

# Application of Transumbilical Paring & Retrieving Techniques in Laparoscopic Myomectomy

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## Research Article

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# Abstract

## Background

To investigate the safety and effectiveness of Transumbilical Paring & Retrieving Techniques(TPRT) in conventional laparoscopic surgery(CLS).

## Methods

From July 2020 and October 2021, referring to the establishment and repair technology of transumbilical laparoendoscopic single site surgery (TU-LESS), TPRT was applied in 111 cases of conventional laparoscopic myomectomy. The operation procedures include ordinary laparoscopic myomectomy and uterine suture, placing the endoscopic bag, bagging tumor, producing the umbilical incision, paring and retrieving tumor and repairing the umbilical incision. Under direct vision, The tumor in the specimen bag was removed by clamping, pulling and reducing through the umbilical incision.

## Results

All operations were completed successfully. the average number of leiomyomas removed was 1.94 (range, 1–11). The mean tumor weight was 155.45g (range, 40–665). The mean total time of tumor removal process from placing the endoscopic bag and repairing the umbilical incision was 12.60min (range, 6–28). The mean VAS scores evaluated 1 day postoperatively was 2.59(range, 1–4). Most pathology revealed benign leiomyoma. No malignancy occurred in any of the cases. A total of 111 cases were followed up through outpatient visits or by telephone, and the average follow-up time was 7.55months (range, 1–16).The umbilical incisions healed well, and there were no complaints of umbilical discomfort.

## Conclusion

Transumbilical Paring & Retrieving Techniques is safe, time saving, cost-efficient, and easy to learn.

## Introduction

Myomectomy is the first choice for women of childbearing age who want to maintain their fertility <sup>[1]</sup>. It can be done by laparotomy, transvaginal or laparoscopy. In laparoscopic myomectomy, the removal of the tumor is an important procedure. In transumbilical laparoendoscopic single site surgery (TU-LESS)<sup>[2]</sup>, the tumor can be quickly removed through the umbilical incision. In conventional laparoscopic surgery(CLS), the tumor was removed through a small incision either in the abdominal wall or in the posterior wall of the vagina. Transvaginal method has risks of retrograde infection and rectal injury. At

present, most of the leiomyoma is removed through the abdomen puncture hole combined with electromechanical power morcellators [3, 4]. But, clinical researches [5][6] found two problems due to the application of Electromechanical power morcellators. One of them is that it can lead to the progress of insidious uterine sarcoma and affect the survival rates of patients after surgery. The other is it may causes leiomyomatosis peritonealis disseminate [LPD]. To avoid the both, the latest expert consensus [7, 8] and U.S. Food & Drug Administration [9] recommended a standard tumor removal procedure which needs to combine morcellators and special disposable endoscopic retriever bags to avoid tumor implantation and metastasis. However, the operation time will be prolonged by 20-30 minutes due to the addition of this kind of specimen bag [7]. The bag is relatively expensive and not easy to be widely used besides. In addition, the application of morcellators in the abdominal cavity also has related complications [10]. To Improve operation efficiency in accordance with the principle of tumor-free technique in CLS, we improved the removal technique by combining the technique of establishment and repair of the transumbilical incision in TU-LESS and Vaginal "Pare Apple "Tumor Extraction [11] in CLS, we called the technique Transumbilical Paring & Retrieving Techniques [TPRT]. We removed the tumor through an extended transumbilical incision without adding any special consumables or instruments. The procedure of tumor removal can be faster and safer than the recommended standard method. The present study was conducted to explore the safety and feasibility of this TPRT in CLS.

## Materials And Methods

### Baseline characteristics

111 patients with uterine leiomyoma undergoing CLS by TPRT From July 2020 and October 2021 were enrolled in the study. 83 cases were from Guiqian International General Hospital and 28 cases from Anshun people's Hospital. The mean patient age was 40.48 years (range, 24–49). 78 cases were received because of uterine mass found in physical examination; 29 cases due to menstrual changes (of which 7 cases showed prolonged menstrual period, 19 cases showed increased menstrual flow, and 3 cases showed irregular vaginal bleeding), 3 cases were received due to frequent urination, one was due to difficulty urinating, and one was due to lower abdominal pain. All patients accepted preoperative ultrasound examination and confirmed diagnosis. 59 cases of single leiomyoma and 52 cases of multiple were eligible in this study with the mean diameter of the largest leiomyoma was 68.86mm (SD  $\pm 17.70$ ; range, 34–134). Leiomyoma types were classified according to FIGO [12] (Table 1).

The inclusion criteria were (1) if they had uterine leiomyoma on Gynecological examination and ultrasound examination indicating of laparoscopic surgery; (2) patients were willing to accept laparoscopic myomectomy. Patients were excluded if they were intolerance to surgery because of severe cardiopulmonary diseases or other complications. The study protocol was reviewed and approved by Ethical medical association of Guiqian International General Hospital [Approval Number: 2021 No.01]. Written informed consents were obtained from the patients.

### Surgical methods

Patients were received intravenous anesthesia with endotracheal intubation and then placed in the lithotomy position. After the preparation of routine disinfection cloth, a longitudinal incision about 15 mm was made downward from the deepest point of umbilicus. Through this incision, a Veress needle was inserted to establish pneumoperitoneum, and the pressure was set to 13-14 mmHg (1 mmHg=0.133 kPa), then a 10-mm trocar and laparoscope was inserted. Subsequently, two 5-mm trocars were inserted at the left lower quadrant abdomen as same as CLS. Myomectomy and uterine suture was performed routinely, and TPRT was performed.

## The TPRT procedure was performed as follows:

(1) According to the principle of tumor-free techniques, surgical specimen should be bagged and isolated from abdominal cavity before removing. An ordinary endoscopic specimen bag suitable for the diameter of tumor was inserted into the abdominal cavity through the 10-mm trocar. After the tumor was bagged, the tether of the bag was clamped for subsequent steps through the lower 5-mm trocar.

(2) An umbilical incision similar to TU-LESS was made. First stop pneumoperitoneum, pull off the 10-mm trocar. Second a longitudinal incision about 15 mm was made upward from the deepest point of umbilicus. The total length of skin incision was 30 mm (15 mm above and below the lowest point of umbilicus). Then the fascia layer below the skin incision and peritoneum was expanded to 40mm.

(3) The tumor was pared and removed in the bag through the incision. The tether of the specimen bag was clamped and guided to being taken out of abdomen cavity through the umbilical incision. The tumor can be clamped and pulled by towel clips, with the help of an assistant opening and pulling the specimen bag<sup>[11]</sup>. We pared the tumor and removed it with a sharp knife in the bag during the whole procedure. After all, the specimen bag was pulled out and the integrity was checked.

(4) The umbilical incision was sutured with 2-0 ETHICON Coated VICRYL (VCP 345) and restored to normal shape.

## Statistical indicators

The time of bagging tumor, producing umbilical incision, Paring and retrieving tumor and repairing umbilical incision, the number, texture and weight of leiomyoma, Visual Analog Scale (VAS) scores at the first day postoperative, the healing of umbilical incision one week postoperatively, were prospectively evaluated and recorded for statistical analysis.

Because this is an empirical exploration research, there is no contrast, descriptive statistics for both categorical (n, %) and continuous data (mean±standard deviation and range) were calculated. All statistical analyses were performed with SPSS for Windows, version 22.0.

## Results

All operations were completed successfully. the average number of leiomyomas removed was  $1.94 \pm 1.67$  (range, 1–11). The mean tumor weight was  $155.45 \pm 95.76$ g (range, 40–665). The time was counted since the endoscopic bag was placed to the umbilical incision was repaired, the mean total time of tumor removal process was  $12.60 \pm 3.78$ min (range, 6–28). The mean VAS scores evaluated 1 day postoperatively was  $2.59 \pm 0.65$ (range, 1–4). Pathology showed that all tumors were benign leiomyomas. No malignancy occurred in any of the cases. All the abdominal incisions healed well one week postoperatively. Details of complications, the timing of the procedure and the texture of the leiomyomas are listed in Table 2.

Table 1. Demographic Information of 111 Patients

Characteristics	N
Age (year)	$40.48 \pm 6.04$
Gravidity	$2.32 \pm 1.65$
Parity	$1.20 \pm 0.90$
BMI	$22.79 \pm 3.06$
Chief complaint (n, %)	
Uterine mass found on physical examination	78(72.3%)
Menstrual changes	29(26.1%)
Urinary system symptoms	3(2.7%)
Lower abdominal pain	1(0.9%)
Classification of leiomyoma diagnosed by ultrasound (n, %)	
Single	59(53.2%)
Multiple	52(46.8%)
Types according to FIGO diagnosed by ultrasound (n, %)	
Type 2	2(1.8%)
Type 3	1(0.9%)
Type 4	15(13.5%)
Type 5	39(35.1%)
Type 6	41(36.9%)
Type 7	2(1.8%)
Type 8	2(1.8%)
Mean diameter of the largest leiomyoma diagnosed by ultrasound(mm)	$68.86 \pm 17.70$

Table 2  
Operation Conditions and Postoperative Complications

<b><i>Variable</i></b>	<b><i>N</i></b>
Average number of leiomyomas removed	1.94±1.67
Texture of tumor (n, %)	
Hard	37(33.3%)
Medium hardness	53(47.7%)
Soft	21(18.9%)
Time of tumor removal process(min)	
Time for placing the endoscopic bag plus bagging tumor	2.03±1.24
Time for producing the umbilical incision	1.68±0.63
Time for paring and retrieving tumor	5.70±2.22
Time for repairing the umbilical incision	3.18±1.47
Total time of tumor removal process	12.60±3.78
Average tumor weight (g)	155.45±95.76
Incidence of operative complications [ n ( % )]	
Accidental skin injury around umbilicus [ n ( % )]	6(5.4%)
Bag breaks [ n ( % )]	11(9.9%)
VAS scores,1 day postoperatively	2.59±0.65
Cases with poor wound healing, 1 week postoperatively [ n ( % )]	0

## Discussion

### Deficiencies of current laparoscopic myomectomy

In TU-LESS, the scar of umbilicus is hidden, and the removal of tumor through umbilical incision is fast, safe and convenient. However, myomectomy and uterine suture procedures are more difficult <sup>[13]</sup>, the operation time is longer and bleeding is more than these in CLS. Above factors directly affect the surgeon's choice of operation method <sup>[14]</sup>. At present, conventional laparoscopic myomectomy is the most popular method. Much more surgical experiences of giant leiomyoma and difficult myomectomy were reported in literatures <sup>[1, 14, 15]</sup>.

Tumor removal is an important procedure in CLS. At present, it is mainly performed with leiomyoma morcellators which was invented in 1973<sup>[4]</sup>. According to the correlative references<sup>[3, 5, 10, 16–18]</sup>, the method may lead to intraabdominal organ damage owing to the incisive procedure is located in the abdominal cavity and lack of experience. More serious, this method may lead to extensive implantation and growth of uterine leiomyoma fragments. If the tumor is unsuspected sarcoma, this method may result in upstaging and decreased survival<sup>[19]</sup>.

To avoid these problems, the consensus of relevant experts<sup>[7, 8]</sup> and U.S. Food & Drug Administration<sup>[9]</sup> recommended that tumor-free principle should be followed in the process of tumor removal. On the basis of the current method of tumor removal, a special disposable endoscopic retriever bags should be added to isolate the tumor. The procedures include placing the special bag into the abdominal cavity, bagging the tumor, inflating the bag to establish the operation space, crushing tumor with a morcellator in the bag, and retrieving the tumor and the bag<sup>[7]</sup>.

However, the whole operation process is still in the abdominal cavity, and the risks of intraabdominal organ damages still exist. Meanwhile, the procedures of placing the special bag and bagging tumor are complicated, resulting in an extension of operation time about 20 minutes without calculating the time of crushing and retrieving tumor<sup>[7]</sup>. Meanwhile, the special bag is disposable material, which is relatively expensive and is not easy to be popularized in clinic.

## **Advantages and practical value of TPRT**

In this study, we performed 111 cases of conventional laparoscopic myomectomy by TPRT. Each TPRT was performed in line with the principle of tumor-free. The tumor was pared in the ordinary endoscopic specimen bag, completely isolated from abdominal wall and abdominal visceral organs. Other advantages compared to the recommended method are listed below.

First, TPRT can shorten the operation time. In our study, the mean total time of tumor removal process counted from inserting the ordinary specimen bag to the end of umbilicus repair is 12.60min(SD±3.78; range, 6–28). And the mean time for Paring and retrieving tumor is only 5.70min(SD±2.22; range, 1–14). They are much shorter than the time taken in recommended method that reported by Shi Yu et al<sup>[20]</sup>, which time for placing the special bag plus the puncture catheter plus the tumor in a morcellation was 22.1 min (SD± 8.9; range, 18–45), time for crushing tumor was 33.5 min (SD± 6.5; range, 20–55), time for retrieving tumor was 9.3 min (SD± 3.7; range, 5–15), and time for handling the bag was 15.4 min (SD± 8.2; range, 8–25). During the procedure of TPRT, we can clamp the tumor with towel clips directly and remove it with “Pare Apple” Tumor Extraction<sup>[11]</sup> which is mastered by most gynecologists and is performed such as in laparoscopic hysterectomy. When the blade is abraded by hard texture or large leiomyomas, the speed of Paring and retrieving tumor can be maintained by properly replacing a new surgical blade. It means that the time of tumor removal is not affected by the texture of tumor.

Second, TPRT has a lower risk of injury to abdominal organs. Different from the recommended method which procedures all performed in abdominal cavity, the possible traumatic excision of TPRT was close

to the abdominal wall around umbilicus. In our study, due to lack of experiences and carelessness in the early stage, there were 11 accidental specimen bag breaks, 6 of which damaged the local umbilicus skin. Solved by washing and suturing. There were no other major accidental damages. Local umbilicus skin damage is easy to repair, and in addition, it can be avoided by using thyroid retractor, small S-hook and other general surgical instruments after the specimen bag was pulled open.

Third, TPRT is easy to be popularized due to it is easy to master and it costs a little. Paring tumor through the umbilicus incision is equivalent to a simple laparotomy around umbilicus. So, it is not difficult for most surgeons to master. We removed a leiomyoma with a diameter of 134 mm within 10 minutes by using a 30-mm umbilical incision. TRPT can also be used for the complete and safe removal of other tumors, such as pelvic endometriosis nodule, exfoliated ovarian tumor, and subtotal hysterectomy specimen and so on. Meanwhile, TPRT does not need special disposable endoscopic retriever bags or morcellators. The ordinary instruments, blades and specimen bags are enough for performing TPRT. It should be noted that the length of the incision can be determined according to the size, texture of leiomyoma and the thick of patient's abdominal wall. For obese patients, the umbilical incision can be extended slightly. For smaller tumor, the incision can be reduced.

Besides, the scars can be seen on the abdomen skin is less, this technique will be accepted by patients easily. In the recommended method, we need to extend the 5-mm puncture hole to be a more than 15 mm incision in order to insert the leiomyoma morcellator. In our method, we extended the umbilicus incision as we did in TU-LESS. Owing to good ductility of the umbilicus, we could restore the normal appearance of the umbilicus after the tumor was removed. There were only two 5-mm scars more than TU-LESS. It is well known that, the difficulty of CLS is much lower than TU-LESS, and the indications of CLS are wider.

## Query of TPRT

The key point of the TPRT is to replace the incision that originally needed to be extended in the lower abdomen to the umbilicus during CLS. While optimizing the surgical procedure, the related complications need to be paid attention to. The main query is that the extended umbilical incision has potential postoperative wound infection, scars, and umbilical hernia due to the umbilical region is the weakest part of the abdomen. In a retrospective study by Park JY on the complications of transumbilical single port laparoscopic surgery<sup>[21]</sup>, the incidence of postoperative umbilical hernia was 0.4% (2/515), at 6 months and 8 months after surgery. The median follow-up time was 23.6 months (6.2-145.4) months, which was equivalent to the incidence of multi-port laparoscopic umbilical hernia. The length of the umbilical incision of the umbilical single port laparoscopic is usually 20 mm. When we take the tumor through the umbilical port, in order to quickly finish this step, we often extend the incision to 25~30 mm. It is equivalent to the length of umbilical incision in robotic single hole laparoscopic surgery which length is 25~40 mm<sup>[22, 23]</sup>. The existing literature<sup>[23-25]</sup> (the average follow-up time and the number of cases were 13.6 months, 1 month, 12 months and 12 cases, 7 cases, respectively, 129 cases) did not suggest an increase in complications such as infection of the umbilical incision and umbilical hernia after robot-assisted single port laparoscopic surgery. In this study, the umbilical repair suture technique draws on the



umbilical operation of TU-LESS. It is necessary to effectively close the peritoneum and fascia layer by layer, and then finish the subcutaneous and skin repair suture. It is necessary to completely stop bleeding during the suture process to avoid hematoma formation and reduce complications such as recent infections.

In conclusion, TPRT optimizes the surgical process in CLS. It is safe, time saving, low cost, easy to learn and to be popularized.

## Declarations

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### DISCLOSURES

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## References

1. Aksoy H, Aydin T, Ozdamar O, et al. Successful use of laparoscopic myomectomy to remove a giant uterine myoma: a case report[J]. J Med Case Rep. 2015;9:286.
2. Sun Dawei. Expert opinion on single-hole laparoscopic surgery in gynecology [J]. Chinese Journal of Obstetrics and Gynecology, 2016J 0 (10): 724–726.
3. Xuejie S, Lu H. Parasitic leiomyoma after laparoscopic myomectomy: a report of 2 cases and literature review. Chinese Journal of minimally invasive surgery, 2018 Journal of minimally invasive surgery 18 (10): 955–957.
4. Steiner RA, Wight E, Tadir Y, et al. Electrical cutting device for laparoscopic removal of tissue from the abdominal cavity[J]. Obstet Gynecol, 1993, 81(3): 471–474.
5. Denschlag D, Ackermann S, Battista MJ, et al. Sarcoma of the Uterus. Guideline of the DGGG and OEGGG (S2k Level, AWMF Register Number 015/074, February 2019)[J]. Geburtshilfe Frauenheilkd, 2019, 79(10): 1043–1060.
6. Wu, Haijing. Zhang Guonan. Research progress of peritoneal disseminated leiomyomatosis [J]. Chinese Journal of Obstetrics and Gynecology, 2015 Journal of Gynecology 0 (3): 232–234.
7. Lang Jinghe Z, Guonan X, Yang, et al. Consensus of Chinese experts on laparoscopic uterine (myoma) fragmentation [J]. Chinese Journal of practical Gynecology Obstetrics. 2020;36(07):626–

8. Halaska MJ, Haidopoulos D, Guyon F, et al. European Society of Gynecological Oncology Statement on Fibroid and Uterine Morcellation[J]. *Int J Gynecol Cancer*,2017,27(1):189–192.
9. U.S. Food & Drug Administration. UPDATE: The FDA recommends performing contained morcellation in women when laparoscopic power morcellation is appropriate [EB/OL].<https://www.fda.gov/medical-devices/safety-communications/updatefda-recommends-performing-contained-morcellation-women-when-laparoscopic-power-morcellation>.i¼»2020-02-25i¼½.
10. Wang X, Li Y. Modified transumbilical single-hole laparoscopic myomectomy [J]. *Chinese Journal of minimally invasive surgery*, 1919 (10): 919–921.
11. Liu Gaoyan M, Qinglian L. Peng. Application of transvaginal apple peeling in laparoscopic total hysterectomy [J]. *Medical Clinical Research*. 2015;32(9):1739–17.
12. Munro MG, Critchley HO, Fraser IS. The FIGO classification of causes of abnormal uterine bleeding in the reproductive years[J]. *Fertil Steril*,2011,95(7):2204–2208, 2201–2208.
13. Moon HS, Jeong K, Lee SR. Robotic-assisted single incision myomectomy in large myoma cases[J]. *Clin Exp Obstet Gynecol*,2017,44(2):283–287.
14. Peker N, Gundogan S, Sendag F. Laparoscopic Management of Huge Myoma Nascendi[J]. *J Minim Invasive Gynecol*,2017,24(3):347–348.
15. Song JY. Laparoscopic Resection of a Rare, Large Broad Ligament Myoma[J]. *Journal of Minimally Invasive Gynecology*,2015,22(4):530–531.
16. Liu Fujun. Dissemination and prevention of tissue comminution in laparoscopic hysteromyoma surgery [J]. *Study on Cancer Prevention treatment*. 2017;44(9):627–6.
17. Steller C, Cholkeri-Singh A, Sasaki K, et al. Power Morcellation Using a Contained Bag System[J]. *JSLs: Journal of the Society of Laparoendoscopic Surgeons*,2017,21(1):e2016-e2095.
18. Serur E, Zambrano N, Brown K, et al. Extracorporeal Manual Morcellation of Very Large Uteri Within an Enclosed Endoscopic Bag: Our 5-Year Experience[J]. *J Minim Invasive Gynecol*. 2016;23(6):903–8.
19. Mowers EL, Skinner B, Mclean K, et al. Effects of morcellation of uterine smooth muscle tumor of uncertain malignant potential and endometrial stromal sarcoma: case series and recommendations for clinical practice[J]. *J Minim Invasive Gynecol*. 2015;22(4):601–6.
20. Shi Yu, Guonan LHong,Z, et al. Analysis of the efficacy and safety of disposable endoscopic specimen bag in laparoscopic uterine (myoma) fragmentation [J]. *Tumor Prevention treatment*. 2020;and 33(5):395–400.
21. Park JY, Kim TJ, Kang HJ, et al. Laparoendoscopic single site (LESS) surgery in benign gynecology: perioperative and late complications of 515 cases. *Eur J Obstet Gynecol Reprod Biol*. 2013;167(2):215–8.

22. Yingchun M, Xiaoming G. Application of robotic single port laparoscopic surgery in the field of gynecology. *Obstetrics-Gynecology and Genetics (Electronic Edition)*, 2015(3):44–47.
23. Gao Jinghai J, Zhijun L. Junping, et al. Robot-assisted transumbilical single port laparoscopy in the treatment of cervical invasive carcinoma: clinical analysis of 12 cases. *J Prac Obste Gynecol*. 2019;35(10):797–800.
24. Lyu Xiaohui G, Xin L, Jia, et al. Primary study on robotic single-site laparoscopy in gynecological surgery. *Chinese journal of laparoscopic surgery (Electronic Edition)*. 2019;12(3):154–8.
25. Zhang Y, Kohn JR, Guan X. Single-incision hysterectomy outcomes with and without robotic assistance. *JSLS*,2019,23(4): e2019.00046.