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Analysis of the Feasibility of Different Surgical Methods for Treating Uterine Fibroids and Their Impact on the Ovarian Function

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Abstract: *Objective:* To analyze the feasibility of different surgical methods for treating uterine fibroids and their impact on ovarian function. *Methods:* 90 patients with uterine fibroids admitted to our hospital from December 2018 to April 2023 were divided into Group A and Group B, with 45 patients in each group. Group A underwent laparoscopic myomectomy (LM) and Group B underwent transcervical resection of myoma (TCRM). The patients were followed up 3 months after surgery and their clinical indexes were compared. *Results*: The duration of hospitalization, surgery, anal ventilation, and getting out of bed were shorter in Group B. Besides, Group B also experience less intraoperative bleeding ($P < 0.05$). There was no difference in the follicle-stimulating hormone (FSH), luteinizing hormone LH, estradiol (E2), and anta follicle count (AFC) levels between the two groups after surgery ($P > 0.05$). The Female Sexual Function Index scores of two groups increased significantly after surgery, with Group B showing a more drastic increase ($P < 0.05$); The VAS ratings of the two groups showed a decreasing trend 1–5 days after surgery, with Group B showing a larger decrease ($P < 0.05$). There was no difference in the incidence of complications between the two groups within 3 months after surgery ($P > 0.05$). *Conclusion:* Both LM and TCRM are effective in treating uterine fibroids with little impact on ovarian function and complications. However, TCRM is associated with reduced bleeding, quicker postoperative recovery, decreased pain, and an enhanced quality of sexual life. Therefore, this surgical approach appears more beneficial for improving prognosis.

Keywords: Uterine fibroids; Laparoscopic myomectomy; Hysteroscopic electrotomy

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1. Introduction

Uterine fibroids often have no obvious symptoms and are mainly diagnosed through physical examinations. However, some patients may also have menstrual abnormalities, lower abdominal distension, or other symptoms. As the condition progresses, it can cause various complications (abnormal uterine bleeding, infertility, etc.), which seriously damage the patient's physical and mental health [1,2]. At present, the clinical treatment of uterine fibroids mainly adopts surgical methods, including traditional laparotomy (open tumor resection), minimally invasive surgery, etc [3]. Although traditional laparotomy can effectively control the progression of the condition, it causes

significant trauma to the patient, resulting in slower postoperative recovery and unideal prognosis [4]. Laparoscopic myomectomy (LM) and transcervical resection of myoma (TCRM) are the most commonly used minimally invasive surgical methods in treating uterine fibroids, with less trauma and bleeding. However, the differences in the efficacy of these two treatments have not been compared. Therefore, this study aimed to explore the differences in the efficacy of TCRM and LM in treating patients with uterine fibroids.

2. Information and methods

2.1. General information

This study was approved by the Medical Ethics Committee of our hospital. 90 patients with uterine fibroids admitted to our hospital from December 2018 to April 2023 were divided into Group A and Group B, with 45 patients in each group. Group A underwent LM and Group B underwent TCRM. In Group A, the duration of the disease ranged from 0.5 to 2 years, with an average duration of 1.11 ± 0.28 years. There were 26 cases of single fibroids and 19 cases of multiple fibroids. The age of patients ranged from 26 to 45 years, with an average age of 37.78 ± 4.56 years, and the fibroid diameter ranged from 4 to 9 cm, with an average diameter of 5.61 ± 0.69 cm. In Group B, the duration of the disease ranged from 0.6 to 2 years, with an average duration of 1.15 ± 0.24 years. There were 25 cases of single fibroids and 20 cases of multiple fibroids. The age of patients ranged from 27 to 45 years, with an average age of 37.83 ± 4.64 years, and the fibroid diameter ranged from 4 to 8 cm, with an average diameter of 5.67 ± 0.74 cm. There were no significant differences in the general information of the patients.

Inclusion criteria: patients whose diagnosis aligned with the criteria outlined in the "Clinical Diagnosis and Treatment Guidelines Obstetrics and Gynecology Division" [5], confirmed by imaging examination, able to comply with relevant treatments and examinations, eligible for minimally invasive surgery, without abnormal amenorrhea pre-surgery, and who provided informed consent. Exclusion criteria: patients with concurrent reproductive system tumors, pregnant or lactating individuals, those with intrauterine adhesions or large uterine fibroids, coagulation dysfunction, prior uterine surgery, or previous relevant treatments.

3. Surgical methods

3.1. Group A (LM)

Surgery was performed 5–7 days after menstruation, and all vital signs should be checked before surgery to ensure the patient's safety. The patient was placed in a lithotomy position, and routine disinfection was performed. Then, the patient was draped and received general anesthesia or epidural anesthesia. After the anesthesia took effect, the surgery began. The uterine lift was inserted to fully expose the uterine fibroids. A transverse incision (about 1 cm in length, located at the upper edge of the patient's umbilical cord) was made to create a carbon dioxide pneumoperitoneum. Then, a laparoscope was inserted to carefully observe the condition of the lesion (size, position, shape, and surrounding anatomical structure). Next, trocar puncture holes (5 mm, 10 mm) were made, surgical instruments were placed, and the surgery was performed. If the subserosal uterus fibroid of the patient had a pedicle, then direct electrocoagulation was performed to cut and stop bleeding, and the fibroid was circumcised and removed with a rotary cutter. The residual fibroid was completely removed using large forceps. For patients with a thicker pedicle, the wound was sutured according to the actual situation to avoid postoperative bleeding. Before removal, posterior pituitary hormones were injected around the uterine fibroid between the muscle walls, the uterine fibroid capsule was cut open, and blunt separation was performed. Then, the tumor body should be removed, and electrocoagulation should be performed to stop bleeding, suture, and flush the pelvic cavity (with physiological saline). When the bleeding stopped, a suture was performed to

complete the surgery. Routine anti-infection treatment was given after the surgery. The patients were followed up for 3 months after surgery.

3.2. Group B (TCRM)

The timing, preoperative examination, anesthesia protocol, patient position, routine disinfection, and draping were consistent with Group A, and the surgery started after anesthesia took effect. The bladder was emptied, the vagina cleaned, and then dilated (with a cervical dilator) to fully expose the cervix. A hysteroscope was inserted to carefully observe the lesion's condition (size, position, shape, and surrounding anatomical structure). If the fibroid volume (submucosa of the pedicle) was small, electrocoagulation was performed to cut off the pedicle and remove the tumor. If the fibroid diameter exceeded 3 cm, it was excised through tissue excision or circular electrode slicing in sections. Non-pedicle submucosal fibroids were directly electrocoagulated for resection under ultrasound guidance. During this phase, uterine fibroids were appropriately pulled downward to reduce intraoperative bleeding as per the actual situation, and uterine ligaments and blood vessels were treated properly using energy instruments like intelligent bipolar electrocoagulation to effectively shorten the surgical time. Attention was given to layered suturing during the suturing phase to avoid dead space and minimize impact on later pregnancy. Both groups were followed up for 3 months post-surgery. The patients were followed up for 3 months after surgery.

4. Observation indexes

(1) Perioperative indexes: Duration of hospitalization, surgery, anal ventilation, and getting out of bed, and volume of intraoperative bleeding.

(2) 5 mL venous blood samples were collected before and 3 months after surgery in the morning. The samples were centrifuged at 3500 r/min for 10 minutes, and the patient's FSH, LH, and E2 levels were measured using enzyme-linked immunosorbent assay. The patient's AFC was detected using vaginal B-scan ultrasonography.

(3) The patients' sexual function was evaluated before and 3 months after surgery through the Female Sexual Function Index (FSFI) [6], which included 6 items, totaling up to 36 points. A higher score indicated better sexual function.

(4) The patient's pain levels were evaluated at 1–5 days after surgery using the Visual Analogue Scale (VAS) [7], with a higher score indicating more severe pain and the maximum score being 10 points.

(5) The incidence of complications within 3 months post-surgery was recorded.

5. Statistical methods

Comparison of categorical data was conducted using the χ^2 test, with results presented as [cases (%)]. For normally distributed econometric data, the Shapiro-Wilk (S-W) method was employed. Intergroup differences were assessed using independent samples *t*-test, within-group differences with a paired *t*-test, and between multiple groups with an *F*-test. Results were indicated as mean ± standard deviation. Data analysis was performed using SPSS 23.0 statistical software, with statistically significant differences denoted as $P < 0.05$.

6. Results

6.1. Perioperative indexes

Based on the data in **Table 1**, Group B showed shorter durations of hospitalization, surgery, anal ventilation,

and getting out of bed, and lower intraoperative bleeding volume ($P < 0.05$).

Table 1. Comparison of perioperative indexes between the two groups (mean ± standard deviation)

Groups	Number of cases	Hospitalization time (d)	Duration of surgery (min)	Anal ventilation time (h)	Volume of intraoperative bleeding (mL)	Time taken to get out of bed (h)
Group A	45	4.33 ± 0.44	54.92 ± 4.16	15.56 ± 2.62	44.62 ± 4.46	13.25 ± 2.18
Group B	45	3.15 ± 0.58	40.55 ± 4.68	10.85 ± 1.91	41.15 ± 4.38	6.82 ± 1.84
t		10.873	15.395	9.745	3.724	15.120
P		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

6.2. Ovarian function

There was no difference in the serum levels of FSH, LH, E2, and AFC between the two groups, both in the comparison between preoperative and postoperative measurements at 3 months and in the intergroup comparison after 3 months ($P > 0.05$).

Table 2. Comparison of ovarian function between the two groups (mean ± standard deviation)

Groups	Number of cases	FSH (U/L)		LH (IU/L)		E2 (pmol/L)		AFC (pieces)	
		Before surgery	3 months after surgery	Before surgery	3 months after surgery	Before surgery	3 months after surgery	Before surgery	3 months after surgery
Group A	45	9.28 ± 1.74	9.45 ± 1.53	7.36 ± 1.58	7.59 ± 1.54	167.52 ± 33.46	169.52 ± 35.87	12.25 ± 2.47	12.33 ± 2.41
Group B	45	9.32 ± 1.81	9.46 ± 1.62	7.22 ± 1.45	7.46 ± 1.57	168.25 ± 32.84	170.45 ± 35.70	12.37 ± 2.69	12.45 ± 2.34
t		0.107	0.030	0.438	0.397	0.104	0.123	0.220	0.240
P		0.915	0.976	0.663	0.693	0.917	0.902	0.826	0.811

6.3. Sexual functions

The FSFI scores of the two groups of patients all increased 3 months after surgery), with Group B demonstrating higher scores ($P < 0.05$), as shown in Table 3.

Table 3. Comparison of sexual functions between the two groups (mean ± standard deviation)

Group	Number of cases	Sexual desire		Sexual arousal		Orgasm	
		Before surgery	3 months after surgery	Before surgery	3 months after surgery	Before surgery	3 months after surgery
Group A	45	2.55 ± 0.51	3.45 ± 0.46*	2.35 ± 0.48	3.26 ± 0.49*	2.29 ± 0.35	3.55 ± 0.42*
Group B	45	2.68 ± 0.34	4.20 ± 0.47*	2.32 ± 0.47	3.84 ± 0.52*	2.25 ± 0.37	4.11 ± 0.51*
t		1.423	7.650	0.300	5.445	0.527	5.686
P		0.158	< 0.001	0.765	< 0.001	0.600	< 0.001

Group	Cases	Vaginal lubrication		Sexual satisfaction		Sexual pain	
		Before surgery	3 months after surgery	Before surgery	3 months after surgery	Before surgery	3 months after surgery
Group A	45	2.16 ± 0.34	3.72 ± 0.36*	2.30 ± 0.41	3.42 ± 0.48*	2.35 ± 0.38	3.54 ± 0.47*
Group B	45	2.15 ± 0.36	4.25 ± 0.48*	2.28 ± 0.37	4.01 ± 0.56*	2.40 ± 0.35	4.25 ± 0.48*
t		0.135	5.926	0.243	5.366	0.649	7.090
P		0.893	< 0.001	0.809	< 0.001	0.518	< 0.001

Note: *$P<0.05$ compared to the preoperative period

6.4. Pain level

According to the data shown in **Table 4**, the VAS scores of both groups showed a decreasing trend (1-5 days after surgery), with Group B showing a larger decrease, $P < 0.05$.

Table 4. Comparison of pain levels between groups (mean ± standard deviation)

Group	Cases	1 day after surgery	3 days after surgery	5 days after surgery	*F*	*P*
Group A	45	5.72 ± 0.63	$4.12 \pm 0.57^{\#}$	$3.10 \pm 0.53^{\#\triangle}$	455.830	< 0.001
Group B	45	5.15 ± 0.60	$3.45 \pm 0.51^{\#}$	$2.45 \pm 0.48^{\#\triangle}$	382.540	< 0.001
t		4.395	5.876	6.098	-	-
P		< 0.001	< 0.001	< 0.001	-	-

Note: Compared to 1 day after surgery, $^{\#}P < 0.05$, compared to 3 days after surgery, $^{\triangle}P < 0.05$

6.5. Complications

There was no difference in the incidence of complications between the two groups (within 3 months after surgery), $P > 0.05$, as shown in **Table 5**.

Table 5. Comparison of incidence of complications between the two groups [cases (%)]

Group	Cases	Vaginal bleeding	Fever	Hyponatremia	Uterine cavity infection	Uterine perforation	Total incidence
Group A	45	2 (4.44)	1 (2.22)	1 (2.22)	1 (2.22)	1 (2.22)	6 (13.33)
Group B	45	1 (2.22)	0 (0.00)	0 (0.00)	1 (2.22)	0 (0.00)	2 (4.44)
χ^2							1.235
P							0.266

7. Discussion

The pathogenesis of uterine fibroids is closely related to genetic and secretion disorders. Relevant research shows that uterine fibroids are most common among women aged 30–50 years, of which the incidence and prevalence of women of childbearing age are about 25% and 50% respectively [8]. Therefore, timely clinical diagnosis and treatment are of great significance. Currently, uterine fibroids is mainly treated through surgery. However, traditional surgery comes with many limitations like trauma and heavy bleeding. Therefore, so there is an urgent need to find a safer and more effective treatment plan in clinical practice.

In this study, no significant differences were found in the FSH, LH, E2, and AFC levels between the two groups. both in the comparison between preoperative and postoperative measurements at 3 months and in the intergroup comparison after 3 months. Additionally, there was no disparity in the incidence of complications within 3 months after surgery between the two groups. These findings suggest that in the treatment of patients with uterine fibroids, both LM and TCRM can yield favorable outcomes with minimal impact on ovarian function and fewer complications. This can be attributed to the minimally invasive nature of both surgical methods, which primarily affect the superficial tissue of the uterus without adversely affecting the ovarian blood supply or environment. Consequently, these surgeries have a relatively minor impact on ovarian function, ensuring safety and reliability.

In this study, perioperative time-related indexes such as hospitalization, surgery duration, time to anal exhaust, and time to getting out of bed were shorter in Group B. Perioperative time-related indexes such as hospitalization, surgery duration, time to anal exhaust, and time to getting out of bed were shorter in Group B.

Additionally, Group B exhibited lower intraoperative bleeding, higher FSFI scores at 3 months post-surgery, and lower VAS scores within 1–5 days after surgery. These findings suggest that compared to LM, TCRM offers benefits including reduced bleeding, faster postoperative recovery, decreased pain, and improved quality of sexual life, thereby contributing to better prognosis. The rationale behind these advantages lies in the surgical approach of TCRM, which primarily utilizes vaginal access, resulting in a milder impact on the patient's abdominal environment and facilitating quicker postoperative recovery. Unlike LM, which involves abdominal cavity perforation and post-surgery sutures, the smooth execution of TCRM procedures is less influenced by the skills and experience of clinical physicians or the severity of uterine fibroids. This approach reduces intraoperative bleeding, shortens both surgery and recovery times, alleviates postoperative pain, and expedites the enhancement of the patient's sexual life.

8. Conclusion

Both LM and TCRM are effective in treating uterine fibroids with little impact on ovarian function and complications. However, TCRM offers reduced bleeding, quicker postoperative recovery, decreased pain, and an enhanced quality of sexual life. Therefore, this surgical approach appears more beneficial for improving prognosis.

Disclosure statement

The author declares no conflict of interest.

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