671-2, doi: 10.1016/S0140-6736(95)92282-2.
- Bradley LD. Uterine fibroid embolization: a viable alternative to hysterectomy. *Am J Obstet Gynecol*. 2009;201:127-35, doi: 10.1016/j.ajog.2009.01.031.
- Walker WJ, Pelage J. Uterine artery embolisation of symptomatic uterine fibroids: clinical results in 400 women with imaging follow up. *BJOG*. 2002;109:1262-71, doi: 10.1046/j.1471-0528.2002.01449.x.
- Gupta JK, Sinha AS, Lumsden MA, Hickey M. Uterine artery embolization for symptomatic uterine fibroids. *Cochrane Database Syst Rev*. 2006;25:CD005073.
- Donnez J, Jadoul P. What are the implications of myomas on fertility? *Hum Reprod*. 2002;17:1424-30, doi: 10.1093/humrep/17.6.1424.
- Ng EH, Ho PC. Doppler ultrasound examination of uterine arteries on the day of oocyte retrieval in patients with uterine fibroids undergoing IVF. *Hum Reprod*. 2002;17:765-70, doi: 10.1093/humrep/17.3.765.
- Olive D, Lindheim S, Pritts E. Non-surgical management of leiomyoma: impact on fertility. *Curr Opin Obstet Gynecol*. 2004; 16:239-43, doi: 10.1097/00001703-200406000-00006.
- Ravina JH, Ciraru-Vigneron N, Aymard A, Le Dref O, Merland JJ. Pregnancy after embolization of uterine myoma: report of 12 cases. *Fertil Steril*. 2001;73:1241-3, doi: 10.1016/S0015-0282(00)00497-0.
- McLucas B. Pregnancy following fibroid embolization. *Int J Gynaecol Obstet*. 2001;74:1-7.
- Pron G, Mocarski E, Bennett J, Vilos G, Common A, Vanderburgh L, et al. Pregnancy after uterine artery embolization for leiomyomata: the Ontario multicenter trial. *Obstet Gynecol*. 2005;105:67-76, doi: 10.1097/01.AOG.0000149156.07061.1f.
- Goldberg J, Pereira L, Berghella V, Diamond J, Darai E, Seiner P, et al. Pregnancy outcomes after treatment for fibromyomata: Uterine artery embolization versus laparoscopic myomectomy. *Am J Obstet Gynecol*. 2004;191:18-21, doi: 10.1016/j.ajog.2004.01.046.
- Walker WJ, McDowell SJ. Pregnancy after uterine artery embolization for leiomyomata: a series of 56 completed pregnancies. *Am J Obstet Gynecol*. 2006; 195:1266-71.

13. Hehenkamp WJ, Volkers NA, Broekmans FJ, de Jong FH, Themmen AP, Birnie E, et al. Loss of ovarian reserve after uterine artery embolization: a randomized comparison with hysterectomy. *Hum Reprod.* 2007;22:1996-2005, doi: 10.1093/humrep/dem105.
14. Park AJ, Bohrer JC, Bradley LD, Diwadkar GB, Moon E, Newman JS, et al. Incidence and risk factors for surgical intervention after uterine artery embolization. *Am J Obstet Gynecol.* 2008; 199:671.e1-6, doi: 10.1016/j.ajog.2008.07.060.
15. Istre O. Management of symptomatic fibroids: conservative surgical treatment modalities other than abdominal or laparoscopic myomectomy. *Best Pract Res Clin Obstet Gynaecol.* 2008;22:735-47, doi: 10.1016/j.bpobgyn.2008.01.010.
16. Committee Opinion of the American College of Obstetricians and Gynecologists. Uterine artery embolization. *ACOG Committee on Gynecologic Practice.* 2004;293:403-4.
17. Stovall DW, Parish SB, Van Voorhis BJ, et al. Uterine leiomyomas reduce the efficacy of assisted reproduction cycles: results of a matched follow-up study. *Hum Reprod.* 1998;13:192-7, doi: 10.1093/humrep/13.1.192.
18. Marshburn PB, Matthews ML, Hurst BS. Uterine artery embolization as a treatment option for uterine myomas. *Obstet Gynecol Clin North Am.* 2006;33:125-44, doi: 10.1016/j.ogc.2005.12.009.
19. Carpenter TT, Walker WJ. Pregnancy following uterine artery embolisation for symptomatic fibroids: a series of 26 completed pregnancies. *BJOG.* 2005;112:321-5, doi: 10.1111/j.1471-0528.2004.00414.x.
20. Chen YJ, Wang PH, Yuan CC, Yen YK, Yang MJ, Ng HT, et al. Pregnancy following treatment of symptomatic myomas with laparoscopic bipolar coagulation of uterine vessels. *Hum Reprod.* 2003;18:1077-81, doi: 10.1093/humrep/deg200.