

Vaginal myomectomy is superior to abdominal myomectomy in treatment effect and postoperative recovery

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Summary

Purpose: This study aimed to investigate the efficacy of vaginal myomectomy and abdominal myomectomy on cervical local microcirculation and ovarian function in patients harboring uterine fibroids during the perioperative period. **Methods:** From September 2017 to September 2019, 94 patients with uterine fibroids admitted in our hospital were randomly divided into the experimental group (vaginal myomectomy, N = 47) and the control group (abdominal myomectomy, N = 47). We compared vascular clarity, erythrocyte aggregation rate, microvascular diameter, blood perfusion, capillary diameter, E2, FSH, LH index and postoperative complications between the two groups. **Results:** On the 1st and 3rd day after operation, the vascular clarity, erythrocyte aggregation rate, microvascular diameter, blood perfusion and capillary diameter in the experimental group had superior beneficial effects compared with the control group, with significant difference ($p < 0.05$). One month and three months after operation, the E2 index of ovarian function in the experimental group was significantly higher than that in the control group ($p < 0.05$). However, the FSH and LH indexes in the experimental group were significantly lower than those in the control group ($p < 0.05$). The incidence of postoperative complications was significantly lower in the experimental group than that in the control group ($p < 0.05$). **Conclusion:** Vaginal myomectomy was the better surgical method for patients harboring uterine fibroids.

Key words: Vaginal myomectomy; Abdominal myomectomy; Clinical effect.

Introduction

Uterine fibroid is one of the most common diseases in clinical gynecology worldwide. According to the World Health Organization, about 800,000 women undergo hysteromyomectomy every year. Approximately 170,000 women in China undergo hysterectomy for uterine fibroids every year, with an average of one patient undergoing surgery every 3 minutes. The main clinical symptoms of the disease are abdominal pressure, menstrual cycle changes and irregular vaginal bleeding. The disease needs to be cured in time. If not treated promptly and effectively, it can lead to increased menstruation, secondary abortion and infertility. Serious cases can be transformed into malignant tumors, which pose a serious threat to the life and health of patients.

As a benign tumor, its main clinical symptoms include abdominal pressure, menstrual cycle changes and irregular vaginal bleeding. Patients harboring uterine fibroid should seek early intervention due to the incidence of increased menstruation, secondary abortion and infertility, with a possibility of malignant transformation [1]. In China, the incidence of uterine fibroids has experienced an increasing trend year by year, especially for women of childbearing age. Surgical treatment is usually recommended for patients with uterine fibroids who meet the surgical indications. Myomectomy is a common surgical method in the clinical treatment for uterine fibroids. Clinical studies have been performed based on myomectomy [2, 3]. In re-

cent years, with the wide application of minimally invasive surgery in clinical surgery, vaginal myomectomy is often applied in the treatment for uterine fibroids. However, there was limited publication on the efficacy profile of vaginal myomectomy and abdominal myomectomy in terms of the status of cervical microcirculation and ovarian function in patients harboring uterine fibroids during the perioperative period. Hence, this study aimed to investigate the efficacy of vaginal myomectomy and abdominal myomectomy on cervical microcirculation and ovarian function in patients with uterine fibroids during the perioperative period, further to provide theoretical basis and insight for the treatment of patients with uterine fibroids.

Patients and Methods

Patients

From September 2017 to September 2019, a total of 94 patients with uterine fibroids admitted in the Second Affiliated Hospital of Anhui Medical University were included in this study. The sample size of this study was calculated according to the following formula: N (sample size) = Z^2 (statistic) $\times p$ (probability value) $\times [1 - p] / E^2$ (error value). According to the random number table method, the above-mentioned 94 patients were randomly divided into the experimental group (N = 47) and the control group (N = 47). There was no significant difference in general information between the two groups ($p > 0.05$) (Table 1).

Table 1. — General information.

	Experimental group (N = 47)	Control group (N = 47)	<i>t</i> / χ^2	<i>p</i>
Mean age (years)	36.19 ± 3.42	35.81 ± 4.02	0.468	0.641
Mean weight (kg)	57.32 ± 7.61	57.08 ± 7.28	0.156	0.876
History of previous pelvic surgery (%)	4.26 (2)	2.13 (1)	0.344	0.577
History of previous cesarean section (%)	6.38 (3)	2.13 (1)	0.211	0.646
Mean lesion diameter (cm)	6.08 ± 0.72	6.01 ± 0.64	0.498	0.62
Mean number of uterine fibroids	4.3 ± 0.3	4.1 ± 0.4	1.901	0.061
Incidence				
Single disease	18	17	0.046	0.831
Multiple disease	29	30	0.045	0.83
Location				
Intramural myoma	18	19	0.045	0.833
Subserous myoma	16	17	0.047	0.829
Mixed	13	11	0.224	0.639

The inclusion criteria were: 1) all patients were diagnosed as uterine fibroids by gynecological examination and B-ultrasound examination, and the size of uterine fibroids was more than 5 cm and less than 9 cm; 2) uterine fibroids caused menorrhagia and secondary anemia and drug treatment was ineffective; 3) uterine fibroids could be determined to be the sole cause of infertility or recurrent abortions; no surgical contraindications; 4) suspected sarcomatosis; postoperative pathology was uterine fibroids; 5) severe abdominal pain, coital pain or chronic abdominal pain, acute abdominal pain caused by torsion of myoma.

Exclusion criteria: 1) patients with operation-related contraindications; 2) patients with diabetes, hyperthyroidism and cardiovascular and cerebrovascular diseases; 3) patients with severe medical complications; 4) patients with uterine prolapse, intraoperative adnexal resection or intraoperative expansion of the scope of operation; 5) incomplete important data; 6) patients with poor compliance.

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Anqing Municipal Hospital (approval number: AS-2017-038-K). All subjects gave their informed consent for inclusion before they participated in the study. The patient enrollment and management process is shown in Figure 1.

Methods

All patients underwent operation 7 days after menstruation, who were given routine preoperative preparation before operation. All patients received tracheal general anesthesia.

In the experimental group, the bladder lithotomy position was taken. The vulva, vagina, the upper 1/3 of the thigh and the lower abdomen were routinely disinfected, and then the women were draped with towel along with urinary catheterization. According to the specific loca-

tion of the uterine fibroids, the anterior fornix or posterior fornix was cut to reach the abdominal cavity, the uterus was observed to determine the location, number and size of leiomyoma, and vasopressin was injected into the myoma capsule until the periphery of the myoma tissue turned white with reduced bleeding. Subserous myoma was removed by electric knife. The removed uterine fibroids were crushed by uterine rotary cutter and put into the medical record bag for pathological examination. The fibrin glue was applied to the uterine wound to prevent adhesion, and the negative pressure drainage tube was placed in the abdominal cavity. At the end of the operation, the peritoneum and vaginal wall were sutured continuously with absorption line (2-0). The intraoperative pictures of the vaginal technique can be found in "Pictures".

In the control group, patients were placed in the supine position. The vulva, vagina, the upper 1/3 of the thigh and the lower abdomen were routinely disinfected, and then the women were draped with towel along with urinary catheterization. A 6-8 cm transverse incision was made in the lower abdomen, and the tissue was separated layer by layer to reach the abdominal cavity. The position of the uterus was observed to determine location and size of uterine fibroids, the myometrium was cut, the myoma was removed, and the wound was sutured layer by layer at the end of the operation.

All patients were treated with indwelling catheter and intravenous injection of broad-spectrum antibiotics. In addition, the patients were encouraged to get out of bed early and exercise, while patients in the control group were required to exhaust before eating. The above operations were performed by an excellent surgeon with working experience of more than 10 years in the same hospital.

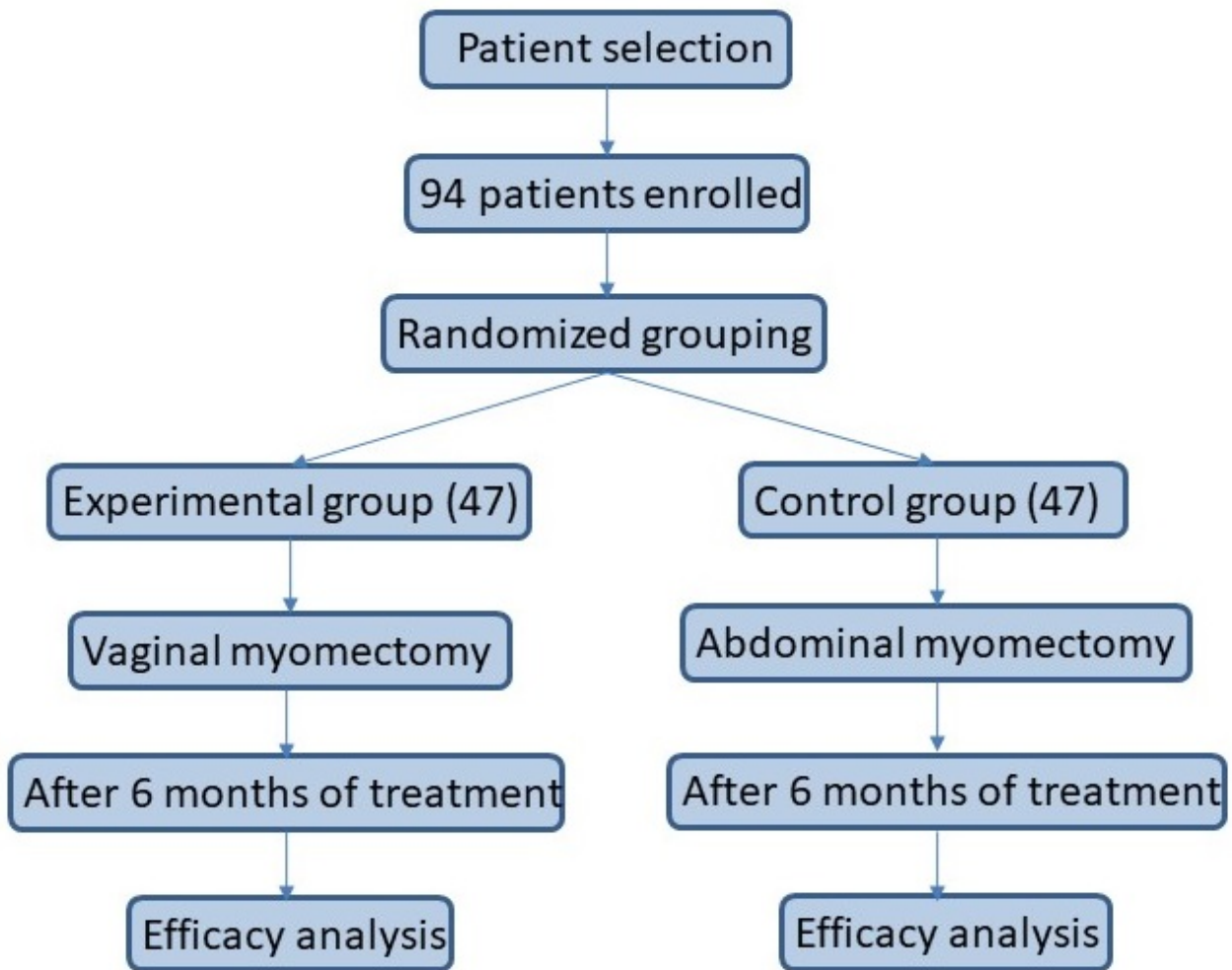


Figure 1. — The flowchart of patient enrollment and clinical management.

Observation indicators

The clinical efficacy, perioperative cervical microcirculation, ovarian function and postoperative complications were recorded and compared between the two groups.

Clinical effect

The intraoperative blood loss, operative time, exhaust time, maximum body temperature and hospitalization time were compared between the two groups.

Cervical local microcirculation during perioperative period

The status of cervical local microcirculation was observed and compared between the two groups before operation, 12, 24, and 72 h after operation, which mainly included vascular clarity, erythrocyte aggregation rate, microvascular diameter, blood perfusion and capillary diameter. The vessel clarity was observed under a microscope. Vessel clarity can be divided into clear and unclear status. Clear status means that the edges of the blood vessels are clear, and sharp and the density (signal) is homogeneous;

unclear status means that the edges of the blood vessels are not clear and sharp, and density (signal) is heterogeneous. TV microscopic dual-slit photometry was used to measure the diameter of microvessels and capillaries. On the display screen, an image of microvessels or capillaries was displayed, a scanner capable of linear movement back and forth was placed in front of the vessel, and then a photosensitive element was provided on the moving rod of the scanner. When the photosensitive element was swept vertically the blood vessel image, it generated an electrical signal with change of light intensity. The length of the signal was proportional to the inner diameter of the blood vessel when the scanning speed was constant. After calibration with a standard width line, the microvascular diameter or capillary diameter can be determined from the width of the signal. The capillary images were shown on the display screen of TV microscopic, a straight blood vessel was selected, and two photosensitive elements were respectively placed at both ends of the straight blood vessel to measure blood perfusion.

Table 2. — Comparison of clinical effects between the two groups ($\bar{x} \pm s$).

Group	Intraoperative blood loss (mL)	Operation time (min)	Exhaust time (h)	Maximum body temperature (°C)	Hospitalization time (d)
Experimental group (N = 47)	95.93 ± 12.83b	97.08 ± 13.08b	25.43 ± 9.08b	37.84 ± 0.39b	10.73 ± 2.84b
Control group (N = 47)	104.83 ± 11.49	104.49 ± 11.28	28.74 ± 13.42	38.76 ± 1.28	11.92 ± 3.83

Note: Compared with the control group after operation ($^b p < 0.05$).

Ovarian function

Fasting venous blood was collected before operation and 6 months after operation in the two groups. The levels of serum follicle stimulating hormone (FSH), estradiol (E2) and luteinizing hormone (LH) were detected by chemical immunofluorescence.

Postoperative complications

Postoperative vaginal stump bleeding, incision infection, pelvic adhesion and sexual dysfunction were compared between the two groups.

Evaluation of cervical local microcirculation status during the perioperative period

XW880 microcirculation micro-observer by Guangzhou Likang Biotechnology Co., Ltd. was used to compare the cervical local microcirculation status of the two groups of patients before operation, 12, 24, and 72 h after operation, mainly including vessel clarity, erythrocyte aggregation rate, microvessel diameter, blood perfusion and capillary diameter.

Statistical analysis

Statistical analysis was performed with SPSS 18.0 software. The measurement data of microvascular diameter, blood perfusion and capillary diameter were expressed by ($\bar{x} \pm s$), and the difference between two groups was examined by *t*-test. Vascular clarity and erythrocyte aggregation rate and other counting data were expressed by n (%), and the data were tested by χ^2 test or Fisher's exact test. $p < 0.05$ was considered as statistically significant difference.

Results

Comparison of clinical efficacy between the two groups

The intraoperative blood loss, operative time, exhaust time, maximum body temperature and hospitalization time in the experimental group were significantly better than those in the control group ($p < 0.05$) (Table 2).

Comparison of vascular clarity and erythrocyte aggregation rate between the two groups

Before treatment, there was no significant difference in vascular clarity and erythrocyte aggregation rate between the two groups ($p > 0.05$). On postoperative day (POD) 1 and 3, the vascular clarity and erythrocyte aggregation rate in the experimental group were significantly higher than

those in the control group ($p < 0.05$) (Table 3).

Comparison of microvascular diameter, blood perfusion and capillary diameter between the two groups

Before operation, there was no significant difference in microvascular diameter, blood perfusion and capillary diameter between the two groups ($p > 0.05$). On POD 1 and 3, the microvascular diameter, blood perfusion and capillary diameter index in the experimental group were significantly higher than those in the control group ($p < 0.05$) (Table 4).

Comparison of ovarian function between the two groups

Before operation, there was no significant difference in FSH, E2 and LH index between the two groups. One month and three months after operation, the E2 index of ovarian function in the experimental group was significantly higher than that in the control group, while the FSH and LH index in the experimental group were significantly lower than those in the control group ($p < 0.05$) (Table 5).

Comparison of postoperative complications between the two groups

The incidence of postoperative complications in the experimental group was significantly lower than that in the control group ($p < 0.05$) (Table 6).

Discussion

Uterine fibroid is one of the most common and life-threatening diseases in clinical gynecology, with as high as 50% in women of childbearing age and more than 70% in infertile women [4]. Accumulating evidence suggests that some intrinsic abnormalities of the myometrium, abnormal myometrial receptors for estrogen, and hormonal changes or altered responses to ischemic damage during the menstrual period may be responsible for the initiation of (epi) genetic changes in uterine myomas [5, 6]. At present, myomectomy is often used to treat uterine fibroids that are large in size and high in number. Abdominal myomectomy is considered as a traditional operation. Because of its good intraoperative visual field, it is often used in patients with a large number of tumors or a large diameter of leiomyoma. However, considering the disadvantages of abdominal myomectomy, such as a large incision, the tendency of intraoperative bleeding, postoperative infection, the requirement for long recovery time and complications,

Table 3. — Comparison of vascular clarity and erythrocyte aggregation rate between the two groups (%).

Group	Vascular clarity		Erythrocyte aggregation rate		
	Clear	Unclear	No or mild aggregation	Mild aggregation	Severe aggregation
Experimental group (N = 47)					
Before operation	16 (34.04)	31 (65.96)	22 (46.81)	16 (34.04)	9 (19.15)
1d after operation	10 (21.28)# *	37 (78.72)# *	11 (23.40) # *	23 (48.94) # *	13 (27.66) # *
3d after operation	17 (36.17)## *	30 (63.83)## *	15 (31.91)## *	24 (51.06)## *	8 (17.02)## *
Control group (N = 47)					
Before operation	17 (36.17)	30 (63.83)	21 (44.68)	16 (34.04)	10 (21.28)
1d after operation	1 (2.13)#	46 (97.87)#	8 (17.02) #	23 (48.94)#	16 (34.04) #
3d after operation	3 (6.38)#	17 (93.62)#	9 (19.15) #	25 (53.19) #	13 (27.66)#

Note: the results were compared with those before operation ([#] $p < 0.05$), 1 day after operation in the control group (^{*} $p < 0.05$), and 3 days after operation in the control group (^{##} $p < 0.05$).

Table 4. — Comparison of microvascular diameter, blood perfusion and capillary diameter between the two groups ($\bar{x} \pm s$).

Group	Microvascular diameter	Blood perfusion	Capillary diameter
Experimental group (N = 47)			
Before operation	67.15 ± 8.92	1.31 ± 0.09	7.06 ± 0.71
1d after operation	49.09 ± 8.93	0.63 ± 0.09	4.61 ± 0.21
3d after operation	55.89 ± 6.52	0.74 ± 0.05	5.19 ± 0.52
Control group (N = 47)			
Before operation	67.39 ± 9.04	1.32 ± 0.08	7.18 ± 0.69
1d after operation	41.21 ± 9.01	0.32 ± 0.07	3.57 ± 0.09
3d after operation	48.07 ± 8.71	0.48 ± 0.08	4.19 ± 0.48

Note: the results were compared with those before operation (^c $p < 0.05$), 1 day after operation in the control group (^a $p < 0.05$), and 3 days after operation in the control group (^b $p < 0.05$).

Table 5. — Comparison of ovarian function between the two groups ($\bar{x} \pm s$).

Group	FSH (U/L)	E2 (ng/L)	LH (U/L)
Experimental group (N = 47)			
Before operation	18.84 ± 1.76	286.83 ± 16.09	17.09 ± 2.83
1month after operation	20.32 ± 2.83	243.83 ± 16.09	18.83 ± 3.09
3 months after operation	21.95 ± 2.01	271.82 ± 14.89	19.01 ± 3.97
Control group (N = 47)			
Before operation	18.39 ± 2.04	287.12 ± 15.61	17.18 ± 2.69
1month after operation	23.83 ± 2.72	226.83 ± 15.09	22.98 ± 2.87
3 months after operation	24.99 ± 3.01	235.63 ± 9.87	24.21 ± 4.09

Note: the results were compared with those before operation (^c $p < 0.05$), 1 month after operation in the control group (^a $p < 0.05$), and 3 months after operation in the control group (^b $p < 0.05$).

Table 6. — Comparison of postoperative complications between the two groups (%).

Group	Vaginal bleeding	Incision infection	Pelvic adhesion	Sexual dysfunction	Total complication rate
Experimental group (N = 47)	1	1	1	1	4 (8.51) ^b
Control group (N = 47)	3	2	2	1	8 (17.02)

Note: compared with the control group after operation (^b $p < 0.05$).

abdominal myomectomy is not conducive to patient rehabilitation [7]. With advances in modern science and technology and medical technology, vaginal myomectomy has become a common clinical procedure in order to meet the needs of physiological function and reproductive function of patients with uterine fibroids and is gradually used as an alternative approach instead of abdominal myomectomy [8].

Vaginal myomectomy makes perfect use of the anatomical structure and position of the vagina and uterus [9, 10], which separates and removes uterine fibroids through vaginal incision. Nevertheless, this operation cannot be seen directly in the course of operation; thus, the surgical field of vision has certain limitations, and it requires experienced surgeons to operate and several surgical indications of patients. In addition, because the incision is in a special site, and the incision is not aseptic, it is easy to lead to postoperative infection. The results of our study demonstrated that compared with the abdominal myomectomy group, the vaginal myomectomy group provided greater beneficial impact on clinical efficacy, including reduced operative time, intraoperative blood loss, exhaust time and hospitalization time, and less change of body temperature, suggesting that vaginal myomectomy is a valid approach for patients with uterine fibroids. Zhou *et al.* have reported [11] the operative time, bleeding volume, anal exhaust time and hospital stay in abdominal myomectomy were significantly higher than those in vaginal myomectomy. Wang H. [12] suggested that vaginal myomectomy had no influence on the body temperature of patients. Cervical local microcirculation can be considered as the effective index to reflect the local blood supply of the uterus, including vascular clarity, erythrocyte aggregation rate, microvascular diameter, blood perfusion and capillary diameter. All of them are important components to evaluate the therapeutic effect and postoperative recovery [13, 14]. The results showed that the vascular clarity, erythrocyte aggregation rate, microvascular diameter, blood perfusion and capillary diameter in the vaginal myomectomy group were superior to those in the abdominal myomectomy group ($p < 0.05$). The results showed that the vascular clarity, erythrocyte aggregation rate, microvascular diameter, blood perfusion and capillary diameter in the vaginal myomectomy group were better than those in the abdominal myomectomy group ($p < 0.05$). Similar to the report by Ye *et al.* [15], it has been suggested that vaginal myomectomy can effectively improve the local microcirculation of the cervix in patients with uterine fibroids. Based on our results, one month and three months after operation, the E2 index of ovarian function in the experimental group was significantly higher than that in the control group, while the FSH and LH indexes in the experimental group were significantly lower than those in the control group, indicating that the effect of vaginal myomectomy on ovarian function remains limited.

The management of uterine myomas strictly depends on several factors, including position, number and volume. In

case of submucous myoma, indeed, the possibility offered by hysteroscopy represents the actual gold standard for both diagnosis and treatment [16-19]. Our results showed that the incidence of postoperative complications in the vaginal myomectomy group was lower than that in the abdominal myomectomy group ($p < 0.05$), suggesting that the vaginal myomectomy group can effectively reduce the incidence of postoperative complications in patients with uterine fibroids, mainly because all the patients in this study were operated by the same surgeon in our hospital with more than ten years' experience. In fact, vaginal myomectomy has been carried out in our hospital for 6 years. During these 6 years, more than 2,000 cases have been operated clinically.

Through this study, it is found that vaginal hysterectomy is more compliant with the needs of the times, and has the following advantages: 1) the operation method is the same as conventional abdominal myomectomy, which can directly touch the uterine body with hands, find hidden small myomas, and avoid recurrence after surgery; 2) during the operation, laparoscopy can be used to observe whether there are pelvic adhesions or not, and the surgical incision need not be too large for removing myoma, which can reduce trauma and exposure time of the abdominal cavity and shorten the operative time; 3) the operation method has less interference to the abdominal cavity, no trauma to the abdominal wall, and less surgical trauma, and is quick and convenient to remove the tumor; 4) the operation method has shorter antibiotic use time, and fever degree and incidence rate after operation are low; 5) the operation method can shorten the hospital stay, reduce the economic burden of patients, and is more acceptable to patients. However, the limitation of vaginal myomectomy in this study is that it is not suitable for patients with vaginal stricture, uterine malignancy or severe complications.

Vaginal myomectomy can effectively maintain the physiological function of the uterus, preserve the fertility of patients, and fully ensure the integrity of pelvic floor anatomy, and the indications are significantly higher than open surgery. Its operation not only conforms to the trend of minimally invasive surgery, but also has better hemostatic effect by suture under laparoscopy, which is a supplement and innovation of modern surgical methods. It cannot only provide more precise and effective surgical treatment for patients, but also benefit the prognosis of patients. Therefore, this surgical method has important clinical value and significance for patients with uterine fibroids. With the continuous progress of surgical technology, vaginal myomectomy and abdominal myomectomy will play their respective strengths and better serve such patients.

In conclusion, vaginal myomectomy exerts great advantages of minimal invasiveness, excellent clinical effect, little effect on cervical microcirculation and ovarian function, and fewer complications. We believe that vaginal myomectomy can be used as a valid and preferred approach for patients with uterine fibroids who need hysterectomy.

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Conflict of Interest

The authors declare no conflict of interest.

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