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Original Article

Effect of mifepristone combined with interventional embolization on patients with uterine fibroids

Mei Wang[1*], Caixia Shang[2*], Qian Sun[4], Junfang Fang[5], Tianjin Li[3]

Departments of [1]Clinical Medicine, [2]Gynecology and Obstetrics, [3]Imaging, The Second People's Hospital of Dongying, Dongying, Shandong Province, China; [4]Department of Pharmacy, Dezhou People's Hospital, Dezhou, Shandong Province, China; [5]Department of Radiology, Affiliated Hospital of Binzhou Medical University, Binzhou, Shandong Province, China. [*]Equal contributors.

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Abstract: Objective: To investigate the effect of mifepristone combined with interventional embolization on uterine blood supply and menstruation in patients with uterine fibroids. Methods: Ninety patients with uterine fibroids in The Second Peopleith uterine fibDongying were divided into a control group and an observation group according to the order of treatment, with 45 cases in each group. The control group received interventional embolization of the uterine artery, whereas the observation group received treatment with mifepristone plus the surgical procedure. Changes in uterine volume, uterine fibroid volume, uterine fibroid blood supply, menstrual blood volume, menstrual period and ovarian hormones were recorded before and after treatment in both groups, and the prognosis was statistically analyzed. Results: Compared with before treatment, both groups had reduced uterine volume and uterine fibroid volume after treatment, but the uterine volume and uterine fibroid volume were significantly smaller in the observation group than in the control group during the same period (all $P < 0.05$). The average flow rate, peak systolic velocity and thickest artery diameter of both groups were lower after surgery than before treatment, while the resistance index was higher than before treatment. The improvement degree of the observation group was significantly higher than that of the control group (all $P < 0.05$). The levels of progesterone, estradiol, follicle-stimulating hormone and luteinizing hormone in the observation group were significantly lower after treatment, and these levels were significantly lower in the observation group than in the control group during the same period (all $P < 0.05$). After 6 months of treatment, the number of menstrual period and menstrual blood volume were significantly reduced in both groups, but the menstrual period and menstrual blood volume were significantly lower in the observation group than in the control group (all $P < 0.05$). The required time for postoperative menstrual recovery to normal level of the observation group was also significantly longer than that of the control group ($P < 0.001$). Postoperative complications were significantly less frequent in the observation group than in the control group ($P = 0.036$). Conclusion: In patients with uterine fibroids, mifepristone combined with interventional embolization can effectively reduce uterine blood supply, restore ovarian function, and reduce postoperative complications, which is worthy of clinical application and promotion.

Keywords: Mifepristone, interventional embolization, uterine fibroids, uterus

Introduction

Uterine fibroids are benign tumors of the female reproductive system, with an average incidence of 20-25%. However, since their growth rate is slow, in the early stages of the disease, most patients have no clinical symptoms or only mild symptoms, and only a few of them show abnormal uterine bleeding, increased menstrual blood volume, pelvic tenderness, and infertility, all of which directly reduce the quality of life of patients [1-3]. At present, the disease is mainly treated with conservative and surgical methods. Satisfactory results are difficult to achieve with pharmacological treatment for this disease. On the other hand, traditional surgery is highly traumatic, and is likely to result in the damage of reproductive organs, endocrine disorders, and infertility. However, with the increasingly high demands for postoperative quality of life and reproductive function, most patients tend to choose methods that can both

retain the uterus while attaining therapeutic effects [4-6].

Uterine arterial embolization (UAE) has achieved good clinical results in the treatment of uterine cancer, uterine bleeding and adenomyosis, and other uterine diseases. This procedure boasts advantages such as reduced trauma, quick recovery, and preservation of the uterus [7, 8]. Nevertheless, UAE also has its own limitations. After UAE, postoperative complications are frequent, and ovarian collateral circulation may be established, entailing risk of recurrence [9]. Mifepristone is a steroid drug with high progesterone activity which can inhibit the secretion of progesterone through non-competitive inhibition. It has also been observed to reduce the levels of progesterone and epidermal growth factor receptors in fibroid tissue, inhibit the proliferation of tumor cells, thus inhibiting the growth of fibroids [10]. Studies have shown that mifepristone can significantly and effectively alleviate the complications after hysteromyoma resection, and improve the efficacy of this procedure [11]. Therefore, this study aimed to assess the effects of mifepristone combined with UAE on uterine blood supply and menstruation in patients with uterine fibroids.

Materials and methods

General information

The study was approved by the Ethics Committee of The Second Peopleffects of mifepDongying. Ninety patients with uterine fibroids who attended The Second Peoplects of mifeprisDongying from January 2017 to January 2018 were included. Both patients and their families signed informed consent. According to the order of treatment, they were allocated into the control group or the observation group, with 45 cases in each group. The control group underwent interventional UAE, whereas the observation group was treated with mifepristone plus UAE.

The inclusion criteria were the following: patients (1) aged between 25 and 45 years; (2) who met the clinical diagnostic criteria for uterine fibroids [12]; (3) had not taken drugs related to the treatment of uterine fibroids within six months. The exclusion criteria were the following: patients with (1) coagulation dysfunction, abnormal immune system or endocrine diseases; (2) uterine fibroids larger than 10 cm; (3) contraindications for angiography; (4) acute and chronic vaginitis, cervicitis or pelvic inflammation; (5) allergy to mifepristone; (6) adnexal masses or endometrial hypertrophy; or (7) malignant changes of the uterine fibroids or endometrium.

Research methods

The control group underwent UAE 3-7 days after menstruation. The right femoral artery was punctured using the Seldinger technique, and the catheter sheath was inserted. Microcatheter angiography was performed bilaterally in the internal iliac arteries, and 10 mL of contrast agent (Ioversol Injection, Jiangsu Hengrui Pharmaceutical Co., Ltd., China) was injected to determine the direction of the uterine artery, and assess the presence of arteriovenous fistulae and evaluate the blood supply of the myomas. The injection rate was 3 mL/s, and the injection pressure was 50 kPa. The 500 μm of sodium alginate microspheres (Beijing Shengyiyao Science and Technology Development Co., Ltd., China) was injected into the target vessel until its blood flow was slow, and the injection was stopped when the iodized oil was deposited. Pain relief and anti-inflammatory treatment were performed after the operation.

The observation group received mifepristone tablet (specification: 10 mg/tablet, Zhejiang Xianju Pharmaceutical Co., Ltd., China), half a tablet per time and once a day. The drug was taken on an empty stomach or 2 hours after eating, followed by fasting for 1-2 h. The treatment was continued for 6 months.

Observation indicators

Key Indicators: The blood supply parameters of uterine fibroids were measured by an experienced physician using the same color ultrasound machine (Philips HD15, China) before surgery, on the second or third day of the menstrual period of 3 and 6 months after surgery (for those who had reported irregular menstrual cycles for more than 30 days, menstrual cycles were considered to have 30 days). The assessed parameters include average flow rate, peak systolic velocity, resistance index, and thickest artery diameter. The three-dimension-

Table 1. Comparison of general data

Group	Control group (n = 45)	Observation group (n = 45)	t/χ^2	P
Age (year)	36.7 ± 7.3	35.8 ± 6.8	0.598	0.551
Course of disease (month)	22.87 ± 4.97	24.56 ± 6.37	1.406	0.163
Fibroid types			0.470	0.791
Subserous	16 (35.56)	17 (37.78)		
Submucous	11 (24.44)	13 (28.89)		
Intramural myoma	18 (40.00)	15 (33.33)		

Table 2. Comparison of changes in uterine volume ($\bar{x}$ ± sd)

Variate				
Uterine volume (cm^3)	Control group	Observation group	t	P
Before treatment	357.54 ± 83.42	351.71 ± 57.40	0.316	0.753
Three months after treatment	285.09 ± 37.37***	245.00 ± 40.91***	4.800	< 0.0001
Six months after treatment	255.20 ± 22.02###,&	191.62 ± 21.12###,&&&	13.82	< 0.0001
F	41.34	164.2		
P	< 0.0001	< 0.0001		

Note: Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, ###P < 0.0001; comparison of 3-month treatment and 6-month treatment, &P < 0.05, &&&P < 0.0001.

al longitudes of uterine and fibroid were measured, and the uterine and fibroid volumes were calculated according to the formula: 0.523abc (where a, b and c represent the length, width and thickness of fibroids, respectively; cm). Changes in the menstrual cycle, menstrual period and menstrual blood volume before and after treatment were statistically analyzed.

Secondary indicators: Venous blood was extracted at a fixed time on the same time points outlined above. A fully automatic chemiluminescence immunoassay analyzer (UniCelDxI 800, Shanghai Health Diagnostic Products Co., Ltd., China) was used to quantify levels of follicle stimulating hormone (FSH) (Shanghai Weiwei Biotechnology Co., Ltd., China), luteinizing hormone (LH) (Jei Daniel Biotech, China), estradiol (E_2) (RealAssay Technology (Shenzhen) Ltd., China), and progesterone (P) (Nanjing SenBeiJia Biotechnology Co., Ltd., China).

Statistical methods

SPSS 21.0 software was used for statistical processing. Continuous data were represented as mean al processideviation ($\bar{x}$ ± sd). One-way ANOVA test was used before and after treatment in the groups and pairwise comparison was used with SNK method subsequently. And t test was used for the comparison between the groups. Count data were represented as number of cases/percentages (n/%). The Chi-square test was used to compare count data between the two groups. Results with P < 0.05 were considered statistically significant.

Results

General data

There were no significant differences in age, course of disease, or number of patients with different fibroid types between the two groups (all P > 0.05; **Table 1**).

Changes in uterine volume and uterine fibroid volume

Before treatment, there were no differences in uterine volume and uterine fibroid volume between groups (both P > 0.05). At the 3-month follow-up after surgery, the uterine volume and uterine fibroid volume in the observation group were smaller than that before treatment (both P < 0.05). At the 6-month follow-up after surgery, the above indicators were significantly lower than that at the 3 month after surgery and before treatment (both P < 0.05). The observation group showed the significantly smaller uterine volume and uterine fibroid volume than the control group (P < 0.05; **Tables 2**, **3**).

Table 3. Comparison of changes in uterine fibroid volume ($\bar{x}$ ± sd)

Variate				
Uterine fibroid volume (cm^3)	Control group	Observation group	t	P
Before treatment	61.02 ± 8.83	59.78 ± 9.31	0.643	0.522
Three months after treatment	50.09 ± 6.29***	39.17 ± 4.41***	9.362	< 0.0001
Six months after treatment	44.73 ± 5.90###,&&&	31.78 ± 4.46###,&&&	11.63	< 0.0001
F	59.49	220.0		
P	< 0.0001	< 0.0001		

Note: Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, ###P < 0.0001; comparison of 3-month treatment and 6-month treatment, &&&P < 0.0001.

Table 4. Average blood flow rate in uterine fibroids ($\bar{x}$ ± sd)

Variate				
Average flow rate (cm/s)	Control group	Observation group	t	P
Before treatment	12.36 ± 1.73	12.22 ± 1.78	0.395	0.694
Three months after treatment	8.78 ± 1.34***	7.42 ± 1.25***	4.50	< 0.0001
Six months after treatment	1.69 ± 0.27###,&&&	1.05 ± 0.24###,&&&	13.97	< 0.0001
F	819.2	890.8		
P	< 0.0001	< 0.0001		

Note: Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, ###P < 0.0001; comparison of 3-month treatment and 6-month treatment, &&&P < 0.0001.

Table 5. Peak systolic velocity in uterine fibroids ($\bar{x}$ ± sd)

Variate				
Peak systolic velocity (cm/s)	Control group	Observation group	t	P
Before treatment	23.16 ± 3.16	22.31 ± 2.77	1.355	0.179
Three months after treatment	19.38 ± 2.90***	16.70 ± 2.54***	4.662	< 0.0001
Six months after treatment	13.33 ± 2.54###,&&&	10.79 ± 1.87###,&&&	5.391	< 0.0001
F	254.0	134.0		
P	< 0.0001	< 0.0001		

Note: Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, ###P < 0.0001; comparison of 3-month treatment and 6-month treatment, &&&P < 0.0001.

Table 6. Internal resistance index of uterine fibroids ($\bar{x}$ ± sd)

Variate				
Resistance index	Control group	Observation group	t	P
Before treatment	0.57 ± 0.07	0.56 ± 0.07	0.757	0.451
Three months after treatment	0.61 ± 0.10***	0.70 ± 0.08***	4.739	< 0.0001
Six months after treatment	0.67 ± 0.09###,&&&	0.80 ± 0.10###,&&&	6.976	< 0.0001
F	96.66	15.05		
P	< 0.0001	< 0.0001		

Note: Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, ###P < 0.0001; comparison of 3-month treatment and 6-month treatment, &&&P < 0.0001.

Changes in the blood supply to uterine fibroids

Before treatment, there were no differences between the groups in average flow rate, peak systolic velocity, resistance index and thickest artery diameter (all P > 0.05). At 6 months after surgery, the average flow rate, peak systolic velocity and thickest artery diameter of the obser-

Table 7. The thickest artery diameter inside uterine fibroids ($\bar{x}$ ± sd)

Variate				
The thickest artery diameter (mm)	Control group	Observation group	t	P
Before treatment	30.56 ± 4.52	32.38 ± 5.64	1.078	0.284
Three months after treatment	12.16 ± 2.52***	10.71 ± 1.80***	3.098	0.003
Six months after treatment	6.91 ± 1.54###,&&&	5.94 ± 1.16###,&	5.375	< 0.0001
F	706.1	896.1		
P	< 0.0001	< 0.0001		

Note: Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, ###P < 0.0001; comparison of 3-month treatment and 6-month treatment, &P < 0.05, &&&P < 0.0001.

Table 8. Comparison of changes in progesterone levels ($\bar{x}$ ± sd)

Variate				
P (ng/mL)	Control group	Observation group	t	P
Before treatment	1.20 ± 0.21	1.15 ± 0.20	1.040	0.301
Three months after treatment	1.10 ± 0.20***	1.00 ± 0.16***	2.679	0.009
Six months after treatment	0.98 ± 0.12###,&&&	0.89 ± 0.17###,&&	2.935	0.004
F	16.97	25.58		
P	< 0.0001	< 0.0001		

Note: P, progesterone. Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, ###P < 0.0001; comparison of 3-month treatment and 6-month treatment, &&P < 0.01, &&&P < 0.0001.

vation group were lower than those before treatment and at 3 months after surgery (all P < 0.05). The resistance index in the observation group was higher than that before treatment and at 3 months after surgery (both P < 0.05). The average flow rate, peak systolic velocity and thickest artery diameter were significantly lower in the observation group than those in the control group, while the resistance index was significantly higher in the observation group (all P < 0.05; **Tables 4**-**7**).

Changes in serum sex hormone levels

Before treatment, there were no differences in the serum levels of P and E_2 between groups (both P > 0.05). At 3 months after treatment, the levels of P and E_2 in the observation group were significantly lower than those before treatment (both P < 0.05). At 6 months after treatment, the levels of P and E_2 in the observation group were significantly lower than those before treatment and at 3 months after surgery (all P < 0.05), and the level of both hormones were significantly lower in the observation group than those in the control group (both P < 0.05; **Tables 8**, **9**).

Changes in serum gonadotropin levels

Before treatment, there were no differences in the serum levels of FSH and LH between the groups (both P > 0.05). At 3 months after treatment, the serum levels of FSH and LH in both groups were significantly lower than those before treatment (both P < 0.05). At 6 months after treatment, the serum levels of FSH and LH in the observation group were significantly lower than those before treatment and at 3 months after surgery (all P < 0.05). The serum levels of both gonadotropins were significantly lower in the observation group than those in the control group (both P < 0.05; **Tables 10**, **11**).

Changes in menstrual conditions

Before treatment, there were no differences in menstrual days and menstrual blood volume between groups (both P > 0.05). After 6 months, menstrual days and menstrual blood volume were significantly reduced in both groups (all P < 0.05). Menstrual days and menstrual blood volume were significantly less in the observation group than those in the control group (both P < 0.05). The required time for postoperative

Table 9. Comparison of changes in estradiol levels ($\bar{x}$ ± sd)

Variate				
E_2 (pmol/L)	Control group	Observation group	t	P
Before treatment	178.52 ± 22.14	179.22 ± 25.19	0.140	0.889
Three months after treatment	169.21 ± 15.13*	147.03 ± 23.17***	5.376	< 0.0001
Six months after treatment	155.96 ± 18.82$^{\#\#\#,\&\&}$	131.14 ± 21.90$^{\#\#\#,\&\&}$	5.767	< 0.0001
F	16.16	49.07		
P	< 0.0001	< 0.0001		

Note: E_2, estradiol. Comparison of pre-treatment and 3-month treatment, *P < 0.05, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, $^{\#\#\#}$P < 0.0001; comparison of 3-month treatment and 6-month treatment, $^{\&\&}$P < 0.01.

Table 10. Comparison of changes in follicle stimulating hormone levels ($\bar{x}$ ± sd)

Variate				
FSH (mIU/mL)	Control group	Observation group	t	P
Before treatment	8.52 ± 1.17	8.46 ± 1.22	0.227	0.821
Three months after treatment	7.82 ± 1.11**	6.50 ± 0.93***	6.103	< 0.0001
Six months after treatment	6.96 ± 0.71$^{\#\#\#,\&\&\&}$	5.57 ± 0.96$^{\#\#\#,\&}$	7.835	< 0.0001
F	26.29	89.85		
P	< 0.0001	< 0.0001		

Note: FSH, follicle stimulating hormone. Comparison of pre-treatment and 3-month treatment, **P < 0.01, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, $^{\#\#\#}$P < 0.0001; comparison of 3-month treatment and 6-month treatment, $^{\&}$P < 0.05, $^{\&\&\&}$P < 0.0001.

Table 11. Comparison of changes in luteinizing hormone levels ($\bar{x}$ ± sd)

Variate				
LH (mIU/mL)	Control group	Observation group	t	P
Before treatment	7.02 ± 0.68	7.23 ± 1.04	1.157	0.251
Three months after treatment	6.80 ± 1.14***	6.19 ± 0.85***	3.270	0.015
Six months after treatment	6.36 ± 0.85$^{\#\#\#}$	5.46 ± 0.82$^{\#\#\#,\&\&\&}$	5.146	< 0.0001
F	6.519	43.11		
P	0.002	< 0.0001		

Note: LH, luteinizing hormone. Comparison of pre-treatment and 3-month treatment, ***P < 0.0001; comparison of pre-treatment and 6-month treatment, $^{\#\#\#}$P < 0.0001; comparison of 3-month treatment and 6-month treatment, $^{\&\&\&}$P < 0.0001.

Table 12. Comparison of menstrual period ($\bar{x}$ ± sd)

Variate				
Menstrual period (day)	Control group	Observation group	t	P
Before treatment	29.64 ± 3.47	29.25 ± 3.72	0.518	0.606
After treatmet	28.55 ± 2.74	28.98 ± 1.53	0.915	0.363
t	1.647	0.441		
P	0.103	0.661		

menstrual recovery to normal level of the observation group was significantly longer than that of the control group (87.93 ± 10.99 vs. 37.01 ± 5.77, t = 27.72, P < 0.0001; **Tables 12**, **13**).

Comparison of adverse reactions between groups

The number of patients with adverse reactions of lower abdominal pain, nausea and vomiting, limb weakness and irregular bleeding was significantly lower in the observation group than those in the control group (all P < 0.05). See **Table 14**.

Table 13. Comparison of menstrual blood volume ($\bar{x}$ ± sd)

Variate				
Menstrual blood volume (mL)	Control group	Observation group	t	P
Before treatment	10.56 ± 2.47	10.51 ± 1.86	0.105	0.917
After treatmet	7.26 ± 1.20	6.32 ± 1.05	3.971	< 0.0001
t	8.044	13.17		
P	< 0.0001	< 0.0001		

Table 14. Comparison of adverse reaction (n, %)

Group	Control group (n = 45)	Observation group (n = 45)	t/χ^2	P
Adverse reaction			4.381	0.036
Lower abdominal pain	6 (13.33)	3 (6.67)		
Nausea and vomiting	6 (13.33)	2 (4.44)		
Limb weakness	7 (15.56)	2 (4.44)		
Irregular bleeding	5 (11.11)	1 (2.22)		

Discussion

Most uterine fibroids appear during the reproductive stage and gradually atrophy after menopause, representing one of the main causes of hysterectomy in women of childbearing age [13-15]. The therapeutic approach to uterine fibroids varies, and the final treatment plan is usually designed according to the patient's age, fertility demands, symptoms, fibroid characteristics, and other factors [16, 17]. With the continuous development and progress of medical technology, arterial embolization has emerged, representing an alternative for the reduction of tumor volume, mainly by blocking normal blood supply to the fibroids [18-20]. However, UAE does not appear to change endocrine status fundamentally. Moreover, the secretion of vascular endothelial factors increases in the embolic fibroid tissue due to ischemia, leading to angiogenesis in the fibroids. As many studies have confirmed, the growth of uterine fibroids requires the combined effect of E_2 and P, as these tumors express high levels of receptors for these hormones [21]. Gonadotropin-releasing hormone is currently used in clinical practice, as it can effectively inhibit FSH and LH secretion, inhibit the normal physiological activity of the ovaries, and achieve an effect similar to ovarian removal, thus reducing uterine blood supply and metabolism, and promoting a reduction in tumor size [22, 23].

Angiography in UAE clearly assesses the blood supply of uterine fibroids. The embolization agent travels in the blood stream to the uterine fibroids and reduces blood supply by closing the target vessels and inducing ischemia. This promotes constant shrinking of the fibroids, in order to achieve the purpose of the treatment. Mifepristone can inhibit the continuous division of fibroid cells, reduce blood perfusion of the local residual tumor tissue, and increase the apoptosis rate of the residual tumor cells. The present study found that uterine volume and uterine fibroid volume were significantly smaller in the observation group than those in the control group during the same time period. The mean flow velocity, peak systolic velocity and thickest artery diameter of the observation group were also significantly lower in the observation group, while the resistance index was significantly higher. These results proved that the use of UAE interventional treatment reduced the blood supply to uterine fibroids, and that mifepristone can block uterine arterial blood flow to reduce the blood supply of uterine fibroids. This is consistent with the results of Yi et al. [24].

After treatment, the serum levels of P, E_2, FSH and LH were significantly lower in the observation group than in the control group during the same time period. After 6 months of treatment, the menstrual days and the menstrual blood volume were significantly less in the observation group than in the control group, but the postoperative menstrual recovery time of the observation group was significantly longer in the control group. After embolization, the endometrium is in a post-traumatic repair state, which requires a relatively stable local microenvironment. Premature recovery of the physiological period can lead to periodic endometrium stripping repair, which hinders the recovery of the body. Delaying the menstrual cycle facilitates injury repair, inhibits the effects of E_2 and P, and reduce the recurrence of uterine fibroids

[25]. The number of patients in the observation group with adverse reactions was significantly lower than in the control group. These symptoms have been attributed to the ischemia of normal tissue after UAE. Postoperative ischemia and the presence of necrotic tissue may lead to the development of fever during its absorption, and postoperative nausea and vomiting may be related to the vagal reflex [9]. The administration of small doses of mifepristone after embolization does not appear to increase postoperative adverse reactions, but can reduce blood supply to the uterine body, regulate E_2 and P levels, and promote fibroid atrophy. It can also prevent the growth of residual microscopic uterine fibroids during the healing period, reducing the risk of recurrence.

However, this study has some shortcomings, such as the small sample size, the short postoperative follow-up time, and the non-evaluation of long-term clinical effects and quality of life. In the future, we will investigate whether UAE affects the formation and development of the placenta due to its impact on uterine blood supply. We will also assess whether the application of ionizing radiation and embolization agents during surgery can affect pregnancy, fetal development, and delivery outcomes. In addition, interventional embolization will be further optimized, with attention to the development of new embolization agents in order to lay a foundation for the large-scale clinical application of UEA. Although low-dose mifepristone is safe and effective for the treatment of uterine fibroids in a short period of time, no consensus is available regarding optimal dose, duration of use, risk of fibroid recurrence after drug discontinuation, and its impact on ovarian function. Therefore, in patients with uterine fibroids, especially women with fertility demands, changes in ovarian function should still be closely monitored when receiving mifepristone.

In conclusion, mifepristone combined with interventional UAE can effectively reduce the volume of uterine and uterine fibroids, decrease the blood supply of fibroids, improve ovarian function, and reduce postoperative complications, which is worthy of clinical application and promotion.

Disclosure of conflict of interest

None.

Address correspondence to: Tianjin Li, Department of Imaging, The Second People's Hospital of Dongying, No. 28 Changchun Road, Dawang Town, Guangrao County, Dongying 257335, Shandong Province, China. Tel: +86-18829284355; E-mail: litianjin98u@163.com

References

[1] Zepiridis LI, Grimbizis GF and Tarlatzis BC. Infertility and uterine fibroids. Best Pract Res Clin Obstet Gynaecol 2016; 34: 66-73.

[2] Parazzini F, Tozzi L and Bianchi S. Pregnancy outcome and uterine fibroids. Best Pract Res Clin Obstet Gynaecol 2016; 34: 74-84.

[3] Donnez J, Donnez O, Matule D, Ahrendt HJ, Hudecek R, Zatik J, Kasilovskiene Z, Dumitrascu MC, Fernandez H, Barlow DH, Bouchard P, Fauser BC, Bestel E and Loumaye E. Long-term medical management of uterine fibroids with ulipristal acetate. Fertil Steril 2016; 105: 165-173.

[4] Donnez J, Donnez O and Dolmans MM. Safety of treatment of uterine fibroids with the selective progesterone receptor modulator, ulipristal acetate. Expert Opin Drug Saf 2016; 15: 1679-1686.

[5] De La Cruz MS and Buchanan EM. Uterine fibroids: diagnosis and treatment. Am Fam Physician 2017; 95: 100-107.

[6] Faustino F, Martinho M, Reis J and Águas F. Update on medical treatment of uterine fibroids. Eur J Obstet Gynecol Reprod Biol 2017; 216: 61-68.

[7] Spies JB. Current role of uterine artery embolization in the management of uterine fibroids. Clin Obstet Gynecol 2016; 59: 93-102.

[8] Schnapauff D, Russ M, Kröncke T and David M. Analysis of presurgical uterine artery embolization (PUAE) for very large uterus myomatosus; patient's desire to preserve the uterus; case series and literature review. Rofo 2018; 190: 616-622.

[9] Salehi M, Jalilian N, Salehi A and Ayazi M. Clinical efficacy and complications of uterine artery embolization in symptomatic uterine fibroids. Glob J Health Sci 2015; 8: 245-50.

[10] Liu C, Lu Q, Qu H, Geng L, Bian M, Huang M, Wang H, Zhang Y, Wen Z, Zheng S and Zhang Z. Different dosages of mifepristone versus enantone to treat uterine fibroids: a multicenter randomized controlled trial. Medicine (Baltimore) 2017; 96: e6124.

[11] Wen YL. Research of therapeutic effects of uterine artery embolization combined with drug therapy in treatment of uterus myoma. Morden Diagnosis And Treatment 2017; 28: 178-179.

[12] He Y, Lv LJ and Long J. Clinical analysis of 48 cases of uterine myoma diagnosed by color doppler ultrasound. Guizhou Medical Journal 2016; 40: 855-856.
[13] Wise LA and Laughlin-Tommaso SK. Epidemiology of uterine fibroids: from menarche to menopause. Clin Obstet Gynecol 2016; 59: 2-24.
[14] Stewart EA, Cookson CL, Gandolfo RA and Schulze-Rath R. Epidemiology of uterine fibroids: a systematic review. BJOG 2017; 124: 1501-1512.
[15] Olejek A, Olszak-Wąsik K and Czerwinska-Bednarska A. Long-term intermittent pharmacological therapy of uterine fibroids - a possibility to avoid hysterectomy and its negative consequences. Prz Menopauzalny 2016; 15: 48-51.
[16] Toub DB. A new paradigm for uterine fibroid treatment: transcervical, intrauterine sonography-guided radiofrequency ablation of uterine fibroids with the sonata system. Curr Obstet Gynecol Rep 2017; 6: 67-73.
[17] Taylor DK and Leppert PC. Treatment for uterine fibroids: searching for effective drug therapies. Drug Discov Today Ther Strateg 2012; 9: e41-e49.
[18] Morita Y, Ito N and Ohashi H. Pregnancy following MR-guided focused ultrasound surgery for a uterine fibroid. Int J Gynaecol Obstet 2007; 99: 56-7.
[19] Ma C. Clinical effect of laparoscopic uterine artery occlusion and adenomyoma exfoliation in the treatment of uterine fibroids. Journal of Baotou Medical College 2018; 34: 86-871.
[20] de Bruijn AM, Lohle PN, Huirne JA, de Vries J, Twisk M; QUESTA-Trial Group, Hehenkamp WJ. Uterine artery embolization versus hysterectomy in the treatment of symptomatic adenomyosis: protocol for the randomized QUESTA trial. JMIR Res Protoc 2018; 7: e47.
[21] Lang JH, Leng JH and Wang ZH. Consensus on the complementary application of gonadotropin-releasing hormone agonist in endometriosis and uterine fibroids. Zhonghua Fu Chan Ke Za Zhi 2017; 52: 77-81.
[22] Lee MJ, Yun BS, Seong SJ, Kim ML, Jung YW, Kim MK, Bae HS, Kim DH and Hwang JY. Uterine fibroid shrinkage after short-term use of selective progesterone receptor modulator or gonadotropin-releasing hormone agonist. Obstet Gynecol Sci 2017; 60: 69-73.
[23] Kapur A, Angomchanu R and Dey M. Efficacy of use of long-term, low-dose mifepristone for the treatment of fibroids. J Obstet Gynaecol India 2016; 66 Suppl 1: 494-8.
[24] Yi LN, Zhang LN and Liu JO. Research of therapeutic effects of uterine artery embolization combined with drug therapy in treatment of uterus myoma. Chinese Journal of Clinical Maternal and Child Medicine (Electronic Edition) 2016; 12: 547-552.
[25] Boggavarapu NR, Berger C, von Grothusen C, Menezes J, Gemzell-Danielsson K and Lalitkumar PG. Effects of low doses of mifepristone on human embryo implantation process in a three-dimensional human endometrial in vitro co-culture system. Contraception 2016; 94: 143-151.