



## ORIGINAL ARTICLE

## Uterine Artery Embolization in The Treatment of Symptomatic Leiomyoma: Effect on Ovarian Function, Clinical Symptoms and Its Complications

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### ABSTRACT

**Introduction:** The present study evaluated the effect of uterine artery embolization on preservation of fertility in leiomyoma and its complications.

**Materials/Methods:** Thirty women with leiomyoma were included in the present study. Hormonal levels, leiomyoma size, patients' symptoms and complications if developed were evaluated, both before and after uterine artery embolization.

**Results:** There was no significant difference between the mean follicle-stimulating hormone, luteinizing hormone and estradiol levels, before and after uterine artery embolization ( $p=0.431$ ,  $p=0.672$ ,  $p=0.772$ , respectively). Fibroids size measured before and after 6 months of uterine artery embolization UAE were  $86.47 \pm 28.42$  cm and  $59.80 \pm 20.90$  cm, respectively ( $p<0.001$ ). None of the patients developed complications such as embolism, wound problems or necessity for hysterectomy. After uterine artery embolization, symptoms such as hypermenorrhea, dysmenorrhea, dyspareunia, and dysuria decreased significantly among patients.

**Conclusion:** Spiral computed tomography has a good sensitivity and specificity for the diagnosis of pulmonary embolism. In the majority of patients who did not have pulmonary embolism, it provided important ancillary information for the final diagnosis.

Therefore, combining Spiral computed tomography scan with a D-dimer Test is more effective in the accurate diagnosis of pulmonary embolism.

### INTRODUCTION

Uterine leiomyoma is a problem that arises in some women of childbearing age (Payson M 2006). Uterine leiomyoma (fibroma) can result in various symptoms such as severe bleeding, pain, compression and reduced fertility amidst women. Of all the hysterectomy cases done in United States annually, 30-40% have been related to this disease (Jacoby VL 2009). Hysterectomy or myomectomy, has been recognized traditionally as the primary approach for this disease, however, these surgical procedures cannot be performed in all the women (Bulman JC 2012). Moreover, these surgeries have many complications.

Uterine artery embolization (UAE) is a new therapeutic option that blocks blood flow to the uterus thereby reducing the size of fibroids. However, some evidences suggest that results with regard to the women fertility are better after

myomectomy, than UAE (Ravina JH 1995). UAE has been established as a minimally invasive method for addressing uterine related disorders (Edwards RD 2007). Further, a recent study stated that the satisfaction rates of the patients after UAE were similar to those with patients undergoing hysterectomy and myomectomy (Gupta JK 2012), although UAE was associated with shorter admission period and quicker resumption of daily activities (Jun F 2014).

However, no study has been conducted on the efficacy of UAE in Iran and further, on its effects with regard to fertility considering hormonal levels, ovaries volume and follicles. Therefore, the aim of the present study was to compare the efficacy of new endovascular treatment (selective UAE) on women with intrauterine myoma of 4 cm or more and its effectiveness in preserving fertility.

## MATERIALS AND METHODS

### Subjects

This cross-sectional study was conducted from July 2016 to May 2018 and all the patients referred for uterine leiomyoma, were assessed for UAE. During this process, all the patients were informed about the possible uterine leiomyoma complications, its associated effects on fertility and pregnancy, as well as available present-day treatments and their advantages and disadvantages. Patients were observed during the entire study and had the right to withdraw further evaluation at any time. The ethical aspect of this study was confirmed by the associated ethical committee. Inclusion criteria were: age under 40 years, patients who had previous uterine surgery or were at risk of hysterectomy with surgery for leiomyoma, planning for future pregnancy, ultrasound confirmation of the leiomyoma, at least 4 cm in the largest diameter inside the uterus (in the case of more than one leiomyoma, the largest with at least 4 cm in diameter was considered) and serum follicle-stimulating hormone (FSH) levels below 30 IU/L on the 3rd day of the menstrual cycle. Exclusion criteria were: pedunculated fibroma with thin pedicle (which is less than 50% of largest diameter of myoma), the size of myomatous uterus greater than the uterus size of 24 weeks of gestation (unless the purpose of UAE is leiomyoma debulking before myomectomy surgery), the size of the intracavity portion of the fibroma more than 3 cm, and ultimately virgin patients.

### Sonography

All surveys were performed by the same radiologist using a curved probe of 3.5-5.5 MHz and endovaginal probe of 6.5 MHz in a high-resonance scanner. The size of the fibroid was calculated according to the previous studies (Orsini LF 1984).

### Hormonal Assay

For hormonal assays, blood sample (10 cc) of venous vein was taken in the morning to assay FSH, luteinizing hormone (LH) and estradiol on the 3rd day of menstrual cycle, before UAE and also 6 months after UAE. The hormonal assay of these hormones is done with a solid phase enzyme-linked immunosorbent assay (ELISA).

### Statistical Analysis

Chi-square test was used to compare qualitative data. All statistical analysis of the data was performed by SPSS 19 (SPSS Inc., Chicago, USA) software. A p-value <0.05 was considered significant.

## RESULTS

In our study, thirty women patients with leiomyoma were enrolled. Characteristics of these patients are illustrated in table 1. With regard to hypermenorrhea; 6 cases (20%) were without, 4 cases (13.3%) with mild, 5 cases (16.66%) with moderate and about 15 cases (50%) with severe hypermenorrhea were detected. After UAE, the cases of hypermenorrhea decreased significantly ( $p=0.031$ ). Around 28 cases (93.33%) were without and 2 cases (6.66%) were with mild severity of hypermenorrhea. Furthermore, no cases of moderate and severe hypermenorrhea were noticed.

**Table 2.** Characteristics of patients

Variable	Mean $\pm$ SD	Range
Age (year)	36.13 $\pm$ 2.3	25-40
BMI (kg/m <sup>2</sup> )	24.53 $\pm$ 3.54	22-27
Gravity (n)	1.6 $\pm$ 1.2	0-4
Parity (n)	1.1 $\pm$ 1.2	0-4

(Abbreviations; BMI: body mass index)

In the case of dysmenorrhea, 8 cases (26.66%) were without, 3 cases (10%) with mild, 2 cases (6.66%) with moderate and around 17 cases (56.66%) with severe dysmenorrhea were detected. However, after UAE, 26 (86.66%) cases were without, 2 cases (6.66%) with mild and 2 cases (6.66%) with moderate dysmenorrhea were identified. Again, no case of severe dysmenorrhea was present. Hence, the number of dysmenorrhea cases decreased significantly after UAE ( $p=0.001$ ).

About dyspareunia, 17 cases (56.66%) were without, 3 cases (10%) with mild, 6 cases (20%) with moderate and 4 cases (13.33%) with severe dyspareunia were detected. After UAE, the cases were 26 (86.66%) without, 2 cases (6.66%) with mild and further 2 cases (6.66%) with moderate dyspareunia were noticed. There was no case of severe dyspareunia present ( $p=0.000$ ).

With regard to the pelvic pain, 16 cases (53.33%) were without, 2 cases (6.66%) with mild, 2 cases (6.66%) with moderate and 10 cases (33.33%) with severe pelvic pain were recognized. After UAE, 28 cases (93.33%) were without and 2 cases (6.66%) were with mild pelvic pain and there were no case of moderate and severe pelvic pain ( $p=0.024$ ).

About dysuria, 20 cases (66.66%) were without, 6 cases (20%) with mild, 2 cases (6.66%) with moderate and 2 cases (6.66%) with severe dysuria were detected. After UAE, 27 cases (90%) were without and 2 cases (6.66%) with mild, and 1 case (3.33%) with moderate dysuria was noticed. There were no case of severe pelvic pain ( $p=0.000$ ). Illustrated in table 2.

Frequency distribution of recovery time and return to routine activity after UAE, for less than 10 days, 10 to 30 days and more than 30 days were 59, 27, and 12, respectively. Illustrated in figure 1.

**Table 2.** The mean and standard deviation before and after UAE

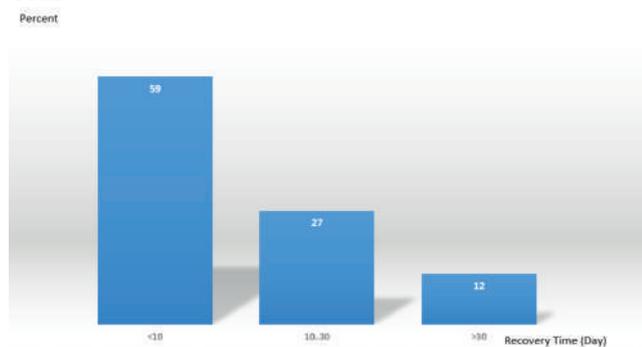
Variable		before UAE	after UAE	P-value
<b>Hypermenorrhea</b>	without	6	2	0.031
	mild	4	2	
	moderate	5	0	
	severe	15	0	
<b>Dysmenorrhea</b>	without	8	26	0.000
	mild	3	2	
	moderate	2	2	
	severe	17	0	
<b>Dyspareunia</b>	without	17	26	0.000
	mild	3	2	
	moderate	6	2	
	severe	4	0	
<b>Pelvic pain</b>	without	16	28	0.024
	mild	2	2	
	moderate	2	0	
	severe	10	0	
<b>Dysuria</b>	without	20	27	0.000
	mild	6	2	
	moderate	2	1	
	severe	2	0	

(Abbreviations; UAE: uterine artery embolization)

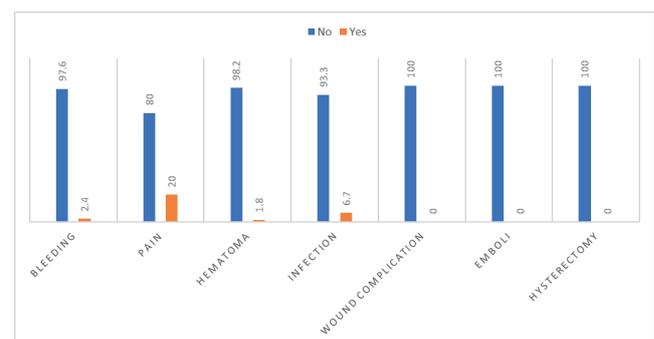
A review of the frequency distribution of complications showed that UAE did not result in serious complications among patients. None of the patients showed complications such as embolism, hysterectomy or wound problems. However, some issues such as infection (6.7%), hematoma (1.8%), bleeding (2.4%) and pain (20%) were observed among the patients. Illustrated in fig 2.

Considering effects on hormonal changes and sonogra-

phy of leiomyoma , UAE did not show significant changes with regard to hormonal levels, and the mean and standard deviation of FSH levels before the UAE was  $15.64 \pm 3.23$  mIU/mL and 6 months after UAE was  $16.83 \pm 4.21$  mIU/mL, ( $p=0.431$ ). The level of LH before UAE was  $12.64 \pm 4.65$  mIU/mL and 6 months after UAE was  $14.32 \pm 3.65$  mIU/mL ( $p=0.672$ ). Finally, the level of estradiol before UAE was 16.3 mIU/mL and 6 months after UAE was 18.51

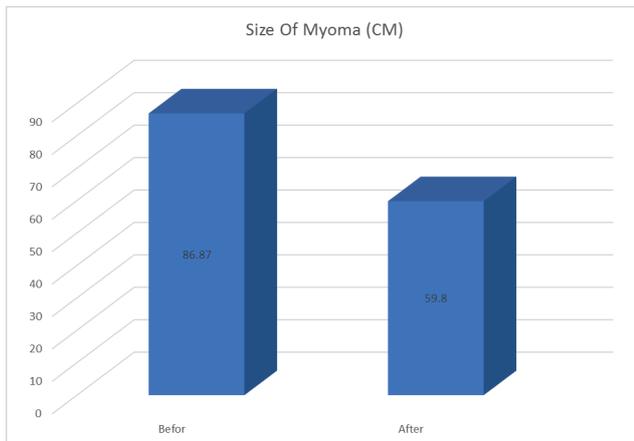
**Fig 1.** Frequency distribution of recovery duration after UAE.

(Abbreviations; UAE: uterine artery embolization)

**Fig 2.** Frequency distribution of complications after UAE.

(Abbreviations; UAE: uterine artery embolization)

**Fig 3.** Mean and standard deviation of myoma size before and after UAE.



(Abbreviations; UAE: uterine artery embolization)

mIU/mL ( $p=0.772$ ) Henceforth, no significant difference was observed. Illustrated in table 3.

Before UAE, size of myoma was  $86.47 \pm 28.42$  cm and 6 months after UAE, the size decreased significantly to  $59.80 \pm 20.90$  cm ( $p=0.000$ ). Illustrated in figure 3.

**Table 3.** The mean and standard deviation sex hormones before and after UAE

Variable	Before UAE	After UAE	P-value
FSH	15.64	16.83	0.431
LH	12.64	14.32	0.672
Estradiol	16.3	18.51	0.772

(Abbreviations; UAE: uterine artery embolization, FSH: follicle-stimulating hormone, LH: luteinizing hormone)

## DISCUSSION

The purpose of the present study was to evaluate the effects of UAE on reducing the size of fibroids and possible complications of this technique. We also studied the effects of UAE on fertility among women with leiomyoma. Till today, considerable research studies have focused on variety of therapeutic techniques and the effects of these on symptom control, fibroid size reduction, possible complications, and fertility (Zhang HX 2012). We assessed these factors in 30 women patients with leiomyoma. Most of the patients in our study were in the reproductive age, with an average age of 36.13 years. The mean body mass index (BMI) was 24.45 kg/m<sup>2</sup>, indicating that the patients were not obese. Both age and obesity are important factors, in the occurrence of leiomyoma and its prognosis. Among the women with leiomyoma who are younger than 40 years, maintaining fertility during the treatment is one of the most important outcomes. Most studies have shown that UAE is a successful technique for managing leiomyoma amidst women of reproductive age, with high pregnancy rates later.

We noticed that UAE did not affect the level of sex hormones, 6 months after the procedure. Hence, these results suggested that unlike other surgical procedures, UAE did not interfere with the fertility in women. Our results were consistent with the previous findings. In one study, the rates of ovarian failure following UAE (11%) and surgical methods (18%) were not found to be significantly different, 12 months after the surgery (Rashid S 2010). Additionally, there was no significant difference in the level of FSH and prostaglandin E<sub>2</sub> hormones before and after 3, 6 and 12 months of UAE (Tropeano G 2003). Contrarily, some studies have reported that UAE is associated with persistent ovarian failure (Orsini LF 1984; Zhang HX 2012; Rashid S 2010; Tropeano G 2003). Some other studies have reported occurrence of infertility, following UAE (Ravina JH 1995; Edwards RD 2007; Jun F 2014; Orsini LF 1984; Zhang HX 2012; Rashid S 2010; Tropeano G 2003; Chrisman HB 2000; Spies JB 2001; Firouznia K 2013; Volkers NA 2007). Besides, it has been hypothesized that UAE may cause ovarian hypoxia, ischemia and subsequent ovarian failure (Spies JB 2001). Extensive studies have been conducted about the success rate of UAE in controlling leiomyoma symptoms. UAE significantly reduced symptoms and improved quality of life in women with leiomyoma over a period of 3 years (Goodwin). When hysterectomy was compared with UAE in the treatment of uterine fibroids, the results showed no significant difference in controlling pain and bulk-related symptoms (Volkers NA 2007). The inconsistency of these results with other research findings was attributed to the severity of the symptoms and history of medical and surgical procedures that made hysterectomy the most suitable approach in that study (Volkers NA 2007). Nonetheless, in the present study, besides controlled symptoms after UAE, none of the patients required hysterectomy. However, certain complications such as infection (6.4%), hematoma (1.8%), bleeding (2.4%) and pain (20%) were seen among the patients. Previous studies have revealed that the rate of post-operative complications, such as infection, wound problems, and need for re-intervention in UAE group was 16% while in the patients with hysterectomy it was 25% (Moss JG 2011). In a review and meta-analysis study, it was concluded that the satisfaction rate of the patients with UAE was significantly higher than those patients who underwent surgery (Gupta JK 2012). The significant reduction in myoma size noticed in our study was similar to that observed in other studies. In a study by Watson et al, 114 patients showed a 58% reduction in fibroids (McLucas B 1999). Similarly, another study concluded that UAE was an excellent technique for controlling symptoms and also had high efficacy in reducing fibroids (Walker WJ 2002). Finally, we have shown that fertility indices measured as the levels of estradiol, FSH and LH hormones did not differ significantly before and after UAE. However, one of the limitations of our study is that we did not compare the results of hysterectomy with UAE. Also, we recommend longer follow-up of patients to detect probable side effects of UAE.

## CONCLUSIONS

Our study shows that UAE could be an appropriate choice for patients with leiomyoma. This technique has high competence in controlling the symptoms, reducing fibroids, and fertility preservation in women.

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## AUTHOR CONTRIBUTIONS

Dr Mohammad Reza Babaei: Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND Soheila Amini Moghaddam: Drafting the work or revising it critically for important intellectual content; AND Komeil Farajnejad: Final approval of the version to be published; AND Alaleh Rajabzadeh: Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

## CONFLICT OF INTERESTS

The authors do not have any actual or potential conflict of interest.

## ETHICAL STANDARDS

We include all patients into the study with their own permission, and they were told that whenever they desire, it is possible to leave the study without any problem.

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