Am J Transl Res 2022;14(4):2647-2654
www.ajtr.org /ISSN:1943-8141/AJTR0141651

Original Article

Comparison of clinical efficacy and safety of transvaginal natural endoscopic surgery and transumbilical single port laparoscopy surgery for endometrial cancer

Guna He[1,2], Lingyu Liu[1,2], Xiaomei Liu[1,2], Hui Guo[1,2], Lingling Chen[1,2], Rongzi Li[1,2]

[1]Department of Gynecology, Fuzhou Second Hospital, Fuzhou Second Hospital of Xiamen University, School of Medicine, Xiamen University, China; [2]The Third Clinical Medical College, Fujian Medical University, Fuzhou 350007, Fujian, China

Received January 10, 2022; Accepted March 9, 2022; Epub April 15, 2022; Published April 30, 2022

Abstract: Objective: To explore the difference in clinical efficacy and safety of transvaginal and transumbilical single port laparoscopy for endometrial cancer. Methods: We retrospectively included 100 endometrial cancer patients who were admitted to the Fuzhou Second Hospital for surgical treatment from September 2020 to September 2021 and divided them into two groups according to different surgical treatment options. Patients in Group A (48 cases) were treated with transvaginal natural endoscopic surgery (TNES), and those in Group B (52 cases) were with transumbilical single port laparoscopic surgery (TSPLS). The operation time, intraoperative blood loss, time to postoperative exhaust, length of hospital stay, pelvic lymph node dissection, and incision infection rate of two groups were compared. The white blood cell count (WBC), hemoglobin (Hb), hematocrit (Hct) of the two groups of patients before and after the surgery were compared between the two groups, as well as th VAS score of 24 hours after the operation, rate of complications during hospitalization, satisfaction with surgery and quality of life 3 months after surgery. Results: Compared with Group B, the operation time and intraoperative blood loss of Group A patients were markedly increased. The time to postoperative exhaust, length of hospital stay, incision infection rate, VAS score at postoperative 24 h, and complication rate of Group A were significantly lower than that of Group B. In addition, Group A had higher performance on the number of pelvic lymph node dissections, surgical satisfaction and quality of life 3 months after surgery. Conclusion: Transvaginal natural cavity endoscopy had better surgical results with faster postoperative recovery and higher safety compared with TSPLS, making it valuable in clinical application and worthy of further popularization.

Keywords: Transvaginal natural cavity endoscopy, transumbilical single port laparoscopy, endometrial cancer, clinical efficacy, safety

Introduction

Endometrial cancer (EC) is one of the common gynecological malignancy in female reproductive system, and its incidence has shown a gradual increase worldwide [1]. For the common form of endometrial gland adenocarcinoma, conservative treatment and surgical treatment are relatively preferred when come to clinical treatment [2]. However, the treatment principle of EC mainly relies on the basis of comprehensive preoperative assessment and intraoperative surgical pathology. Conventional surgical methods include open surgery and laparoscopic surgery [3, 4], among which, laparoscopic surgery has the advantages of less trauma, less intraoperative bleeding and faster postoperative recovery, and thus a routine choice for EC surgery [5].

Although traditional laparoscopy has been widely used in the staging of EC, transumbilical single port laparoscopic surgery (TSPLS) is gradually being promoted because of its higher aesthetics [6]. TSPLS completes all surgical operations through the natural cavity of the human umbilicus, holding almost the same surgical effect that traditional laparoscopic surgery does in current stage [7]. Transvaginal natural endoscopic surgery (TNES) (V-NOTES) is also a surgical method that has gradually emerged in the field of gynecology in recent

years, in which vagina was served as an approach to avoid abdominal skin scars [8]. Since the first report of TNES for ectopic pregnancy after salpingectomy in 2021, both domestic and foreign scholars have successively reported the use of TNES for adnexectomy, ovarian cystectomy, and uterus Resection, etc. [9]. TSPLS and TNES, as representatives in the minimally invasive era, were both proven to be able to effectively improve postoperative pain and patient satisfaction and are both favored by targeting patients.

At present, the application of single port laparoscopy in endometrial cancer is still in its early stage and thus with limited experience [10]. However, the application of TNES in EC is in the exploratory stage, and the present study compared the clinical efficacy and safety of TNES and TSPLS in EC, so as to provide more surgical options for EC patients.

Materials and methods

Clinical information

We retrospectively included 100 EC patients admitted to the Fuzhou Second Hospital for surgical treatment from September 2020 to September 2021. They were divided into two groups according to different surgical treatment options. Patients in Group A (48 cases) were treated with TNES, and those in Group B (52 cases) were with TSPLS.

Inclusion criteria: patients diagnosed with EC via pathological examination; patients ≥35 years old; patients who could bear surgery; patients with preoperative assessment of lesions confined to the uterus, tumor diameter <4 cm, no cervical involvement, and no intra-abdominal metastasis. Exclusion criteria: patients with endometriosis; patients with severe organ dysfunction; patients with severe medical and surgical basic diseases; patients with inflammation and infection; patients with multiple history of abdominal surgery; patients suspected of multiple tumor metastases; patients who refused surgical treatment. All patients agreed to join the study with a written informed consent form signed. This study was in conform to the Declaration of Helsinki and had been approved by the Fuzhou Second Hospital ethics committee and conformed to.

Surgical methods

Surgical operation for patients in Group A: We pulled the cervix with the mouse tooth forceps, incised the vaginal mucosa along the vaginal vault ring, separated the vesicocervix space and the rectum-uterine space, sutured the uterosacral ligament and part of the main ligament, inserted the transvaginal single port laparoscopic special instrument platform (Space Cardi, Beijing), applied incision protective sleeve to surround the cervix, and filled it with CO_2 gas (maximum pressure 12 mm Hg, 1 mm Hg=0.133 kPa). The buttocks were taken high and the head was taken low, patients were then inserted with conventional laparoscopic instruments with 10 mm 30° laparoscopic lens. The uterine artery, broad ligament, uterine round ligament, and pelvic funnel ligament were cut off after bipolar electrocoagulation, and the uterine specimen was obtained. Subsequently, single port laparoscopic approach platform was re-inserted for pelvic and peri-aortic lymph node dissection. After resection, the wound was washed and inspected. After hemostasis, the vaginal stump was closed with a 2-0 absorbable thread.

Surgical operation for patients in Group B: An incision about 1.5 to 3 cm long was made in the umbilicus, a single-hole multi-channel tube was inserted, and carbon dioxide was injected to establish an artificial pneumoperitoneum. The pneumoperitoneum pressure was set to 11-13 mm Hg. The vaginal lifting cup was placed under the stage, and the pelvic and abdominal cavity was explored through laparoscopy, including the gastrointestinal tract, omentum, liver, diaphragm, and peritoneal surface, to determine whether there were distant metastatic lesions. Subsequently, we inspected the uterus and double appendages to find out whether there were metastatic lesions in the pelvic cavity and collected ascites specimens or peritoneal lavage fluid for cytology. Then, bipolar electrocoagulation was performed to ligate both fallopian tubes. The uterus was pulled to the left to expose the right pelvic cavity, ultrasonic knife was to cut the right round ligament near the pelvic wall and the anterior broad ligament along the broken end of the round ligament. Simultaneously, the peritoneum above the funnel ligament of the right pelvic pelvis was incised, and the ovarian arteries and

veins were freed. The ovarian arteries and veins were clamped with an ultrasonic knife and then cut off by electrocoagulation. Same process was performed to the left round ligament, broad ligament, pelvic funnel ligament and ovarian arteries and veins. The uterus was pushed up by lifting the uterine device, the bladder and the uterus were cut open by the ultrasonic knife, then the bladder was pushed down close to the cervix, and the uterine arteries and veins were cut off by electrocoagulation at the isthmus of the cervix with ultrasonic knife. After cutting off the vagina in the fornix of the external cervix, the uterus and bilateral appendages were completely removed. Subsequently, pelvic lymph node dissection was performed. We separated the posterior peritoneum along the posterior lobe of the broad ligament up to 2 cm above the right common iliac artery, and freed the ureter. Close to the beginning of the common iliac artery, an ultrasonic knife was used to blunt and sharply free the right common iliac artery, internal iliac artery, and external iliac artery and laterally from top to bottom, removing the lymph nodes and adipose tissue attached to the paravascular. Then the deep circumflex iliac vein was seen crossing at the lower end of the external iliac artery, where the inguinal lymph nodes were separated and cleared. Lastly, we entered the obturator fossa between the external iliac vein and the internal iliac artery to remove the lymph node tissue in the obturator fossa.

Evaluation index

Operation time (from the first cut through the skin to the end of skin suture) and intraoperative blood loss (the total amount of fluid in the negative pressure suction bag minus the total amount of peritoneal lavage, peritoneal effusion and anti-adhesion agent) of two groups of patients were calculated and compared.

The time to postoperative exhaust and hospitalization days of the two groups of patients were counted and compared.

The number of pelvic lymph nodes dissected and the incision infection rate (poor incision healing and infection occurred within 1 month after operation) of the two groups of patients were calculated and compared.

The white blood cell count (WBC), hemoglobin (Hb) and hematocrit (Hct) of the two groups of patients before and 3 days after the operation were detected and compared with blood cell analyzers.

The international standard Visual Analogue Scale (VAS) score [11] (0-10 points) was utilized to evaluate the pain 24 hours after the operation of the two groups of patients, and the magnitudes of pain was scaled with 11 digits from 0 to 10 (points), the larger the score, the greater the pain.

The incidence of complications during hospitalization of the two groups of patients was counted and compared. Complications included intestinal obstruction, urinary retention, pelvic lymphatic cyst and venous thrombosis.

A self-made surgical satisfaction questionnaire was used to evaluate and compare the surgical satisfaction of two groups of patients with a full score of 10 points, a score of 7-10 indicated very satisfied, 4-6 indicated satisfied, and a score less than 4 indicated dissatisfied. Surgical satisfaction rate = (number of very satisfied + number of satisfied)/total number of patients ×100%.

The quality of life scale (developed by the European Organization for Research and Treatment of Cancer, FACT-G) [12] was applied to compare life quality of two groups of patients 3 months after surgery in terms of physical function, cognitive function, emotional function, role function, and social function with a total score of 100 points.

Statistical methods

The SPSS 19.0 statistical software was applied for statistical analysis of the data, and GraphPad Prism 8 for figure rendering. Count data was expressed as n (%) and analyzed using the χ^2 test. Measurement data was expressed as mean ± standard deviation, and the inter-group comparison was conducted using independent t test while intra-group comparison was conducted using paired t test. $P<0.05$ indicated that the difference was statistically significance.

Results

General information comparison

Two groups of patients were comparable for no significant differences in age, BMI, reproduc-

Table 1. General information table

Factors	Group A n=48	Group B n=52	t/X^2	P
Age (years)			0.014	0.907
≥45	31 (64.58)	33 (63.46)		
<45	17 (35.42)	19 (36.54)		
BMI (kg/m^2)	22.13±1.00	22.13±1.27	0.042	0.967
History of pelvic surgery			0.054	0.567
YES	18 (37.50)	15 (28.85)		
NO	30 (62.50)	37 (71.15)		
Number of pregnancies			0.017	0.897
≥2	20 (41.67)	21 (40.38)		
<2	28 (58.33)	31 (59.62)		
Pathology type			0.024	0.877
adenocarcinoma	33 (68.75)	35 (67.31)		
squamous cell carcinoma	15 (31.25)	17 (32.69)		
Pathological stage			0.007	0.933
Stage I~II	31 (64.58)	34 (65.38)		
Stage III	17 (35.42)	18 (34.62)		

Table 2. Comparison of operation time and intraoperative blood loss between two groups

Items	Group A n=48	Group B n=52	t	P
Operation time min	105.33±14.54*	92.63±6.88#	5.652	<0.001
Intraoperative blood loss ml	26.87±2.86*	23.18±3.08#	6.194	<0.001

Note: * and # are compared using independent t-test; P<0.001.

Table 3. Comparison of postoperative exhaust time and length of hospital stay between two groups

Items	Group A n=48	Group B n=52	t	P
postoperative exhaust time (h)	15.76±2.8*	18.81±3.58#	4.718	<0.001
length of hospital stay (d)	5.29±0.77*	7.08±0.92#	10.50	<0.001

Note: * and # are compared using independent t-test; P<0.001.

tive history, etc. (P>0.05). Details are shown in **Table 1**.

Comparison of operation time and intraoperative blood loss

The operation time and intraoperative blood loss of patients in Group A were (105.33± 14.54) min and (26.87±2.86) ml, respectively. Those in Group B were (92.63±6.88) min and (23.18±3.08) ml respectively, indicating statistically significant differences (both P<0.05), as shown in **Table 2**.

Comparison of postoperative exhaust time and length of hospital stay

The time to postoperative exhaust and length of hospital stay of Group A were (15.76±2.8) h and (5.29±0.77) d respectively. Those of group B were (18.81±3.58) h and (7.08±0.92) d respectively, showing a notable longer duration than those of Group A patients (P<0.05) (**Table 3**).

Comparison of the number of pelvic lymph nodes dissected and the infection rate of incision

The number of pelvic lymph node dissections in Group A was 31.63±5.94, and the incision infection rate was 8.33% (4/48). Those of Group B was 24.81±4.75, and the incision infection rate was 23.08% (12/52) respectively, indicating a significantly lower number of pelvic lymph node dissections, yet a significantly higher incision infection rate when compared with those in Group A (**Table 4**).

Table 4. Comparison of the number of pelvic lymph nodes dissected and the infection rate of incisions in the two groups

Items	Group A n=48	Group B n=52	t/X^2	P
number of pelvic lymph nodes dissected	31.63±5.94*	24.81±4.75#	6.364	<0.001
infection rate of incision	4 (8.33)**	12 (23.08)##	4.037	0.045

Note: * and # are compared using independent t-test; P<0.001. ** vs ## are compared using X^2 test; P < 0.05.

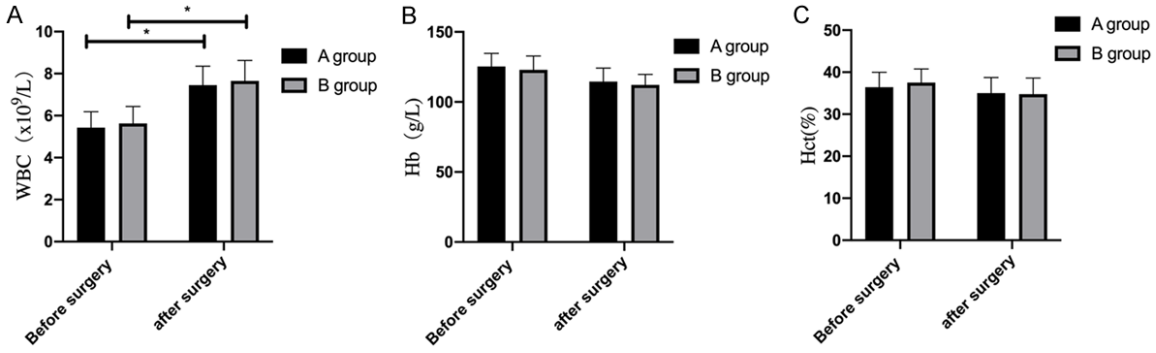

Figure 1. Comparison of WBC, Hb and Hct before and after operation between two groups; A: Comparison of WBC before and after operation; B: Comparison of Hb before and after operation; C: Comparison of Hct before and after operation. *P<0.05.

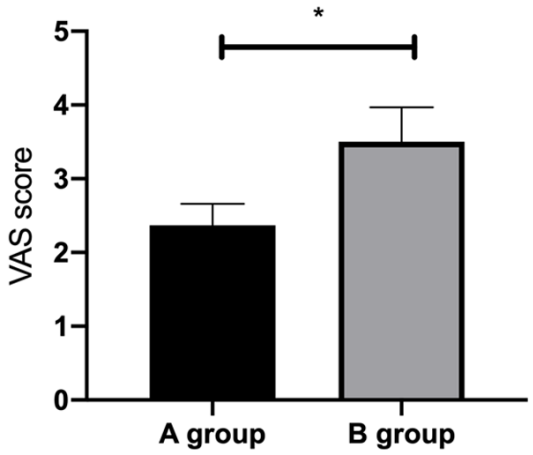

Figure 2. Comparison of the VAS scores of the two groups of patients after surgery. *P<0.05.

Comparison of WBC, Hb and Hct before and after operation

The WBC, Hb and Hct of the patients in Group A were 5.43±0.76 (×10^9/L), 125.33±9.31 (g/L), 36.43±3.55 (%) before surgery, and 7.45±0.9 (×10^9/L), 114.58±9.55 (g/L), 35.04±3.68 (%) after surgery. Corresponding data of Group B were 5.63±0.81 (×10^9/L), 122.91±9.89 (g/L), 37.54±3.22 (%) and 7.65±0.98 (×10^9/L), 112.16±7.5 (g/L), 34.78±3.81 (%) respectively. The WBC of the two groups of patients after the operation was strikingly higher than that before the operation, and there were no notable changes in Hb and Hct before and after the operation (P>0.05). As shown in **Figure 1**.

Comparison of the VAS scores of patients in two groups after surgery

24 hours after surgery, the VAS score was 2.37±0.29 in Group A and 3.50±0.47 in Group B (P<0.05). Details are shown in **Figure 2**.

Comparison of the incidence of complications during hospitalization

After treatment, the number of patients in Group A who developed intestinal obstruction, urinary retention, pelvic lymphatic cysts, and venous thrombosis were 2, 1, 1, and 1, respectively with a complication rate of 10.42%. Those in Group B were 3, 4, 3, and 3, respectively. The complication rate of Group B was 25.00%, which was significantly higher than that in Group A. See **Table 5** for details.

Comparison of surgical satisfaction

The number of patients in Group A who were very satisfied, satisfied, and dissatisfied with the operation were 32, 14, and 2, respectively, with a satisfaction rate of 95.83%. Corresponding data in Group B were 25, 15 and 12

Table 5. Comparison of adverse reaction rates between the two groups of patients [n, (%)]

Adverse reactions	Group A n=48	Group B n=52	X^2	P
Intestinal obstruction	2 (4.17)	3 (5.77)	-	-
Urinary retention	1 (2.08)	4 (7.69)	-	-
Pelvic lymphatic cyst	1 (2.08)	3 (5.77)	-	-
Venous thrombosis	1 (2.08)	3 (5.77)	-	-
Complication rate	5 (10.42)	13 (25.00)	3.596	0.058

Table 6. Comparison of surgical satisfaction between the two groups of patients

Surgical Satisfaction	Group A n=48	Group B n=52	X^2	P
Very satisfied	32 (66.67)	25 (48.08)	-	-
Satisfied	14 (29.17)	15 (28.85)	-	-
Dissatisfied	2 (4.17)	12 (23.08)	-	-
Surgical satisfaction rate	46 (95.83)*	40 (76.92)#	7.413	0.007

Note: * and # are compared using X^2 test; $P < 0.05$.

Table 7. Comparison of the quality of life of the two groups of patients after treatment

Quality of Life	Group A n=48	Group B n=52	X^2	P
Physical function	51.77±5.22*	43.69±4.24#	8.525	<0.001
Cognitive function	61.22±5.29*	51.82±5.94#	8.330	<0.001
Emotional function	53.65±5.72*	44.74±4.98#	8.324	<0.001
Role function	60.28±5.48*	52.72±5.12#	7.132	<0.001
Social function	56.21±5.62*	45.98±4.79#	9.820	<0.001

Note: * and # are compared using independent t-test; P<0.001.

respectively with a surgical satisfaction of 76.92%, indicating that the surgical satisfaction of Group A was significantly higher than that of Group B. Details are shown in **Table 6**.

Comparison of life quality in two groups of patients after treatment

The quality of life of the two groups of patients was evaluated 3 months after the operation, showing that life quality in Group A were significantly higher than those in Group B. Details are presented in **Table 7**.

Discussion

EC is a relatively common clinical malignant tumor, accounting for 20.0% to 30.0% of female reproductive system malignancies [13]. Most patients with EC visit the clinic because of irregular vaginal bleeding, fortunately they are usually in early or middle stage at the time of diagnosis [14]. At present, surgical treatment is still the main treatment option for EC. Compared with open surgery, laparoscopic technology has the advantages of less trauma, less bleeding and faster recovery, and has become the preferred surgical method [15].

However, traditional laparoscopic techniques usually require 3 to 4 openings, while TSPLS can be performed only by opening the umbilical hole with inconspicuous abdominal scar [16]. TNES takes the vagina with no incision in the abdomen, which avoids penetrating the abdominal muscles, fascia and possible puncture-related complications [17]. The goal of TNES is to improve patient's prognosis through rapid recovery and good cosmetic effects, while traditional vaginal surgery is favored because of the inconspicuous scar on the abdomen. However, compared with traditional vaginal surgery, TNES can clearly display the scope of surgery through vaginal laparoscopy, enlarge the surgical field of vision, and easily handle narrow areas that cannot be reached by the fingers with the help of laparoscopic instruments [17, 18]. In our study, we first compared the operative time, intraoperative blood loss, and length of stay in the two groups of patients. Results showed that although the operation

time and intraoperative blood loss of TNES were greater than those of TSPLS, it had the advantage of notable shorter first exhaust time and length of hospital stay, suggesting that TNES could promote faster recovery of patients. Previous studies have explained that the long implementation time of TNES was mainly due to its complicated operation and higher requirements for doctors [19]. The intraoperative blood loss in Group A was more than that in Group B, the difference in blood loss between two groups was within 20 ml, so there would be no difference in hemoglobin.

Subsequently, we compared the number of lymph node dissections and incision infection rate of the two groups of patients, which turns out that the number of lymph node dissections in patients undergoing TNES was notably greater than that in patients undergoing TSPLS. However, the incision infection rate and VAS score of TNES patients were drastically lower than those treated with TSPLS. Since The number of lymph node dissection is an important indicator to measure the effect of surgery [20], above results suggested that natural vaginal cavity endoscopic surgery was of better surgical effect especially in lymph nodes clearance and had a lower infection rate. In addition, postoperative complication rate comparison indicated that the complication rate of patients undergoing TNES was significantly lower than that of patients undergoing TSPLS, suggesting that TNES was of better safety. Studies have pointed out that although laparoscopic surgery had obvious advantages such as less trauma, less bleeding, high safety, less impact on organ function, and quick postoperative recovery, it could lead to a higher risk of postoperative complications because of requirements of puncture, pneumoperitoneum, and electric perm [21, 22]. However, the known TNES is not only minimally invasive, but also more conducive to the recovery of patients after surgery and has more advantages than laparoscopic surgery [23]. In addition, transvaginal resection of the uterus can also reduce the incidence of pelvic adhesions and relieve patient's pain with no obvious incision in the patient's abdomen, which is helpful for the development of early supplementary treatment, while reducing the impact on pelvic organs and blood vessels with lower incidence of postoperative complications and favorable long-term prognosis [24, 25]. The results of life quality between two groups also showed that all indicators of patients who underwent TNES were significantly higher than those of patients who underwent TSPLS, and undoubtedly with higher satisfaction. Analysis of the reason for this phenomenon was that the TNES could effectively ensure the full exposure of the surgical field, effectively avoid the phenomenon of directly touching the abdominal organs such as gauze and gloves, and reduce the degree of stimulation of the gastrointestinal tract by surgical operation. At the very least, it will provide favorable conditions for patients to reduce postoperative pain, thereby improving the quality of life of patients [26].

In summary, TNES has better surgical results than TSPLS and has faster postoperative recovery and higher safety, which is worthy of further promotion and development. However, this study also has certain limitations. Due to the small sample size, the results of this study need to be further demonstrated by multi-center and big data research. Second, whether transvaginal natural orifice endoscopic surgery can bring more benefits to patients was uncertain, but we will further analyze its comprehensive impact on the prognosis of patients with endometrial cancer in future studies.

Disclosure of conflict of interest

None.

Address correspondence to: Guna He, Department of Gynecology, Fuzhou Second Hospital, Fuzhou Second Hospital of Xiamen University, School of Medicine, Xiamen University, China; The Third Clinical Medical College, Fujian Medical University, No. 47 Shangteng Road, Cangshan District, Fuzhou 350007, Fujian, China. Tel: 0591-2216-9527; E-mail: he.guna@Yahoo.com

References

[1] Braun MM, Overbeek-Wager EA and Grumbo RJ. Diagnosis and management of endometrial cancer. Am Fam Physician 2016; 93: 468-474.

[2] Passarello K, Kurian S and Villanueva V. Endometrial cancer: an overview of pathophysiology, management, and care. Semin Oncol Nurs 2019; 35: 157-165.

[3] Onstad MA, Schmandt RE and Lu KH. Addressing the role of obesity in endometrial cancer risk, prevention, and treatment. J Clin Oncol 2016; 34: 4225-4230.

[4] Murali R, Delair DF, Bean SM, Abu-Rustum NR and Soslow RA. Evolving roles of histologic evaluation and molecular/genomic profiling in the management of endometrial cancer. J Natl Compr Canc Netw 2018; 16: 201-209.
[5] Yang J, Na YJ, Song YJ, Choi OH, Lee SK and Kim HG. The effectiveness of laparoendoscopic single-site surgery (LESS) compared with conventional laparoscopic surgery for ectopic pregnancy with hemoperitoneum. Taiwan J Obstet Gynecol 2016; 55: 35-39.
[6] Park JY, Kim DY, Kim SH, Suh DS, Kim JH and Nam JH. Laparoendoscopic single-site compared with conventional laparoscopic ovarian cystectomy for ovarian endometrioma. J Minim Invasive Gynecol 2015; 22: 813-819.
[7] Kim WC, Lee JE, Kwon YS, Koo YJ, Lee IH and Lim KT. Laparoendoscopic single-site surgery (LESS) for adnexal tumors: one surgeon's initial experience over a one-year period. Eur J Obstet Gynecol Reprod Biol 2011; 158: 265-268.
[8] Baekelandt JF, De Mulder PA, Le Roy I, Mathieu C, Laenen A, Enzlin P, Weyers S, Mol BWJ and Bosteels JJA. Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) adnexectomy for benign pathology compared with laparoscopic excision (NOTABLE): a protocol for a randomised controlled trial. BMJ Open 2018; 8: e018059.
[9] Fu T, Liu Y and Li K. Hybrid transvaginal natural orifice transluminal endoscopic surgery of radical sigmoidectomy for sigmoid colon cancer. Surg Oncol 2019; 30: 90-91.
[10] Park JY, Kim DY, Suh DS, Kim JH and Nam JH. Laparoendoscopic single-site versus conventional laparoscopic surgical staging for early-stage endometrial cancer. Int J Gynecol Cancer 2014; 24: 358-363.
[11] Sung YT and Wu JS. The visual analogue scale for rating, ranking and paired-comparison (VAS-RRP): a new technique for psychological measurement. Behav Res Methods 2018; 50: 1694-1715.
[12] Song L, Tan X, Bredle J, Bennett AV and Northouse L. Psychometric properties of the FACT-G quality of life scale for family caregivers of cancer patients. Qual Life Res 2020; 29: 2241-2252.
[13] Emons G and Vordermark D. Adjuvant treatment for endometrial cancer. Curr Opin Oncol 2019; 31: 404-410.
[14] Clarke MA, Long BJ, Del Mar Morillo A, Arbyn M, Bakkum-Gamez JN and Wentzensen N. Association of endometrial cancer risk with postmenopausal bleeding in women: a systematic review and meta-analysis. JAMA Intern Med 2018; 178: 1210-1222.
[15] Galaal K, Donkers H, Bryant A and Lopes AD. Laparoscopy versus laparotomy for the management of early stage endometrial cancer. Cochrane Database Syst Rev 2018; 10: CD006655.
[16] Kang JH, Lee DH and Lee JH. Single-port laparoscopically assisted transumbilical ultramini-laparotomic myomectomy. J Minim Invasive Gynecol 2014; 21: 945-950.
[17] Li CB and Hua KQ. Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) in gynecologic surgeries: a systematic review. Asian J Surg 2020; 43: 44-51.
[18] Baekelandt J. Transvaginal natural-orifice transluminal endoscopic surgery: a new approach to myomectomy. Fertil Steril 2018; 109: 179.
[19] Yang YS, Hur MH, Oh KY and Kim SY. Transvaginal natural orifice transluminal endoscopic surgery for adnexal masses. J Obstet Gynaecol Res 2013; 39: 1604-1609.
[20] Rossi EC, Kowalski LD, Scalici J, Cantrell L, Schuler K, Hanna RK, Method M, Ade M, Ivanova A and Boggess JF. A comparison of sentinel lymph node biopsy to lymphadenectomy for endometrial cancer staging (FIRES trial): a multicentre, prospective, cohort study. Lancet Oncol 2017; 18: 384-392.
[21] Angioni S, Pontis A, Sedda F, Zampetoglou T, Cela V, Mereu L and Litta P. Single-port versus conventional multiport access prophylactic laparoscopic bilateral salpingo-oophorectomy in high-risk patients for ovarian cancer: a comparison of surgical outcomes. Onco Targets Ther 2015; 8: 1575-1580.
[22] Lee YY, Kim TJ, Kim CJ, Park HS, Choi CH, Lee JW, Lee JH, Bae DS and Kim BG. Single port access laparoscopic adnexal surgery versus conventional laparoscopic adnexal surgery: a comparison of peri-operative outcomes. Eur J Obstet Gynecol Reprod Biol 2010; 151: 181-184.
[23] Xu B, Liu Y, Ying X and Fan Z. Transvaginal endoscopic surgery for tubal ectopic pregnancy. JSLS 2014; 18: 76-82.
[24] Zou X, Zhang G, Xie T, Yuan Y, Xiao R, Wu G, Wang X, Xu H, Liu F, Wu Y, Liao Y, Liu Q, Sun Y, Yang B, Wang L, Xu C and Gao X. Natural orifice transluminal endoscopic surgery in urology: the Chinese experience. Asian J Urol 2020; 7: 1-9.
[25] Kim SM, Baek JM, Park EK, Jeung IC, Choi JH, Kim CJ and Lee YS. A comparison of single-, two- and three-port laparoscopic myomectomy. JSLS 2015; 19: e2015.00084.
[26] Kuon Lee S, You YK, Park JH, Kim HJ, Lee KK and Kim DG. Single-port transumbilical laparoscopic cholecystectomy: a preliminary study in 37 patients with gallbladder disease. J Laparoendosc Adv Surg Tech A 2009; 19: 495-499.