ORIGINAL ARTICLE

Surgical outcome of benign cases with pelvic adhesions undergoing robotic total hysterectomy

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Abstract

Background: Robotic total hysterectomies have been considered contraindicated for patients with intra-abdominal adherences, but the evidence for this is not strong, and we hypothesized that the procedure can be of benefit even in these cases. In our research, we analyzed how the severity of pelvic adhesions affects robotic total hysterectomy, and by comparing different types of adhesions, we can further identify the outcomes differences in between, which may aid in future surgical decision making.

Methods: Prospective cohort study (Canadian Task Force classification II-2). All 410 patients with uterine myoma or adenomyosis undergoing robotic total hysterectomies between 2011 and 2016 using the da Vinci Si system by the same surgeon in Taipei Medical University Hospital were included in the study.

Results: Baseline characteristics, blood loss, docking time, operation time, time to perform uterine artery ligation (UAL), pain score, hospital stay, complication rate, and laparotomy conversion rate were analyzed between benign cases with or without pelvic adhesions undergoing robotic total hysterectomy. Furthermore, in our subgroups analysis, we have divided the patients with adhesion into different groups according to the severity of adhesion. The abdomen and pelvic cavity was divided into nine sections, and the outcomes of different adhesion condition were compared. We found that patients with adhesions had increased docking time and operation time, but other differences between groups were not statistically significant. The results of the adhesion group showed no significant increases in blood loss, intra- and postoperative complications, and length of hospital stay. Only significantly longer surgical time compared with the normal group was noted.

Conclusion: Our results suggest that robotic total hysterectomies with UAL are effective and safe for patients with benign gynecologic conditions, and the surgical method should be considered even for patients with adhesion risks.

Keywords: Adenomyosis; Hysterectomy; Laparotomy; Myoma; Postoperative complications

1. INTRODUCTION

Severe intra-abdominal adhesions often occur because of intra-abdominal infections or previous abdominal surgeries, such as myomectomy, cystectomy, electrofulguration for endometriosis, appendectomy, or bowel surgery.[1] History of any of these procedures were considered as a contraindication for laparoscopic surgeries because of the increase in surgical difficulty and operating times, leading to conversion to laparotomy and causing 8.8% of re-admissions.[2]

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Currently, robotic surgery has become one of the fastest developing fields in gynecological surgery, and we believe it provides advantages for patients with severe intra-abdominal adhesions. However, no strong evidence exists of its benefits for patients with severe adhesions undergoing robotic surgery.

Therefore, we retrospectively reviewed the data of 492 patients diagnosed with uterine myoma or adenomyosis and underwent robotic-assisted total hysterectomy surgery (RTH) at our institution between June 2011 and December 2016. The patients were divided into two groups, depending on whether they had intra-abdominal adhesions. We analyzed the surgical outcomes of RTH with uterine artery ligation (UAL) in these patients to identify any advantages of robotic surgery for patients with intra-abdominal adhesions.

We hope that our study may help advance the robotic surgery technology to improve management of complicated benign gynecological diseases.

2. METHODS

This is a retrospective cohort study. We implemented four inclusion criteria: (1) Patients diagnosed as having uterine myoma or adenomyosis confirmed by pathology report, (2) operation date between December 2011 and April 2016, (3) patients undergoing RTH using the da Vinci Si system with UAL, and (4) Operation performed by the same surgeon in the Taipei medical university hospital. Our exclusion criteria included patients with confirmed malignancies on pathology reports and cases missing surgical videos or medical records data. We have identified 492 cases by the inclusion criteria, and analyzed data for 410 cases after applying the exclusion criteria. Data were collected from medical records and operation videos of each patient.

For all of our cases, the diagnosis of pelvis adhesions were only confirmed during the surgery and not from the preoperation assumptions. Among the 410 cases, 287 cases lacked intra-abdominal adhesions, and 123 had intra-abdominal adhesions. For our subgroup analysis, we further subdivided the patients in the adhesion group according to the adhesion severity, location, and quantity (Fig. 1).

We defined the adhesion severity scoring system as follows: 0, no adhesions; 1, filmy adhesions, blunt dissection; 2, strong adhesions, sharp dissection; and 3, very strong vascularized adhesions, sharp dissection, damage hardly preventable.[3] We classified the adhesion locations into 10 categories, nine based on the relative location with respect to the umbilicus (right upper, epigastrium, left flank, left lower, pelvis right lower, right flank, central; Supplementary File 1 http://links.lww.com/JCMA/A154), and one for bowel-to-bowel adhesions.[4] We defined all adhesions to the uterus or ovaries as pelvic adhesions, and the numbers of 10 adhesion areas were counted in each patient.

We collected data including the patient's age, body weight, body height, body mass index (BMI), parity, vaginal delivery and abdominal operation histories, high CA-125 level, uterine length, and uterine weight, and the usage of high camera and assistant ports during the procedure as baseline characteristics. We defined high CA-125 levels as those above 35 U/mL. The high camera port was defined as the main trocar located about 6 cm above the umbilicus, and the nonhigh camera port was defined as the main trocar located right at the umbilicus. We located the assistant port laterocaudally to the robotic left arm, allowing for the laparoscopic instrument entrance. We obtained uterine length measurements by preoperative transvaginal and transabdominal ultrasounds. The uterine weight was obtained after the pathological report.

Surgical outcomes were collected, which included blood loss, blood transfusion, docking time, operation time, time to UAL, postoperative pain scores, postoperative 24-hour pain scores, hospital stay lengths, complications, and laparotomy conversion rates. We defined the docking time from the beginning of surgical preparation after endotracheal tube insertion to the moment the robotic console was ready to begin, and the operation time was defined from the moment of the Veress needle insertion or skin incision by scalpels to the completion of skin wound closure.

All of the operations were performed using the third generation da Vinci Si system. We located the camera port about 6 cm above or at the umbilicus, and only two robotic arms were applied: scissors with monopolar electrocautery in the right hand and a grasper with bipolar electrocautery in the left hand. The two robotic arms were located laterocaudally to the camera port. UAL was performed immediately after adhesiolysis as part of the robotic total hysterectomy procedure in all the cases, and vaginal closure transvaginally was performed using 1-0 Vicryl.

IBM SPSS Statistics 24th edition software was applied for statistical analysis. For continuous variables, independent t and one-way analysis of variance (ANOVA) tests were used to compare means between two or more groups, with Scheffe used as

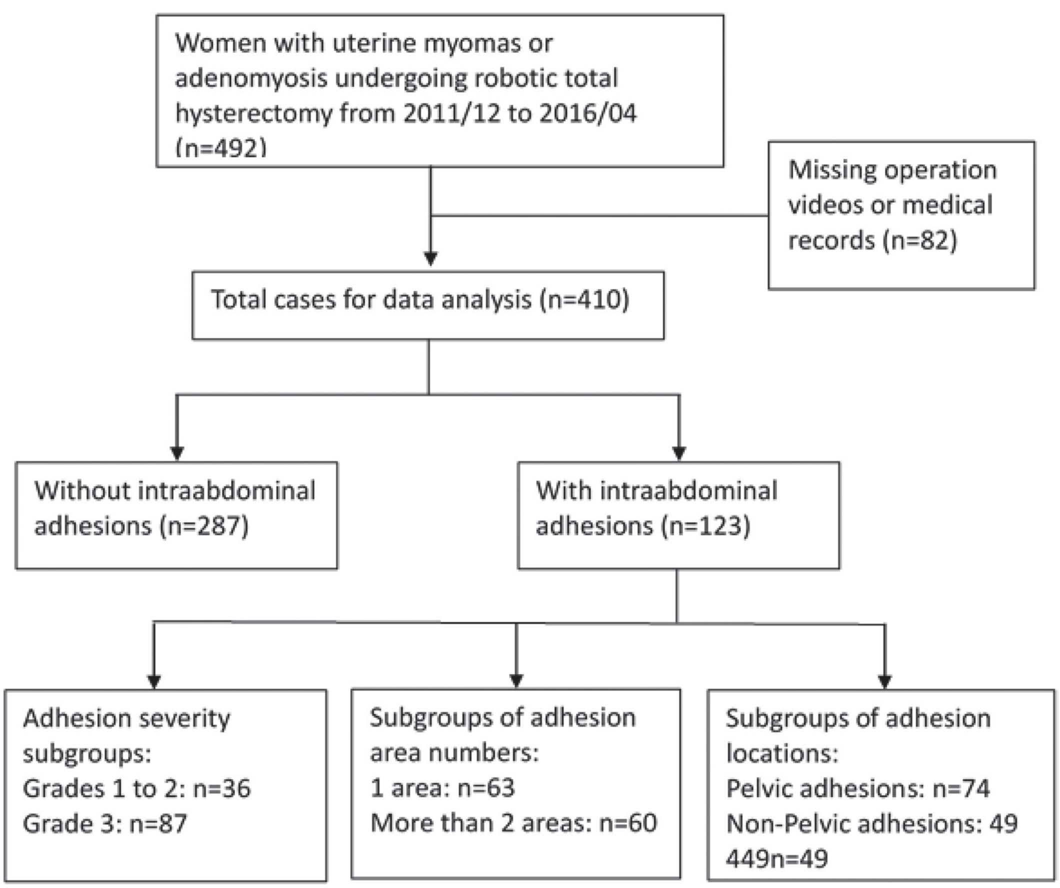

Fig. 1 Study flowchart.

the posthoc test of ANOVA. Data were reported as means and standard deviations. For categorical variables, χ^2 or Fisher exact tests were used for analysis. In addition, data were reported as counts and percentages. All statistical testes were two-tailed, and p values lower than 0.05 were considered statistically significant.

The Taipei Medical University Joint Institutional Review Board approved the study (TMU-JIRB, N201611016).

3. RESULTS

We found that patients in the nonadhesion group were older than those in the adhesion group (46.35 vs 44.5 years; $p < 0.01$). The mean parity of women (1.73 vs 1.18, $p < 0.01$) and vaginal delivery numbers (45.6% vs 32.5%; $p = 0.02$) were higher in the adhesion group. Women in the adhesion group had more high-level camera ports (98.4% vs 90.6%; $p < 0.01$) and more assistant port usages (69.1% vs 35.2%; $p < 0.01$). There were no differences in body weight, body height, BMI, CA-125 level, uterine length, or uterine weight between the two groups. When comparing surgical outcomes, the UAL time was longer in the adhesion group patients (29.8 vs 21.3 minutes; $p < 0.01$). However, we found no significant differences in docking time, operation time, blood loss, blood transfusion, pain scores, hospital stay, complications or laparotomy conversion rates between groups (Table 1).

Pelvic adhesions were the most common accounting for 60.2% of all adhesions and were presented in 18.0% of all RTH cases, including adhesions within the posterior uterine wall and bilateral ovaries. The second most common adhesion type was bowel-to-bowel (26.8% in RTH with adhesions, 8% in all RTH), and the third most common was the central adhesion around the umbilicus (21.1% in RTH with adhesions, and 6.3% in all RTH).

During our subgroup analysis, we divided patients in the adhesion group into subgroups, based on their adhesion severities, the number of areas involved, and the locations. We compared subgroups with different adhesion score (between 0, 1, 2, and 3) and found those in the group with adhesion score 0 were older (46.4 vs 44.3 years; $p < 0.01$) and had higher parity (1.72 vs 1.05; $p < 0.01$) than those in the group with adhesion score 3. Besides, there were significant differences in vaginal delivery ($p = 0.02$), abdominal operation history ($p = 0.02$), high-level camera port ($p = 0.03$), and assistant port usage ($p < 0.01$) between the groups. The docking times ($p < 0.01$) and UAL times ($p < 0.01$) were longer in adhesion score 3 group than in the adhesion score 1–2 and 0 groups, and the operation time was almost significantly different between groups ($p = 0.06$; Table 2).

For the adhesion areas subgroups, we divided patients into three groups (0 adhesion areas, 1 adhesion area, and more than 2 adhesion areas). We found significant differences in age between groups ($p = 0.02$), but the differences disappeared in the post hoc analysis. We noted the patients with no adhesions had higher parity than those in the group with more than two adhesion areas (1.72 vs 1.07; $p < 0.01$), and there were also significant differences in vaginal delivery ($p = 0.05$), abdominal operation history ($p = 0.02$), high camera port ($p = 0.03$), and assistant port ($p < 0.01$) between the groups. When comparing surgical outcomes, the operation time was longer in patients with more than two adhesion areas than in those without adhesions (162.4 vs 139.2 minutes; $p < 0.01$). The UAL times were longer in those with more than two adhesions than in those with 1 or 0 adhesion areas (32.9 vs 27.2 vs 21.3 minutes; $p < 0.01$; Table 3).

For the adhesion location subgroups, we compared patients with pelvic adhesions and those with nonpelvic adhesions. The patients with adhesion scores of 3 (86.5% vs 46.9%; $p < 0.01$) and those with more than two adhesion areas (59.5% vs 32.7%; $p < 0.01$) had a higher proportion of pelvic adhesions. The docking times (35.7 vs 25.3 minutes; $p < 0.01$) were longer and the postoperative pain scores (2.80 vs 2.20; $p < 0.01$) were higher in the patients of the pelvic adhesion group (Table 4).

Table 1

Baseline characteristics and surgical outcomes of patients

	Without adhesion (n = 287)	With adhesion (n = 123)	p^a
Baseline characteristic			
Age (31–73 years)	46.35 (6.0)	44.5 (5.9)	**<0.01**
Body weight (kg)	58.7 (9.2)	58.5 (10.4)	0.87
Body height (cm)	159.0 (5.8)	159.7 (5.2)	0.23
BMI	23.2 (3.6)	23.0 (3.9)	0.51
Parity	1.73 (1.3)	1.18 (1.1)	**<0.01**
Vaginal delivery history	131/287 (45.6%)	40/123 (32.5%)	**0.02**
Abdominal operation history	139/287 (48.4%)	78/123 (63.4%)	**<0.01**
High CA-125 level	137/287 (47.7%)	56/123 (45.5%)	0.55
High-level camera port	260/287 (90.6%)	121/123 (98.4%)	**<0.01**
Assistant port usage	101/287 (35.2%)	85/123 (69.1%)	**<0.01**
Uterine length (cm)	7.8 (2.1)	7.4 (1.9)	0.10
Uterine weight (g)	339.6 (244.2)	282.9 (138.2)	0.08
Surgical outcomes			
Blood loss	122.3 (152.9)	138.0 (206.1)	0.39
Blood transfusion	7/287 (2.4%)	3/123 (2.4%)	0.85
Docking time (min)	29.8 (13.5)	31.5 (13.1)	0.23
Operation time (min)	139.2 (48.4)	151.8 (50.8)	0.18
UAL time(min)	21.3 (9.5)	29.8 (14.3)	**<0.01**
Pain score	2.63 (1.25)	2.56 (1.28)	0.63
24-h pain score	1.66 (0.94)	1.68 (0.89)	0.91
Hospital stay (d)	3.59 (2.77)	3.82 (1.81)	0.39
Complications	10/287 (3.5%)	8/123 (6.5%)	0.17
Laparotomy conversion	2/287 (0.7%)	2/123 (1.6%)	0.59

A p value less than 0.01 is considered as highly statistically significant.

BMI = body mass index; UAL = uterine artery ligation.

[a]Independent t, χ^2, Fisher exact tests.

4. DISCUSSION

Surgical options for total hysterectomy with good cosmetic effects, including vaginal hysterectomy and laparoscopically assisted vaginal hysterectomy (LAVH),[5] may be used in uncomplicated cases. However, if the patient has a high risk of intra-abdominal adhesions, the minimally invasive approaches to hysterectomy may not be performed. The many factors increasing the risk of intra-abdominal adhesions include pelvic infection, tissue hypoxia or ischemia, trauma caused by a laparotomy, foreign body reactions, previous adhesiolysis, and the presence of intraperitoneal blood.[6] Many researches comparing robotic vs laparoscopic hysterectomy for benign diseases have been published.[7-14] Studies have shown longer operation times, the same laparotomy conversion rates, and higher hospital costs with RTH than with LAVH.[7-14] Our analysis suggests that complex hysterectomies being performed robotically,[7] including cases of patients with stage III–IV endometriosis, previous multiple laparotomies, severe adhesions, and large and heavy uteruses.[15]

When it comes to robotic hysterectomy vs laparoscopic hysterectomy, previous studies have shown high BMIs, laparotomy history, more severe endometriosis, high risks of intra-abdominal adhesion, larger uterus sizes, and longer operation time resulting in worse surgical outcomes in the group of robotic hysterectomy.[7,9,11,13] However, based on our analysis, we believe that the da Vinci Surgical System provides surgeons with a better surgical vision, flexible range of instrument motion, and comfortable

Table 2

Characteristics and surgical outcomes of subgroups with various adhesion severity

Adhesion severity[b]	0 (n = 287)	1–2 (n = 36)	3 (n = 87)	p^a
Baseline characteristics				
Age (y)	46.4 (6.0)	45.1 (6.0)	44.3 (5.9)	**0.01 (severity 0> 3)**
Body weight (kg)	58.7 (9.2)	59.8 (10.7)	58.0 (9.6)	0.63
Body height (cm)	159.0 (5.8)	160.1 (5.4)	159.6 (5.0)	0.45
BMI	23.2 (3.6)	23.3 (4.0)	22.8 (3.9)	0.62
Parity	1.72 (1.27)	1.58 (1.23)	1.05 (0.99)	**<0.01 (severity0 > 3)**
Vaginal delivery	130/287 (45.3%)	16/36 (44.4%)	25/87 (28.7%)	**0.02**
Abdominal operation history	138/287 (48.1%)	23/36 (63.9%)	56/87 (64.4%)	**0.02**
High CA-125 level	136/287 (47.4%)	16/36 (44.4%)	41/87 (47.1%)	0.96
High camera port	259/287 (90.2%)	36/36 (100%)	86/87 (98.9%)	**0.03**
Assistant port usage	101/287 (35.2%)	25/36 (69.4%)	60/87 (69.0%)	**<0.01**
Uterine length (cm)	7.8 (2.1)	7.4 (1.9)	7.4 (1.9)	0.25
Uterine weight (g)	338.8 (244.6)	302.4 (170.5)	278.3 (124.6)	0.19
Surgical outcomes				
Blood loss	122.3 (152.9)	131.9 (103.6)	140.5 (236.3)	0.67
Blood transfusion	7/287 (2.4%)	0/36 (0%)	3/87 (3.4%)	0.53
Docking time (min)	29.8 (13.5)	24.5 (10.2)	34.6 (13.2)	**<0.01 (Severity 0< 3, 1–2, <3)**
Operation time (min)	139.2 (48.4)	150.0 (42.0)	152.5 (54.2)	0.06
UAL time (min)	21.3 (9.5)	26.8 (9.4)	31.1 (15.8)	**<0.01 (Severity0 < 1–2, 0 < 3)**
Pain score	2.63 (1.25)	2.39 (1.57)	2.63 (1.13)	0.55
Pain score 24 h	1.66 (0.94)	1.69 (0.82)	1.66 (0.92)	0.98
Hospital stay (d)	3.59 (2.77)	3.69 (0.71)	3.86 (2.10)	0.67
Complication	10/287 (3.5%)	2/36 (5.6%)	6/87 (6.9%)	0.29
Conversion	2/287 (0.7%)	0/36 (0%)	2/87 (2.3%)	0.47

A *p* value less than 0.01 is considered as highly statistically significant.

ANOVA = analysis of variance; BMI = body mass index; UAL = uterine artery ligation.

[a]One-way ANOVA (post hoc test: Scheffe), χ^2, Fisher exact test.

[b]Scoring: 0 no adhesions, 1 filmy adhesions, blunt dissection, 2 strong adhesions, sharp dissection, 3 very strong vascularized adhesions, sharp dissection, damage hardly preventable.

Table 3

Characteristics and surgical outcomes of subgroups with various numbers of adhesion sites

Numbers of adhesion sites	0 area (n = 287)	1 area (n = 63)	More than 2 areas (n = 60)	p^a
Baseline characteristics				
Age (y)	46.4 ± 6.0	44.6 ± 5.5	44.4 ± 6.5	**0.02**
Body weight (kg)	58.7 ± 9.2	56.8 ± 9.6	60.3 ± 10.9	0.12
Body height (cm)	159.0 ± 5.8	159.9 ± 4.8	159.6 ± 5.5	0.47
BMI	23.2 ± 3.6	22.2 ± 3.5	23.7 ± 4.1	0.06
Parity	1.72 ± 1.27	1.34 ± 1.1	1.07 ± 1.08	**<0.01 (0 area > morethan 2areas)**
Vaginal delivery	130/287 (45.3%)	22/63 (34.9%)	19/60 (31.7%)	**0.05**
Abdominal operation history	138/287 (48.1%)	40/63 (63.5%)	39/60 (65.0%)	**0.02**
High CA-125 level	136/287 (47.4%)	33/63 (52.4%)	24/60 (40.0%)	0.38
High camera port	259/287 (90.2%)	62/63 (98.4%)	60/60 (100%)	**0.03**
Assistant port usage	101/287 (35.2%)	38/63 (60.3%)	47/60 (78.3%)	**<0.01**
Uterine length (cm)	7.8 ± 1.1	7.5 ± 1.8	7.3 ± 1.9	0.21
Uterine weight (g)	338.8 ± 244.6	299.3 ± 136.3	323.2 ± 220.1	0.18
Surgical outcomes				
Blood loss	122.3 ± 152.9	136.1 ± 244.2	140.0 ± 158.3	0.69
Blood transfusion	7/287 (2.4%)	1/63 (1.6%)	2/60 (3.3%)	0.78
Docking time (min)	29.8 ± 13.5	21.4 ± 13.1	21.6 ± 13.3	0.48
Operation time (min)	139.2 ± 48.4	141.7 ± 50.2	162.4 ± 49.6	**<0.01 (0 area < morethan 2areas)**
UAL time (min)	21.3 ± 9.5	27.2 ± 10.8	32.9 ± 17.0	**<0.01 (0 area < 1 area < morethan 2areas)**
Pain score	2.63 ± 1.25	2.49 ± 1.19	2.63 ± 1.37	0.73
24-h pain score	1.66 ± 0.94	1.70 ± 0.82	1.64 ± 0.96	0.94
Hospital stay (day)	3.59 ± 2.77	3.73 ± 2.10	3.90 ± 1.45	0.67
Complication	10/287 (3.5%)	5/63 (7.9%)	3/60 (5.0%)	0.24
Conversion	2/287 (0.7%)	2/63 (3.2%)	0/60 (0%)	0.22

The p value that is less than 0.05 as statistically significant and is less than 0.01 as highly statistically significant.

ANOVA = analysis of variance; BMI = body mass index; UAL = uterine artery ligation.

[a]One-way ANOVA (post hoc test: Scheffe), χ^2, Fisher exact test.

Table 4

Characteristics and surgical outcomes of subgroups with pelvic or nonpelvic adhesion

	Pelvic adhesion (n = 74)	Nonpelvic adhesion (n = 49)	p^a
Baseline characteristics			
Age (y)	44.7 ± 6.3	44.3 ± 5.3	0.71
Body weight (kg)	59.0 ± 10.7	57.9 ± 9.9	0.57
Body height (cm)	159.1 ± 5.1	160.6 ± 5.2	0.12
BMI	23.3 ± 4.1	22.4 ± 3.5	0.21
Parity	1.10 ± 0.93	1.38 ± 1.28	0.17
Vaginal delivery	25/74 ± 33.8%	16/49 ± 32.7%	0.90
Abdominal operation history	44/74 (59.5%)	35/49 (71.4%)	0.21
High CA-125 level	34/74 (45.9%)	23/49 (46.9%)	0.91
High camera port	73/74 (98.6%)	49/49 (100%)	1.00
Assistant port usage	54/74 (73.0%)	31/49 (63.3%)	0.25
Uterine length (cm)	7.4 ± 1.8	7.4 ± 1.9	0.90
Uterine weight (g)	285.9 ± 144.5	285.2 ± 133.9	0.98
Adhesion severity			**<0.01**
1–2	10/74 (13.5%)	26/49 (53.1%)	
3	64/74 (86.5%)	23/49 (46.9%)	
Adhesion areas			**<0.01**
1 area	30/74 (40.5%)	33/49 (67.3%)	
More than 2 areas	44/74 (59.5%)	16/49 (32.7%)	
Surgical outcomes			
Blood loss	122.3 ± 149.2	161.7 ± 270.4	0.30
Blood transfusion	1/74 ± 1.4%	2/49 ± 4.1%	0.56
Docking time (min)	35.7 ± 12.9	25.3 ± 10.9	**<0.01**
Operation time (min)	151.1 ± 49.0	152.9 ± 53.8	0.84
UAL time (min)	30.8 ± 13.9	28.4 ± 14.9	0.37
Pain score	2.80 ± 1.30	2.20 ± 1.15	**0.01**
Pain score 24 h	1.76 ± 0.84	1.54 ± 0.94	0.19
Hospital stay (d)	3.64 ± 0.93	4.08 ± 2.62	0.18
Complication	3/74 (4.1%)	5/49 (10.2%)	0.26
Laparotomy conversion	0/74 (0%)	2/49 (4.1%)	0.16

A *p* value less than 0.01 is considered as highly statistically significant.
BMI = body mass index; UAL = uterine artery ligation.
[a]Independent *t*, χ^2, Fisher exact test.

seating position than other surgical techniques, which allow the surgeons to exert their expertize to the fullest. Hence, we hope our results will contribute to the reevaluation of robotic surgery applied on patients with severe intra-abdominal adhesions, and assist in the update of indications for robotic surgery.

In our research, when comparing the variables of the adhesion and nonadhesion groups, we found age, parity, vaginal delivery, abdominal operation history, and assistant port usage showed significant differences between the two groups, but we found no differences in body weight, height, BMI, CA-125 level, uterine length, or uterine weight. According to our surgical outcomes results, only the longer UAL time was higher in the adhesion group. Unexpectedly, we found no significant differences in docking time, operation time, blood loss, blood transfusion, pain scores, hospital stay, complication, and laparotomy conversion rates between the groups (Table 1). There were each two cases of laparotomy conversion in both groups. In the group without adhesion, the conversion was due to large uterus with excessive blood loss and poor surgical view. As for the adhesion group, both patients had the conversion result from the frozen pelvis. The adhesion was so severe that it required surgeons of genitourinary and general surgery to join the team work. One of the cases turned out to be genital tuberculosis confirmed by pathology, and the other was a case of endometriosis.

In our subgroup analysis of adhesion severity and numbers of affected areas, the above-mentioned adhesion risks are also corresponding to the result of increased adhesion severity and areas (Tables 2 and 3). As mentioned previously, in addition to the need for assistant port usage and longer UAL time for the patients in the adhesion group, we also noted longer docking times in the patients with increased adhesion areas and longer operation times in those with high adhesion severity. We have noticed that the docking time is shorter in adhesion severity group 1–2 compared with adhesion severity group 0, but the *p* value did not show significance in the difference. Furthermore, the unequal number of cases in these two groups might also lead to analytical bias, and other factors including the skills of the assistants might also be taken into account.

From our result, it can be concluded that performing UAL can require more operation time, but there are several advantages provided by conducting the procedure. UAL has already been demonstrated in previous research as a feasible way to reduce intraoperative blood loss in certain gynecological surgery.[16] Especially in the circumstances of pelvic adhesion, in which there are more difficulties with identifying the structure and higher risk in vessel injuries, the hemostatic effect of UAL could further aid in facilitating the surgical procedure and reducing morbidity associated with surgery. Besides, with the help of the endowrist instrument of robot, which is a useful tool in operating in very tight spaces and difficult angles, UAL can be conducted smoothly in most of our surgeries without complications.

Intra-abdominal adhesions complicate surgeries, and pelvic adhesions (including posterior uterine wall and bilateral ovaries adhesions) are the most common and difficult to operate within gynecological surgeries. According to our study, there are no reliable ways to evaluate pelvic adhesions before the operations, and tests like ultrasound, magnetic resonance imaging (MRI) scans, and computed tomography (CT) scans do not detect them very frequently. We believe that history, pelvic examination by an experienced physician, or the presence of other symptoms, such as pain during defecation, dyspareunia, or periodic diarrhea, are more adequate for pelvic adhesion evaluation.[17] We also found that the patients with pelvic adhesions have a higher incidence of postoperative pain, and special measures need to be taken in advance to alleviate their symptoms after the operations.

There are some limitations within our research. First of all, the unequal distribution of patients in the subgroups of adhesion severity may lead to analytical bias. Second, due to that some of the patients did not receive their previous treatment in our hospital, we could not get a thorough understanding of their previous surgery, including the procedure, time, complications, etc. It is our future goal to acquire more data regarding patients who has gone through robotic surgery with pelvic adhesions, and to evaluate the outcome between groups, which might aid in clinical decision making.

According to our results, for patients who have pelvic adhesions, receiving robotic total hysterectomy may require longer docking time and time to perform UAL, but there are no increased rates of blood loss, complications, laparotomy conversion comparing to nonadhesion group. We strongly believe that for patients suffering from benign gynecology diseases with high risks of intra-abdominal adhesions, with robotic surgery offering better surgical view and more flexible instruments, it should be taken into account as the first choice when surgical treatment is considered.

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APPENDIX A. SUPPLEMENTARY DATA

Supplementary data related to this article can be found at http://links.lww.com/JCMA/A154.

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