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Research Article

Effect Analysis of Cystoscopy Combined with Ureteral Catheterization in total Abdominal Hysterectomy for giant Uterine Fibroids

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Abstract

Recording the postoperative observation indexes and postoperative complications to assess the therapeutic effect of intervention of auxiliary means in the operation of giant cervical fibroid. The study was conducted in a district hospital, wherein patients with giant uterine fibroids were requested to execute operation of total hysterectomy combined with ureteral catheterization under cystoscopy. During the period from July 2021 to March 2024, a total of eighty cases who underwent an open total hysterectomy for giant fibroids were enrolled in the study. Cystoscopy combined with ureteral intubation has good effect in laparotomy for large uterine fibroids, which shortened operation time, reduced intraoperative blood loss and pain score, and the incidence of ureteral injury, bladder injury and urinary tract infection decreased. The study involved cystoscopy to broaden the horizon of the surgery. Cystoscopy combined with ureteral intubation has good effect in laparotomy for large uterine fibroids, which can shorten operation time, be safer, reduce doctor-patient disputes, improve patient satisfaction, and is easy to be applied and promoted in clinic in county-level hospitals.

Keywords: cystoscope; ureteral intubation; giant uterine fibroids; total abdominal hysterectomy

Introduction

Uterine fibroids, also called leiomyomas or fibroids, are the result of excessive growth of smooth muscle and thick-walled vessels in the uterus [14]. As a common gynecological pathology, they have a complicated pathogenesis [7,15]. Surgical removal is the most common approach to treating uterine fibroids, and they have become the leading indication for hysterectomy [13,20,21]. It is difficult to accurately calculate the incidence of uterine fibroids; however, it is estimated that the prevalence rate of reproductive age women reached to over 25%, and the incidence rate reached more than 50% according to surgical specimens and autopsy statistics [5]. There are several aspects need to be considered to administrate treatment—the size and location of fibroids; the presence and size of the submucosal component; penetration of the myometrial component; proximity to the uterine serosa; relationship with and proximity to the endometrial cavity; vascular supply; and coexistence of adenomyosis or deep endometriosis [11]. At present, there is no consensus and guideline on the diagnosis and treatment of uterine fibroids in China.

Giant or large uterine fibroids (uterine weight >500g) are common in middle-aged and elderly women, often manifested as abdominal mass, abdominal pain and other symptoms, especially in developing countries [10]. Long-term fibroid growth is likely to transform to malignant, so that removing such uterine fibroids surgically is recommended, especially for those postmenopausal women [3,22]. Due to the large uterine fibroids, it is difficult to expose the operative field during the operation. Large uterine fibroids also cause urinary incontinence in women [12,16]. Thus, it increases the probability of ureteral injury, which may lead to the possibility of a second operation if it is not detected in time during the operation.

Despite the significant advances in laparoscopic surgery in the past years, urologic complications (UCs) are still issues to be reckoned by every gynecologist [8]. UCs occur both during intraoperation (bladder or ureteral section, coagulation, and ligation) and post-operation complications (bladder or ureteral fistulas, urinary retention, micturition difficulties, incontinence, and urinary tract infection) [1]. It is reported that the incidence of bladder injury was 2.2% while the ureter injury rate was 1.1% [4], and the incidence of vesicovaginal fistulas in patients who experienced laparoscopic radical hysterectomy was about 2%, while post-operative urinary retention rates were about 14% [19].

It is reported that the cystoscopy and robotic surgery were involved in for bladder endometriosis in India [2]. American studies have reported that due to the difficulty in removing giant uterine fibroids during laparoscopic surgery, it is usually necessary to remove the uterus one by one after crushing the uterus with a closed crushing bag, and the operation time is significantly extended. There are many reports of ureteral injury caused by extensive hysterectomy in gynecological surgery, and the postoperative complications are serious. If the diagnosis and treatment are delayed, it is easy to lead to adverse consequences. The incidence of iatrogenic ureteral injury ranges from 0.05% to 30%. It has been reported that a case of a 45-year-old woman with giant cervical fibroid and urinary retention, was operated with a total abdominal hysterectomy, without facing any intraoperative complications. It is effective to perform cystoscope-assisted laparoscopic enucleation of a large progressive bladder leiomyoma [23]. In this case, preoperative uterine artery embolization (UAE) was performed to prevent intraoperative blood loss, and Double-J (DJ) stenting was performed to avoid ureteric injury [17]. Therefore, in some district hospital, it is recommended to combine preoperative cystoscopy and ureteral intubation in total open hysterectomy to treat giant uterine fibroids [6].

How to avoid ureteral injury and reduce surgical complications is a key problem to be paid attention to in total hysterectomy due to large uterine fibroids. The patients with giant uterine fibroids included in this study were all over 45 years old, and the opinions of family members and patients were requested for total hysterectomy. The purpose of this study is to analyze the effect of cystoscopy combined with ureteral catheterization in total hysterectomy for large uterine fibroids. After placement can shorten the operation time and reduce ureteral damage.

Materials and methods

The work was approved and performed under Wuwei Liangzhou Hospital Ethics Committee. From July 2021 to March 2024, a total of eighty cases who underwent an open total hysterectomy for giant fibroids were divided randomly into study group and control group (n=40/group). Cystoscopy and ureteral catheter placement. The cystoscope (Hawk PG-V type) and imaging system were prepared before operation. The patient was first taken to the lithotomy position and anesthesia was performed. After routine perineal area skin disinfection, the cystoscope directly under the urethral opening. The bladder was observed, both ureteral orifices were clearly visible, and the injection of clear urine was smooth. A F4.7 ureteral catheter was entered from the cystoscopic operation channel. The end of the cystoscope was aligned with the ureteral opening on the right side, and the ureteral catheter was slowly pushed forward with a length of about 25 cm. The end of the ureteral catheter entered the calyces. Slowly withdraw the cystoscope with one hand, and push the ureteral catheter forward with the other hand to prevent the ureteral catheter already in place from withdrawing with the cystoscope. After the cystoscope is completely withdrawn, the assistant fixes the implanted ureteral catheter. Then another ureteral catheter was inserted in the same way. After the cystoscope was withdrawn, an F14 catheter was inserted, 15 ml of normal saline was injected into the air sac, and the catheter was pulled outward to ensure that the air sac was at the bladder neck. Two ureteral catheters were taped to the catheter to avoid slipping out during the operation.

After successful anesthesia, the patient was placed in a supine position, and routine sterilization was performed. A 15 cm incision was made in the middle of the abdominal wall, and subcutaneous and subcutaneous tissues were separated and cut layer by layer. The huge uterus and myoma were pulled out of the abdominal incision at the same time, and the left round ligament, left proper ligament of ovary and isthmus of fallopian tube were respectively clamp and cut. Individualized surgical paths were developed according to the growth site of the fibroids. If the vesical reflexion peritoneum could not be exposed, the serous membrane layer should be separated along the anterior wall of the uterus and the fibroids, pushed downward to approach the vesical reflexion peritoneum, and the arteriovenous of the uterus should be gradually exposed, with forceps and double suture, and then the principal sacral ligament should be treated, a huge hysterectomy should be performed, and the pelvic cavity should be rinsed to check no active bleeding. Both ureters were carefully checked for good movement and peristalsis before abdominal closure. The peritoneum was closed, sutured layer by layer, and routine anti-infection and thrombosis prevention were performed. The control group did not undergo cystoscopy combined with ureteral intubation before surgery, and the patient was supine with the research group before hysterectomy.

Tumor morphology was reviewed by from pathologists with expertise in gynecologic pathology. The specimens were collected from tumor tissues of two cases of liomyoma, and stored in 4% paraformaldehyde. The tissue samples were embedded in paraffin, and then stained with Hematoxylin and Eosin (H&E) dyes. After histological H&E staining, organ damage was observed by digital trinocular camera microscope (Leica DM3000, Germany).

SPSS 25.0 statistical software (SPSS Inc., Chicago, IL, USA) was used for data analysis. Chi-square test was used for counting data, T-test was used for measurement data, $P<0.05$ was considered statistically significant.

Results

The preoperative patient demographics are summarized as Table 1.

Control group		Study group	
Case load	40	Case load	40
Age, Mean ± SD, years	52.68 ± 3.85	Age, Mean ± SD, years	53.18 ± 2.86
Course of disease, Mean ± SD, years	3.15±0.86	Course of disease, Mean ± SD, years	3.15±1.10
Diameter of fibroids, cm	14.20±1.57	Diameter of fibroids, cm	14.58±1.87

Table 1: Characteristics of the patients

The cases were between 44 and 60 years old, with an average age of 53 years. The disease courses were from one year to five years, and all patients had giant uterine fibroids and each fibroid diameter was more than 10 cm.

It made the view of operation wider that the combination of cystoscopy with ureteral catheterization (Fig. 1A). Fig. 1B shows a specimen with uterus, bilateral fallopian tubes and cervix giant fibroid.

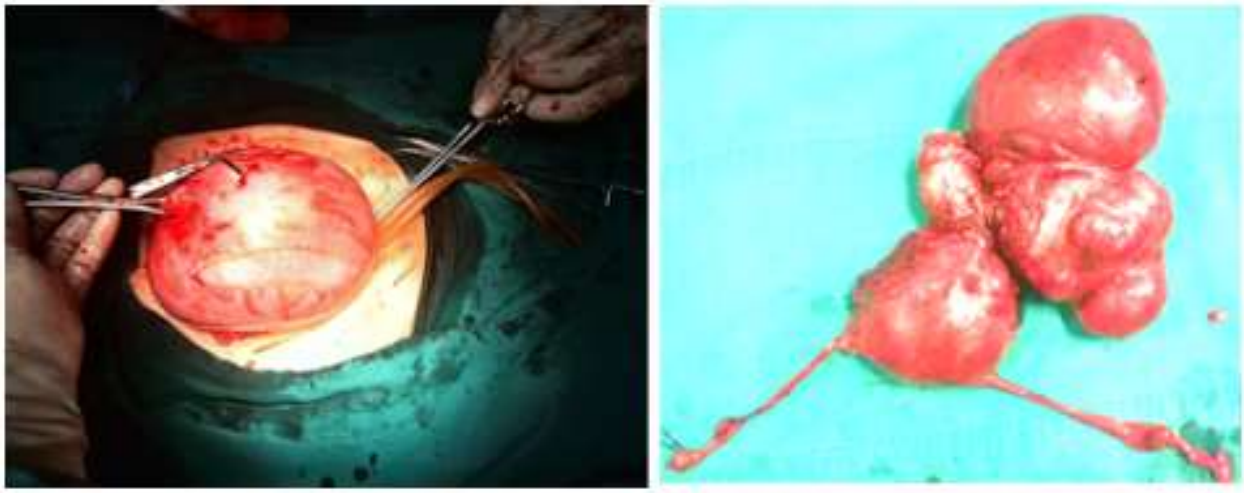

Figure 1: (A) An intraoperative open giant myomectomy; **(B)** a specimen with uterus, bilateral fallopian tubes and cervix giant fibroid.

The volume of this cervix giant fibroid was about 12 cm×15 cm. A large open uterus with bilateral salpingectomy specimen and various fibroids were removed (Figure. 2).

Figure 2: A large open uterus with bilateral salpingectomy specimen and various fibroids removed.

The perioperative data and outcomes are presented in Table 2.

Control group	Mean ± SD	Study group	Mean ± SD
Peroperative bleeding, ml	111.75±18.66	Peroperative bleeding, ml	99.50±7.83
Time of operation, min	106.50±12.31	Time of operation, min	89.75±7.68
VAS	3.43±0.75	VAS	1.65±0.74

Table 2: Comparison of postoperative observation indexes between the two groups

The mean operative time of control group and study group was 106.50±12.31 min and 89.75±7.68 min (T=3.829, P=0.001), respectively. The Volumes of peroperative bleeding of control group and study group was 111.75±18.66 mL and 99.50±7.83 mL (T=7.303, P=0.005), respectively. The visual analogue pain scores (VAS) of two groups were 3.43±0.75 and 1.65±0.74 (T=10.707, P<0.001), respectively. According to the comparison of postoperative observation indexes between the two groups, the amount of intraoperative blood loss and operation time in the study group were significantly shorter than those in the control group, and the VAS in the study group was significantly lower than that in the control group.

All available hematoxylin and eosin (H&E) samples from each case were reviewed by pathologists with expertise in Gynecologic Pathology. Samples were collected from tumor tissues of two cases of liomyoma, and then assessed for classic morphology. All cases displayed characteristic features of uterine fibroids. The pathological sections of these solid tumors showed that the tumor cells were distributed in bundles, braid and swirls, hyaline degeneration was observed in the tumor stroma, and the tumor cells grew in a benign long spindle shape (Figure. 3).

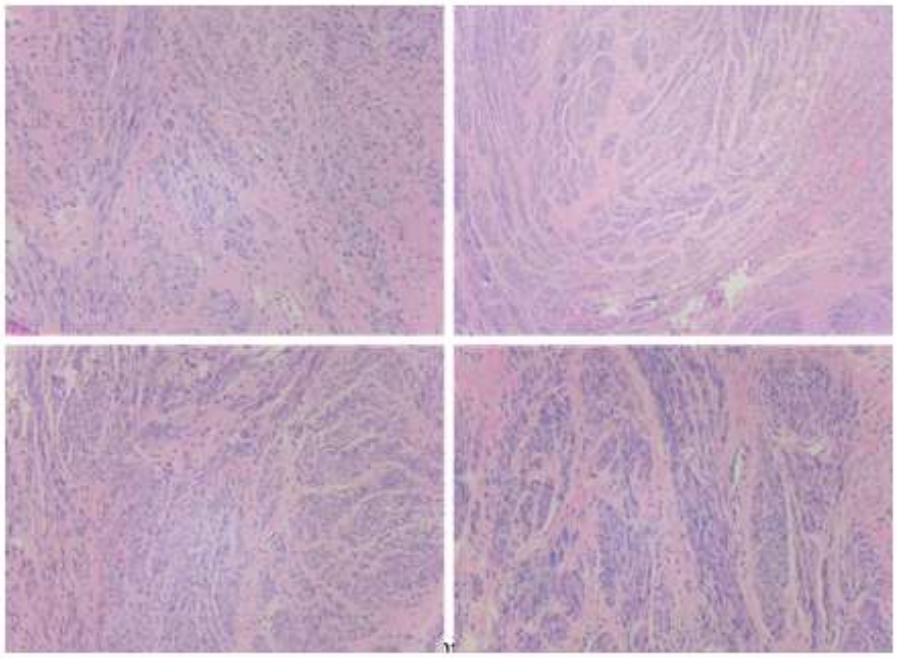

Figure 3: Histopathology of pathological sections of the solid tumors.

This indicates that most uterine leiomyomas are fusiform leiomyomas. The postoperative complications were compared between the two groups. The incidence of postoperative ureteral injury, bladder injury and urinary tract infection in the study group was significantly lower than that in the control group (Table 3, χ^2=4.211, P=0.04).

Control group	n (%)	Study group	n (%)
Ureteral injury	1 (2.5%)	Ureteral injury	0 (0.0%)
Bladder injury	1 (2.5%)	Ureteral injury	0 (0.0%)
Urinary tract infection	2 (5.0%)	Urinary tract infection	0 (0.0%)
Occurrence rate of complications	4 (10.0%)	Occurrence rate of complications	0 (0.0%)

Table 3: Comparison of postoperative complications between the two groups

Discussion

According to literature reports, the surgical methods for total hysterectomy for giant uterine fibroids include transabdominal, laparoscopic, and laparoscopic-assisted Yin, etc. [9]. Due to the difficulty in exposing the operating field and the increased risk of damage to the surrounding organs, especially the ureter and bladder, due to the huge uterine fibroids, total open hysterectomy was selected in this study. In addition, the research team placed ureteral catheter under the guidance of cystoscope before surgery as an intraoperative marker, and the operation was carried out smoothly without damage to the ureter and bladder. In the control group, there was one case of ureteral injury, which was caused by the displacement of the ureter to the side of the myoma due to the huge cervical myoma, and the ureter was accidentally injured when the right lateral uterine blood vessel was severed by forceps. Due to the intraoperative exploration before abdominal closure, intermittent bright seepage was found in the operation field of the right vaginal end, and the right ureteral injury was carefully identified again, and urologist was asked to perform ureteral repair in time. A ureteral stent was placed after surgery. Another case of bladder injury was due to the large uterine fibroids close to the anterior wall of the uterus. Due to the history of cesarean section, the bladder reflexion and peritoneum adhered to the abdominal wall, resulting in unclear boundaries, and the bladder injury was caused when the bladder was pushed down. The urological department was requested to perform bladder repair during the operation. Therefore, ureteral catheter is placed before operation for patients with large uterine fibroids undergoing total hysterectomy, which can indicate the ureter and avoid the ureter in time to avoid accidental injury.

There were no urinary tract infections in the study group and two urinary tract infections in the control group. In one case, the ureter could not be determined whether it was damaged due to bleeding and adhesion after hysterectomy due to giant uterine myoma, so the ureteral catheter was inserted by cystoscope after total hysterectomy, and urinary tract infection occurred after surgery; in the other case, the ureteral catheter was inserted for a long time during the operation to explore the ureter and the urinary catheter was retained for a long time, resulting in postoperative infection. It can be seen that repeated operation during the operation is easy to increase the probability of urinary tract infection. Preoperative cystoscopic ureteral catheter placement can make the ureter easy to identify, avoid repeated exploration, and reduce the incidence of urinary tract infection. In addition, preoperative indwelling ureteral catheter can make the surgical field of view wider, reduce the risk of ureteral injury in the case of narrow operating space, make the surgical progress smoother and faster, significantly shorten the operation time, significantly reduce the amount of intraoperative blood loss, and more conducive to postoperative recovery of patients.

As reported, hysterectomy may affect lower urinary tract function, and its most common long-term sequelae is stressing urinary incontinence [18]. It is believed that the pathological mechanism of the specific pathogenesis is related to the injury of pelvic floor support structure I during the operation. Since the main support and fix of the uterus, the sacral and cardinal ligaments around the uterus, were cut off in a total hysterectomy, so that the anatomical position of the bladder and the angle between the urethra changed [12]. During the operation, routine hand touch of the ureter was performed to determine whether there was any damage. For those who were uncertain

about whether there was damage, urology was asked to assist in determining during the operation, and ureteral stent was placed or ureteral and bladder repair was performed if necessary.

The tumor cells were distributed in bundles, braid and swirls, hyaline degeneration was observed in the tumor stroma, and the tumor cells grew in a benign long spindle shape. This indicates that most uterine leiomyomas are fusiform leiomyomas. However, in rare cases, cellular-rich and intravenously leiomyoma can also occur, and the nature of leiomyoma in these special cases needs to be further determined.

Because the implementation of cystoscopic ureteral catheterization before total hysterectomy of giant uterine myoma can significantly reduce the probability of ureteral injury and make the operation safer, thus reducing medical disputes and improving patient satisfaction, it is a good method to carry out complex pelvic surgery to prevent ureteral injury. At present, ureteral injury has also been reported in laparoscopic giant myoma resection, which is not easy to detect during the operation. Therefore, it is more necessary to preset ureteral catheter before laparoscopic giant myoma resection in the future, so as to reduce the incidence of ureteral injury and reduce the risk of surgery. At present, the ureteral catheterization under cystoscope is assisted by the urological department. In the future, gynecologists will use hysteroscope instead of cystoscope to make effective and rational use of resources and benefit more patients.

With the rapid development of society, more and more attention has been paid to women's health, and women, especially rural women, are encouraged to screen for gynecological diseases as soon as possible, detect uterine fibroids in time, and intervene as soon as possible to avoid giant uterine fibroids, the possibility of malignant changes, resulting in surgical difficulties and increased surgical complications. At present, there are many surgical methods in giant hysteromyoma resection at home and abroad, and more and more attention is paid to safe and effective treatment programs. Cystoscopy combined with ureteral intubation has good effect in laparotomy for large uterine fibroids, which can shorten operation time, be safer, reduce doctor-patient disputes, improve patient satisfaction, and is easy to be applied and promoted in clinic in county-level hospitals. At present, cystoscopy combined with ureteral intubation requires the assistance of urological surgeons. For primary gynecologists, cystoscopy can be replaced by hysteroscopy. It is hoped that through the promotion of this technology, more patients will benefit.

Conclusions

The application of cystoscopy combined with ureteral intubation in total hysterectomy with large uterine fibroids will reduce the amount of intraoperative blood loss, shorten the operation time, and will not cause ureteral injury. And reduce patient pain; The postoperative complications of patients were significantly reduced, and the postoperative recovery was good, thus reducing the psychological and economic burden of patients and their families, greatly improving patient satisfaction, and reducing doctor-patient disputes. Thus, it provides favorable guarantee for county-level hospitals to carry out complex gynecological surgery.

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Author contributions

Conceptualization and design: CMW and HJH. Analysis and/or interpretation of the data: all authors. Drafting of the article: CMW and FPH. Critical revision of the article for important intellectual content: all authors. Final approval of the article: all authors. All authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The experiments involved in this study were permitted by ethics committee under Wuwei Liangzhou Hospital Ethics Committee. Informed consent to participate was obtained from all of the participants in the study. All patients had agreed and signed a contract to use their samples experimentally.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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