

# Analysis of the effect of laparoscopy and hysteroscopy on ovarian function, immune function and quality of sexual life of patients with hysteromyoma at different ages

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**Abstract.** This study aims to comparatively analyze the impact of laparoscopic myomectomy (LM) and transcervical resection of myoma (TCRM) on ovarian function, immune function and quality of sexual life of patients with hysteromyoma. Two hundred and forty patients with hysteromyoma admitted into the Second Affiliated Hospital of Zhengzhou University from June 2014 to June 2016 were divided into laparoscopic myomectomy group (LM group, n=120) and transcervical resection of myoma group (TCRM group, n=120) according to random figure table. The difference between the two surgical methods were compared among hysteromyoma patients of different age in the following aspects: perioperative indicators, ovarian function, immune function and quality of sexual life before treatment and after operation. 1) there was no significant difference in age structure between LM and TCRM group ( $P>0.05$ ). 2) There were no significant differences in the amount of bleeding, operative time, analgesics usage rate between the groups ( $P>0.05$ ), but the anal exhaust time, postoperative ambulation time, hospitalization time and hospitalization costs in TCRM group were significantly less than that in LM group, the difference was statistically significant ( $P<0.01$ ). 3) Before treatment and in the 3rd, and 6th month after operation, there was no significant difference on follicle stimulating hormone (FSH), luteinizing hormone (LH) or estradiol (E2) level between the two groups ( $P>0.05$ ); but in the 3rd month after operation, the level of E2 decreased remarkably, with FSH and LH level increased significantly compared with the 6th month after operation and before treatment ( $P<0.05$ ). 4) Compared with the preoperative status, there was no significant decrease in humoral immunity (IgG, IgA,

IgM) and cellular immune function ( $CD4^+$ ,  $CD8^+$ ) in TCRM group at the 3rd and 6th month after operation ( $P>0.05$ ). While at the 3rd month after operation, the levels of  $CD4^+$ ,  $CD8^+$  were decreased significantly in comparison to those at the 6th month after operation ( $P<0.05$ ), but the levels of IgG, IgA and IgM were not decreased significantly ( $P>0.05$ ). 5) There was no significant difference in the quality of sexual life between the two groups before operation or at the 3rd and 6th month after operation ( $P>0.05$ ). In recent years, endoscopic treatment has become the main treatment evolution of hysteromyoma, patients of all ages are paying attention to the preservation of the uterus. This study showed that TCRM is approaching through the natural cavity, which has the features of less damage to body, faster recovery and lower cost of hospitalization than LM. The two surgical methods have no obvious influence on ovarian function, immune function and quality of sexual life.

## Introduction

Uterine fibroids are the most common benign lesions of the female reproductive system, that mostly occur in the 30-50-year-old female population (1), can cause menstrual changes (especially by excessive, shortening cycle), lower abdominal mass, infertility, increased leucorrhea, frequent urination, urgency, dysuria, constipation and other oppressive symptoms, and 4-8% (2) of uterine fibroids may be malignant, so it needs attention clinically and active and effective treatment. However, the etiology of uterine fibroids is not yet fully clear, although there are various drug treatment methods, the side effects are severe, and they can only temporarily alleviate the symptoms, shrink the tumor, the tumor begin to grow again after withdrawing the drug, symptoms recur, the methods are not easy and cannot be performed in a long-term (3). At present, surgical treatment has become the main treatment of uterine fibroids, in recent years, with the delay of female reproductive age, the incidence is increasing year by year and the occurrence is at younger age, and with the continuous development of minimally invasive technology, the laparoscopic minimally invasive surgery which only resect uterine myoma to retain fertility are widely accepted. Laparoscopic myomectomy (LM) and transcervical resection of myoma (TCRM) are the main

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treatments of uterine fibroids at present (4). There are many studies on the clinical efficacy of the two surgical methods for uterine fibroids, but there are few reports on whether there are differences in the effects of the two procedures on ovarian function, immune function and quality of life. In this study, we compared the effects of LM and TCRM on ovarian reserve function, immune function and quality of sexual life in order to provide evidence for clinical choice.

## Materials and methods

**Clinical data.** Two hundred and forty patients with complete clinical data, diagnosed with uterine submucosal fibroids by postoperative pathology admitted to The Second Affiliated Hospital of Zhengzhou University from June 2014 to June 2016 were selected. Inclusion criteria: i) 20-38 years old, married and having a normal sex life; ii) not accompanied by other diseases of the uterus, no hot flashes, insomnia and other perimenopausal symptoms; and iii) no abnormalities in bilateral ovaries; ovaries are preserved in the operation. According to the random number table method, patients were divided into 120 cases of laparoscopic group and 120 cases of hysteroscopy group. There was no significant difference in age, incidence time, body weight, single/multiple fibroids and average diameter of fibroids between the two groups ( $P>0.05$ ). The baseline was consistent and comparable, see Table I. Exclusion criteria: i) pregnant; ii) combined with pelvic organ disease; iii) combined with endocrine and metabolic diseases, using steroid drug within 1 year; and iv) combined with laparoscopic or hysteroscopic surgery contraindications. This study was approved by the Ethics Committee of the Second Affiliated Hospital of Zhengzhou University, the patient were informed and signed a consent form, active preoperative preparation was performed.

**Surgical approach.** LM group was performed laparoscopic myomectomy, surgery procedure: patients took supine position, routine disinfection, towels placed, after the anesthesia, four puncture points were taken: the first puncture point was in the upper edge of the umbilicus; pneumoperitoneum control was established and pneumoperitoneum pressure was maintained between 12-14 mmHg, laparoscopic was placed, the other three points were punctured under the laparoscopic direct vision. Six units of pituitrin diluted in definite proportion was injected using conventional uterine muscle injection, single pole electric hook was used to longitudinally incise the tumor to tumor nucleus, using grasping forceps to seize and completely remove the tumor. All levels of uterus were sutured layer by layer, the myoma was removed by rotary cutting, direct clamping or through the vagina. The pelvic was washed and the CO<sub>2</sub> was discharged, the equipment was counted, all the puncture points were intradermically sutured.

TCRM group was performed with transcervical resection of myoma, surgery procedure: the patient took the bladder lithotomy position, conventional perineum disinfection, towel was placed, after the anesthesia, the cervix was expanded to 7.5# by expanding stick, hysteroscopy was placed, saline was used as the conventional uterine distention medium, intra-uterine pressure was controlled between 21-23 kPa, different method of incision was taken according to the situation under

the hysteroscopy. If the fibroid was with pedicle, the tumor surface was cut, after the tumor became smaller, the pedicle handle was cut and the tumor was clamped out; if the fibroid did not have pedicle, the tumor capsule was firstly cut, then the fibroids were cut into pieces and removed. The patients were under intravenous general anesthesia, postoperative routine antibiotics was administered to prevent infection, uterus contraction treatment was performed.

**Observation indicators.** All patients were followed up by outpatient service, telephone or WeChat, with an average follow-up time of (12.67±1.23) months. According to age, patients were divided into  $\geq 20$ , <25 years group;  $\geq 25$ , <30 years group;  $\geq 30$ , <35 years group;  $\geq 35$ ,  $\leq 38$  years group, four groups of uterine fibroids patients at different ages were observed and the differences compared between the surgical method of LM and TCRM.

The perioperative condition of two groups of patients were observed: the operation time, intraoperative blood loss, postoperative exhaust and out-of-bed time, hospitalization time, postoperative analgesic use rate and average hospitalization costs.

**Evaluation of ovarian function:** preoperative and 3 months and 6 months postoperative serum sex hormone levels were detected by enzyme-linked immunosorbent assay, including follicle-stimulating hormone (FSH), luteinizing hormone (LH) and estradiol (E2), combined with B-ultrasound detection of ovulation to evaluate ovarian reserve function. FSH  $\leq 10$  mIU/ml, E2  $\geq 60$  pg/ml for the basic value, and/or, FSH  $\leq 20$  mIU/ml on menstrual day 10, E2 was significantly higher than in the menstrual period, 2 times and above of the basic value; B-ultrasound detection showed the follicle gradually became dominant and matured to be excreted, thus was considered as good ovarian reserve function.

The immune function of patients before and at 3, and 6 months after the operation was detected, 3-5 ml elbow vein blood was extracted, performed in strict accordance with the kit manual (Beijing Weishu District Biological Products Co., Ltd., Beijing, China). The cellular immune function was detected for T lymphocyte subsets using FacScan flow cytometry (BD Biosciences, Franklin Lakes, NJ, USA), including CD4<sup>+</sup>, CD8<sup>+</sup>; humoral immune function was detected using polyclonal antibody unidirectional immunodiffusion to detect immunoglobulin, including the determination of IgG, IgA, IgM levels.

The quality of sexual life was observed before, and at 3 and 6 months after operation, sexual function scale (FSFI) (5) was used to evaluate six sexual function-related dimensions: sexual desire, sexual arousal, vaginal lubrication, orgasm, sexual satisfaction, sexual intercourse pain, the better the quality of sexual life, the higher the score.

**Statistical analysis.** The data were recorded using SPSS 20.0 software (SPSS, Inc., Chicago, IL, USA). The measurement data were recorded as the mean  $\pm$  SD. The comparison of the two independent samples was performed by t-test. Enumeration data were expressed by percentage. Fisher's exactness method or Chi-square test were used for comparison.  $P<0.05$  was considered to indicate a statistically significant difference.

Table I. General conditions.

Characteristics	LM group (n=120)	TCRM group (n=120)	t/ $\chi^2$ test	P-value
Age (years)	27.8±5.4	27.6±5.5	1.194	0.087
Onset time (months)	12.56±6.35	12.46±6.33	1.235	0.073
BMI (kg/m <sup>2</sup> )	20.73±1.65	20.69±1.71	1.243	0.068
Single/multiple fibroids (case)	97/23	99/21	1.431	0.061
The average diameter of the fibroids (cm)	3.53±0.41	3.35±0.46	1.522	0.054

Table II. Comparison of two different surgical methods in patients with uterine fibroids at different ages (% , case).

Age (years)	LM group (% , case)	TCRM group (% , case)	$\chi^2$ test	P-value
≥20, <25	25.00 (30)	24.17 (29)	1.252	0.067
≥25, <30	52.50 (63)	54.17 (65)	1.314	0.063
≥30, <35	17.50 (21)	15.83 (19)	1.421	0.058
≥35, ≤38	5.00 (6)	5.83 (7)	1.352	0.061

Table III. Comparison of two groups of patients during perioperative period (mean ± SD).

Item	LM group (n=120)	TCRM group (n=120)	t/ $\chi^2$ test	P-value
Operation time (min)	65.37±18.62	59.23±17.14	2.158	0.254
Intraoperative blood loss (ml)	32.49±7.34	27.38±5.69	1.865	0.262
Anal exhaust time (h)	17.36±1.77	9.81±1.64	10.697	>0.05
Out-of-bed time (h)	33.13±2.87	7.41±2.65	21.423	>0.05
Hospitalization time (days)	5.79±1.32	3.56±1.29	9.451	0.002
Postoperative analgesic use rate (%)	23.33 (28/120)	20.83 (25/120)	0.219	0.346
Average hospitalization cost (RMB)	11467±2984	6386±1765	15.624	>0.05

## Results

*Comparison of two different surgical methods in patients with uterine fibroids at different ages.* In the ≥20, <25-year group, the LM and TCRM operation was, respectively, 25.00% (30/120), 24.17% (29/120); in the ≥25, <30-year group, the proportion of LM and TCRM was 52.50% (63/120), 54.17% (65/120); in the ≥30, <35-year-old group, the LM and TCRM was 17.50% (21/120), 15.83% (19/120); in the ≥35, <38-year-group, the LM and TCRM was, respectively 5.00% (6/120) and 5.83% (7/120). There was no significant difference in the age composition ratio between the LM group and the TCRM group (P>0.05) (Table II).

*Comparison of two groups of patients during perioperative period.* There were no significant differences in the operation time, intraoperative blood loss and postoperative analgesic use rate between the two groups (P>0.05). However, the time of anal exhaust, time of getting out of bed, hospitalization time and cost of TCRM group were less than that of LM group, the difference was statistically significant (P<0.05) (Table III).

*Comparison of ovarian function in the groups.* There was no significant difference in FSH, LH and E2 between the two groups (P>0.05). There was no significant difference between the two groups at different ages (P>0.05). However, the level of E2 was significantly decreased 3 months after operation, the levels of FSH and LH were significantly increased at 3 months after operation in the two groups, the difference was statistically significant in comparison to before and 6 months after operation (P<0.05). There was no significant difference in ovarian reserve function between the two groups (P>0.05) (Table IV).

*Comparison of the immune function of the two groups.* There was no significant difference in preoperative cellular immune function (CD4<sup>+</sup>, CD8<sup>+</sup>) and humoral immune function (IgG, IgA, IgM) between the two groups (P>0.05), the results were comparable. There was no statistically significant difference between the two groups at different ages (P>0.05). However, 3 months after operation, CD4<sup>+</sup> and CD8<sup>+</sup> in LM group was significantly decreased compared to before and 6 months after operation (P<0.05), IgG, IgA

Table IV. Comparison of ovarian function in the groups (mean  $\pm$  SD, %).

Item	LM (n=120)			TCRM group (n=120)		
	Before	3 months after	6 months after	Before	3 months after	6 months after
FSH (mIU/ml)	8.21 $\pm$ 1.53	12.24 $\pm$ 3.47 <sup>a,b</sup>	8.23 $\pm$ 1.45	8.25 $\pm$ 1.38	12.03 $\pm$ 2.86 <sup>a,b</sup>	8.26 $\pm$ 1.27
LH (mIU/ml)	6.47 $\pm$ 1.24	10.23 $\pm$ 2.06 <sup>a,b</sup>	6.56 $\pm$ 1.07	6.35 $\pm$ 2.08	10.02 $\pm$ 2.14 <sup>a,b</sup>	6.38 $\pm$ 1.65
E2 (pg/ml)	162.59 $\pm$ 41.35	128.52 $\pm$ 31.23 <sup>a,b</sup>	160.68 $\pm$ 39.07	163.01 $\pm$ 44.12	131.25 $\pm$ 33.26 <sup>a,b</sup>	162.53 $\pm$ 40.26
Good ovarian reserve function (case, %)	95.83 (115/120)	90.83 (109/120)	94.17 (113/120)	96.67 (116/120)	91.67 (110/120)	95.00 (114/120)

<sup>a</sup>P<0.05 vs. same group before operation; <sup>b</sup>P<0.05 vs. same group after 6 months.

Table V. Comparison of immune function related indicators in the groups (mean  $\pm$  SD, n=120).

Group	Time	IgG (g/l)	IgA (g/l)	IgM (g/l)	CD4 <sup>+</sup> (%)	CD8 <sup>+</sup> (%)
LM	Before	13.31 $\pm$ 1.69	2.32 $\pm$ 0.42	1.58 $\pm$ 0.54	40.02 $\pm$ 2.93	30.16 $\pm$ 2.51
	3 months after	13.26 $\pm$ 1.92	2.29 $\pm$ 0.48	1.57 $\pm$ 0.49	38.12 $\pm$ 3.24 <sup>a,b</sup>	32.27 $\pm$ 2.94 <sup>a,b</sup>
	6 months after	13.29 $\pm$ 1.85	2.31 $\pm$ 0.53	1.60 $\pm$ 0.58	40.04 $\pm$ 3.28	30.14 $\pm$ 2.57
TCRM	Before	13.34 $\pm$ 1.71	2.29 $\pm$ 0.45	1.59 $\pm$ 0.52	40.00 $\pm$ 2.95	30.15 $\pm$ 2.49
	3 months after	13.27 $\pm$ 1.94	2.28 $\pm$ 0.51	1.56 $\pm$ 0.50	39.84 $\pm$ 3.12	30.18 $\pm$ 2.88
	6 months after	13.36 $\pm$ 1.82	2.30 $\pm$ 0.52	1.61 $\pm$ 0.57	40.03 $\pm$ 3.16	30.13 $\pm$ 2.56

<sup>a</sup>P<0.05 vs. same group before operation; <sup>b</sup>P<0.05 vs. same group after 6 months.

Table VI. Comparison of the quality of sexual life of the groups (mean  $\pm$  SD, n=120).

Group	Time	Preoperative sexual desire	Sexual arousal	Vaginal lubrication	Orgasm	Sexual satisfaction	Sexual intercourse pain
LM	Before	5.93 $\pm$ 0.87	14.32 $\pm$ 1.42	15.21 $\pm$ 2.34	11.46 $\pm$ 1.43	11.63 $\pm$ 1.81	10.86 $\pm$ 1.87
	3 months after	5.96 $\pm$ 0.92	14.56 $\pm$ 1.38	15.47 $\pm$ 2.25	11.72 $\pm$ 1.67	11.76 $\pm$ 1.92	10.92 $\pm$ 1.96
	6 months after	6.01 $\pm$ 1.02	14.95 $\pm$ 1.23	15.68 $\pm$ 2.37	12.10 $\pm$ 1.72	11.85 $\pm$ 2.14	11.12 $\pm$ 2.25
TCRM	Before	5.94 $\pm$ 0.89	14.27 $\pm$ 1.51	15.12 $\pm$ 2.26	11.48 $\pm$ 1.35	11.64 $\pm$ 1.82	10.91 $\pm$ 1.78
	3 months after	5.93 $\pm$ 0.82	14.42 $\pm$ 1.37	15.45 $\pm$ 2.41	11.81 $\pm$ 1.53	11.78 $\pm$ 1.97	10.97 $\pm$ 2.03
	6 months after	5.98 $\pm$ 0.97	14.74 $\pm$ 1.46	15.65 $\pm$ 2.17	12.06 $\pm$ 1.75	11.93 $\pm$ 2.12	11.07 $\pm$ 2.43

There was no significant difference between the two groups at different time points (P>0.05).

and IgM had no significant decrease (P>0.05). Three months and 6 months after operation, CD4<sup>+</sup>, CD8<sup>+</sup>, IgG, IgA, IgM had no significant decrease in TCRM group compared to before operation (P>0.05) (Table V).

*Comparison of the quality of sexual life of the two groups.* There were no significant differences between the two groups in terms of preoperative sexual desire, sexual arousal, vaginal lubrication, orgasm, sexual satisfaction and sexual intercourse pain (P>0.05). Compared with the preoperative state, there were no significant differences in the indicators of quality of sexual life in the two groups of patients at 3 and 6 months after operation (P>0.05) (Table VI).

## Discussion

Uterine fibroids are the most common reproductive benign tumors in women of reproductive age, patients often progress to habitual abortion or infertility due to the excess amount of menstrual flow, chronic blood loss progressing to anemia, or the shape and function changes because of uterus cavity occupation (6). In recent years, with the improvement of public health awareness, medical progress and development, the detection rate of uterine fibroids have significantly increased, its wide incidence and the great harm caused enough clinical attention. Conservative treatment and surgical treatment are currently two ways to treat uterine fibroids. There are many



drugs on the market for the treatment of uterine fibroids, danazol, tamoxifen, GnRHa are all in clinical use, but the efficacy of drug treatment is limited, with many side effects, high recurrence rate after withdrawal, few patients can adhere to the drug treatment for a long time, which prevent it from clinical promotion, therefore, surgical treatment is a routine and mainstream method of uterine fibroids (7). However, whether to take surgical treatment often depends on the clinical symptoms of patients, fibroids growth rate and fertility requirements, in general, for fibroids >3 cm patients with obvious clinical symptoms or infertility, surgical treatment should be performed (8).

Surgical treatment can be divided into traditional and minimally invasive surgery. The traditional uterine fibroids resection and hysterectomy via abdomen in the 1950s was accepted by the majority of gynecologists because of the good surgical field of vision which was conducive to the complete removal of uterine fibroids (9). However, the traditional surgery is featured by severe trauma, slow recovery, and long-term adverse effects on ovarian function after hysterectomy, studies have shown that 34% of women occurred with perimenopausal symptoms and ovarian failure 2 years after operation, the age of ovarian failure was 4 years earlier than the natural menopause of women (10), mainly because of the uterine artery ovarian branch and ovarian blood supply redistribution after hysterectomy, ovarian blood supply disorder affecting the release of estrogen, decreased estrogen levels can cause premature ovarian failure, resulting in decreased quality of sexual life, therefore, the clinical application has limitations.

Since the 1980s, with the development of laparoscopy, hysteroscopy and other endoscopic methods and social, psychological, and medical model changes, with particular emphasis on individual and humanization of surgery, and striving to perform effective treatment while reducing damage to the body. Studies have shown that LM, and TCRM have the features of less bleeding, small damage to patient's body, rapid postoperative rehabilitation and minor effects on reproductive endocrine system (11-14), they have been widely used clinically and are considered to be the ideal surgical treatment of uterine fibroids, they are gradually replacing the traditional surgery. This study showed that TCRM group had a shorter postoperative exhaust time, shorter out-of-bed time, shorter hospitalization time and less hospital cost than the LM group, the difference was statistically significant ( $P<0.05$ ), indicating that compared with LM, TCRM has some advantages. Hysteroscopy does not need abdominal puncture, the surgery is performed along the natural cavity of the vagina, which has less impact on the abdominal environment, resulting in faster postoperative rehabilitation and shorter hospital stay.

This study shows that compared with 6 months after surgery and before surgery, although the E2 levels decreased significantly in two groups of patients 3 months after the surgery, FSH, and LH levels were significantly increased ( $P<0.05$ ). However, there was no significant difference between the two groups at different time points ( $P>0.05$ ) and no significant difference between the two groups in the ovarian function ( $P>0.05$ ). The results indicate that the two surgical procedures have no significant impact on ovarian function of patients, this is because the two operations only damage the uterine myometrial layer, and do not damage the

ovarian artery and uterine ovarian artery which maintain the ovarian function, the blood supply of ovary was reserved (15), the transient reversal disorder of sex hormone 3 months after operation may be associated with surgical stress and short-term uterine injury.

This study showed that 3 months after operation, the cellular immune indicators ( $CD4^+$ ,  $CD8^+$ ) were decreased compared to before and 6 months after surgery ( $P<0.05$ ), and humoral immune indicator (IgG, IgA, IgM) did not decrease significantly ( $P>0.05$ ), indicating that LM group suffered some damage to cellular immune function at 3 months after operation, which can be proved by  $CD4^+$  decreasing 3 months after the operation,  $CD8^+$  increasing 3 months after operation.  $CD4^+$ ,  $CD8^+$  are T lymph subgroup molecules located on the Th1, Th2 lymphocyte surface,  $CD4^+$  can produce immunological response against Mycobacterium tuberculosis infection, and  $CD8^+$  can inhibit the activity of B lymphocytes and  $CD4^+$ , playing a negative regulative role of immunity (16). Thus, TCRM has no significant effect on immune function, and LM can produce some reversible damage on the cellular immune function in the short term.

The harmony of sexual life plays an important role on maintaining emotion between husband and wife, maintaining marriage and improving the quality of life. However, uterine fibroids often lead to hyposexuality and orgasm dysfunction, which may be associated with menstrual disorders, leucorrhea increase, oppression symptoms caused by uterine fibroids leading to reduced self-evaluation of women, it may also cause hyposexuality or loss of sexual pleasure of the spouse (17,18). This study showed that for the patients who underwent LM and TCRM, there was no significant differences in the indicators of the quality of sexual life at 3 and 6 months after operation ( $P>0.05$ ), indicating that although LM did not improve the quality of sexual life, it did not reduce the quality. However, Meston and Kescu *et al* (19,20) found that for patients underwent hysterectomy, the sexual desire decreased significantly after operation, the quality of sexual life was seriously affected.

In summary, endoscopic treatment of uterine fibroids is the main evolution in recent years, the retention of the uterus was emphasized for all ages. TCRM, which is through the natural cavity, has the features of small surgical damage, fast recovery, low cost of hospitalization compared to LM. Neither surgical procedure has significant influence on the ovarian function, immune function or sexual life. However, the sample size of this study is limited, expansion of the sample size, multi-center, long-term study may lead to more meaningful results for the optimization of surgical procedure and health economics.

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