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Robotic Trachelectomy After Supracervical Hysterectomy for Benign Gynecologic Disease

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ABSTRACT

Background and Objectives: A renewed interest in the supra cervical approach to hysterectomy has created a cohort of patients with a retained cervix at risk of persistent symptoms requiring a subsequent trachelectomy. The objective of this study was to evaluate the efficacy of robotic trachelectomy after a previous supracervical hysterectomy.

Methods: This is a retrospective chart review of women who had robotic trachelectomy after supracervical hysterectomy for benign gynecologic disease from January 2009 through October 2014.

Results: Eleven patients underwent robotic trachelectomy for benign conditions during the observed period. Prior supracervical hysterectomy had been performed for pelvic pain (8/11, 73%), abnormal uterine bleeding (7/11, 64%), and dysmenorrhea (5/11, 45%). In 10 of 11 patients, the symptoms leading to robotic trachelectomy were the same as those leading to supracervical hysterectomy. The time from hysterectomy to recurrence of symptoms ranged from 0.5 to 26 months (median, 6), whereas the time interval from previous surgery to robotic trachelectomy ranged from 1 to 57 months (median, 26). Mean age and body mass index at robotic trachelectomy were 42 ± 5.4 years and 32 ± 6.1 kg/m^2. Mean length of surgery was 218 ± 88 minutes (range, 100–405). There was 1 major postoperative complication involving bladder perforation and subsequent vesicovaginal fistula (VVF). Endometriosis was seen in 27% of pathologic specimens and cervicitis in another 27%; 45% showed normal tissue histology. In 6 (55%) cases, symptoms leading to trachelectomy resolved completely after surgery, and the other 5 (45%) patients reported a significant improvement.

Conclusions: Although trachelectomy can be a challenging surgery, our experience suggests that the robotic approach may be a valuable means of achieving safe and reproducible outcomes.

Key Words: Benign gynecologic disease, Robotic trachelectomy technique, Supracervical hysterectomy.

INTRODUCTION

A resurgence of interest in the supracervical approach to hysterectomy has occurred over the past 20 years. Early studies of supracervical hysterectomy (SCH) demonstrated improved outcomes compared to total hysterectomy, particularly in sexual and urinary function, in addition to a diminished risk of vaginal prolapse.[1–5] Although such claims did not stand up to subsequent scrutiny,[6–9] SCH persisted as many supported retaining the cervix as a way to facilitate the performance of laparoscopic hysterectomy and make it accessible to a wider population of surgeons. These trends have created a cohort of post-hysterectomy patients at risk of persistent or recurrence of symptoms requiring a subsequent trachelectomy, defined as the surgical removal of the cervix from an intact uterus, or the excision of a retained surgical stump. There are several surgical techniques reported in the literature for trachelectomy. The preferred surgical approach should be based on the clinical indication, anatomic considerations, and the surgeon's experience.

Several large studies advocating for vaginal trachelectomy reported less morbidity and shorter hospital stay, compared with laparotomy.[10–12] In cases of prolapse, the vaginal approach may be preferred[12]; however, in patients with chronic pelvic pain or a history of endometriosis or adhesive disease, laparoscopy may offer an advantage in

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anatomic visualization and dissection.[13,14] To date, few studies have described the surgical techniques and outcomes of laparoscopic trachelectomy.[13,14] This paucity of information may reflect a lack of widespread adoption of this approach, which could be due to its technical challenges.

Robotic surgery may offer potential advantages in overcoming the challenges of traditional laparoscopy. A thorough literature search on robot-assisted laparoscopic trachelectomy (RT) after SCH revealed only a single case report and a case series.[15,16] We, therefore, elected to review the surgical outcomes of patients in our health system who underwent RT after SCH.

MATERIALS AND METHODS

This study was a retrospective chart review of women who had RT after SCH for benign indications from January 2009 through October 2014. The study was approved by our institutional review board.

Clinical data were obtained from the patients' electronic medical records. Information regarding patient demographics and medical, surgical, obstetric, and gynecologic history were collected. The indications for SCH, the mode of surgery, and the postoperative course were reviewed. In regard to the RT procedure, we gathered data regarding the indications for surgery, the preoperative imaging performed, and the time interval between SCH and RT. Any concomitant procedure at the time of the RT was documented. Intraoperative findings, postoperative course, and findings on final pathology were obtained. Patients' charts were reviewed to document resolution and persistence or worsening of symptoms.

Description of Surgical Technique

Patients in our series were referred to the division of minimally invasive gynecologic surgery for persistent symptoms after SCH. All had complex surgical history, including multiple laparotomies and severe endometriosis, pelvic adhesions or both. Therefore, robotic trachelectomy was offered as a safe and effective surgical approach that could treat all potential pathologies. Preoperative Papanicolaou smear was obtained in all cases to rule out cervical dysplasia. All women underwent an outpatient chemical bowel preparation and were given perioperative prophylactic antibiotics.

After the induction of general anesthesia, the patient was placed in a dorsal supine lithotomy position with the feet in Allen stirrups (Allen Universal, Inc., Cleveland, OH, USA). A Foley catheter was inserted in the bladder. Given the increased risk for adhesive disease in the areas of peritoneal access in such a group of patients, Palmer's point was chosen as the preferred technique for obtaining safe intraperitoneal entry and insufflation. After confirmation of orogastric tube placement by the anesthesia team, a point in the midclavicular line 3 cm below the left subcostal margin was injected with 0.25% Marcaine (Hospira Inc, Lake Forest, IL, USA) and entered with a Veress needle. Entry was confirmed with low pressure (<10 mm Hg) and tympani, with abdominal percussion in the right upper quadrant. A high-pressure insufflation at 15–20 mm Hg was favored for initial entry. A 5-mm accessory trocar was inserted under direct visualization with a 5-mm, 0° laparoscope in the left upper quadrant.

A cervical manipulator was placed under direct vision after peritoneal access was gained. For that purpose, we used a Koh ring from the RUMI manipulator (Cooper Surgical Inc, Trumbull, CT, USA) sutured to the cervix for stability then mobilized with a tenaculum, Hulka tenaculum, or Vulsellum clamp.

A 4-robotic arm approach was implemented to allow optimal retraction and independence for the console surgeon. The 8.5- or 12-mm port for the robotic camera was placed at the umbilicus. Additional 8-mm ports were placed 10 cm to the lateral right and lateral left of this incision at a 15° angle caudad. An additional right lower quadrant robotic 8-mm port site was placed 10 cm away from this right lower quadrant incision. The monopolar scissor, bipolar fenestrated, or Maryland grasper and ProGrasp (Intuitive Surgical, Inc, Sunnyvale, CA, USA) were used for dissection, energy, and retraction. A 5-mm trocar allowed for suction and additional retraction.

The dissection proceeded by lysing any adhesions obscuring access to the pelvis. Bilateral ureterolysis was performed routinely to identify and lateralize the ureters, and on the left, this process often required mobilization of the rectosigmoid at the pelvic brim. Because the bladder was often scarred over the anterior aspect of the cervical stump, we performed retrograde filling of the bladder with irrigation fluid, to ascertain the dissection plane, and mobilized the bladder caudad by dissecting from a posterior–lateral to anterior–medial direction. This allowed for identification of the bladder pillars and cervical branches of the uterine artery, which were then isolated, coapted with the bipolar instrument, and cut. At this stage of the dissection, the vesicocervical junction was usually quite clear, and both blunt and sharp dissection allowed the bladder to be

displaced and an adequate width of vaginal fornix to be available for colpotomy and reapproximation.

A posterior colpotomy was performed after the dissection. In cases of an obliterated posterior cul-de-sac, proceeding with entry into the rectovaginal space was also facilitated by proceeding first with ureterolysis and bladder mobilization. Subsequently, a lateral-to-medial direction of dissection across the uterosacral ligaments successfully opened the Denonvilliers' fascia of the rectovaginal space, where fat identified the anterior aspect of the rectum. We used an EEA sizer (Medtronic, Minneapolis, MN, USA) to identify the rectum and to place light counterattraction posteriorly against the posterior deflection of the colpotomizer ring. The colpotomy was performed with focused energy delivered via a monopolar instrument, the cervix was retrieved transvaginally, and a 10-mm trocar embedded in an inflatable pneumo occluder balloon was placed in the vagina for delivery of suture. The vaginal cuff was closed with running 2-0 barbed sutures in a 2-layered closure fashion. Reduced pressure visualization confirmed hemostasis, and routine cystoscopy after administration of indigo carmine assessed ureteral patency and bladder integrity.

Table 1.
Demographic and Clinical Characteristics of Prior SCH

Variable	Value
Age (mean ± SD)	39 ± 6.9
BMI (mean ± SD)	30 ± 5
Indication for SCH, *n* (%)	
Pelvic pain	8 (73)
Abnormal uterine bleeding	7 (64)
Dysmenorrhea	5 (45)
Type of SCH/surgery, *n* (%)	
Laparoscopic	6 (55)
Abdominal	5 (45)
Uterine weight (g)	
Range	44–1500
Median	366
Interval from SCH to recurrence of symptoms (mo)	
Range	0.5–26
Median	6

SCH, supracervical hysterectomy; SD, standard deviation.

RESULTS

Eleven patients underwent RT for benign indications during the study period. Patient demographic and clinical information regarding prior SCH is outlined in **Table 1**. SCH was most commonly performed for pelvic pain (8/11, 73%) and abnormal uterine bleeding (7/11, 64%). More than one indication for surgery was present in 64% of the cases. Laparoscopic and abdominal SCHs were performed in 55% and 45% of cases, respectively, with a median uterine weight of 367 g (44–1500 g). In 10 of 11 cases, the symptoms leading to RT were the same as those experienced prior to SCH. In 1 of the cases, the SCH was complicated by a pelvic abscess and a vesicovaginal fistula (VVF) necessitating a trachelectomy 1 month after the surgery.

The median interval time from SCH to seeking medical help for the persistence or recurrence of symptoms was 6 months (2 weeks to 26 months) and to RT, it was 27 months (1–57 months). Interval pelvic imaging, pelvic ultrasound followed by pelvic magnetic resonance imaging, demonstrated residual uterine tissue, an ovarian remnant mass, and a pelvic mass/hematosalpinx in 3 of the 11 patients. Concomitant procedures, mostly adnexal, were performed in 8 of 11 cases (73%) (**Table 2**). Ureteral stents were placed bilaterally in 2 cases: one was a case of VVF that occurred 2 weeks after SCH, and in the other case, the stents were placed in the presence of extensive pelvic adhesions because of a history of multiple laparotomies and severe endometriosis. The mean length of surgery was 218 minutes (range, 100–405). The average estimated blood loss during RT was 81 mL (range, 10–200).

There were 3 intraoperative and postoperative complications in our case series. One patient had a posterior bladder wall defect secondary to thermal injury sustained during trachelectomy for severe endometriosis. She presented with postoperative abdominal pain, fever, and urinary symptoms, and work-up demonstrated the posterior bladder wall defect. Two weeks after robotic repair, she presented with a VVF and underwent successful robotic repair.

In a second case, dissection of fibrotic tissue surrounding the left distal ureter caused a superficial adventitial laceration, necessitating ureteral stent placement for 6 weeks. The third complication was a vaginal cuff hematoma that resolved spontaneously with conservative management.

The median postoperative length of stay after RT was 1 d. Final pathology showed endometriosis in 3 cases, cervicitis in another 3, and a normal cervix in the

Table 2.
Demographic and Clinical Characteristics of Robotic Trachelectomy

Variable	Value/*n* (%)
Age (mean ± SD)	42 ± 5.4
Body mass index (mean ± SD)	32 ± 6.1
Indication for RT, *n* (%)	
Pelvic pain	8 (73)
Vaginal bleeding	7 (64)
Dyspareunia	3 (27)
Pelvic mass	3 (27)
VVF	1 (9)
Time interval from SCH to RT (mo)	
Range	1–57
Median	26
Concomitant procedures, *n*	
Bilateral/unilateral salpingo-oophorectomy	4
Bilateral salpingectomy	2
Appendectomy	2
Resection of ovarian remnant	1
Tension free obturator tape	1
Resection of VVF	1
Operative time (min)	
Range	100–405
Mean	218 ± 88
Estimated blood loss, mL (mean ± SD)	81 ± 59.6
Hemoglobin loss, g/L (mean ± SD)	1.5 ± 0.8
Pathologic diagnosis, *n*	
Cervicitis	3
Endometriosis	3
No pathologic diagnosis/normal	5

RT, robotic trachelectomy; SCH, supracervical hysterectomy; SD, standard deviation.

remaining 5 cases. Pathology results did not support the presence of suspected residual uterine tissue or ovarian remnant mass demonstrated by imaging studies. However, a single case of suspected hematosalpinx was confirmed by pathology.

Six patients reported complete resolution of symptoms after surgery, and the remaining 5 patients reported a significant improvement of their symptoms after a follow-up of 12 to 72 months.

DISCUSSION

We present a case series of RT following SCH for benign indications. Our study demonstrates that trachelectomy can be considered a definitive therapy for patients with persistent pelvic pain and vaginal bleeding after SCH. Although trachelectomy can be a challenging surgery, our experience suggests that the robotic approach may be a dependable means of achieving safe and reproducible outcomes.

A growing interest in SCH in the 1990s led to a significant increase in the rate of patients who underwent this procedure. Laparoscopic SCH is considered to be technically less challenging with a lower risk of bladder and ureteral injury, shorter operative time, and lower blood loss, compared with laparoscopic total hysterectomy.[17–19] Early studies reported that SCH is associated with improved urinary function, pelvic support, and sexual function,[1–5] though subsequent studies cast doubt on these presumed advantages.[6–9] Moreover, the current climate of concern regarding the risk of the occurrence of occult leiomyosarcoma after mechanical morcellation of uterine tissue may shift the pendulum away from SCH.[20–22] Nevertheless, SCH remains an option for patients and physicians; therefore, the issue of persistent post-hysterectomy symptoms associated with retained cervix will continue to present clinical challenges.

The range of the time interval from SCH to trachelectomy is very wide, based on the published literature. Consequently, patients' ages at trachelectomy vary considerably. This discrepancy can be attributed to the type of symptoms presented. Persistent symptoms after SCH, such as pelvic pain, vaginal bleeding, and dyspareunia, may call for early intervention, whereas evolving symptoms, such as pelvic relaxation, may be encountered many years later, during the postmenopausal period.

Hilger et al.[11] showed that the average time between SCH and trachelectomy for patients with prolapse was 31.1 years as compared to 20.7 years for other indications. Pasley et al.[23] reported pelvic prolapse as the most common indication for trachelectomy, with a mean time interval of 30 years between surgeries. In our series, most patients suffered from persistent symptoms after SCH, and the median interval between procedures was 27 months. Our results are comparable to those of Okaro et al.[14] and Tam et al.[16] who reported a mean interval time of 14 and 48 months, respectively.

The decision regarding the surgical approach to trachelectomy should be based on the underlying disease. Okaro and colleagues[14] reported that in all cases where

trachelectomy was performed because of persistent symptoms, mainly pelvic pain and vaginal bleeding, the surgical approach was either laparoscopic (87.5%) or abdominal (12.5%). Tam and colleagues[16] also reported a series of robotic trachelectomy with similar indications. Vaginal trachelectomy was the preferred surgical approach when the leading indication for intervention was pelvic organ prolapse evolving after SCH.[11,23,24] In our case series, most patients underwent RT due to persistent symptoms, including pelvic pain and vaginal bleeding, which may be suggestive of endometriosis as the leading cause of patients' complaints.

When removal of the cervical stump is secondary to endometriosis, adhesions, or pelvic mass, the vaginal approach may present significant technical challenges, whereas a laparoscopic surgery may facilitate the procedure and optimize patient outcomes. Specifically, laparoscopy is associated with reduced morbidity, smaller incisions, less pain, shorter recovery time, and shorter hospital stay, compared with laparotomy.

In 1996, Nezhat et al.[13] was the first to publish a series of 6 laparoscopic trachelectomies for persistent pelvic pain and endometriosis after SCH. Okaro et al.[14] reported 14 cases of successful laparoscopic trachelectomy. However, laparoscopic trachelectomy, as reflected in the paucity of studies in the literature, has not been widely adopted by gynecologic surgeons,[13,14] perhaps because of the technical challenges of laparoscopy, including 2-dimensional view, the fulcrum effect across abdominal wall access, and paradoxical movement, which may limit dexterity in more difficult dissections, such as trachelectomy. The robotic platform provides a 3-dimensional view, improved ergonomics, and intuitive motion and may help overcome these technical challenges of traditional laparoscopy.

In their series of laparoscopic trachelectomy, Nezhat and colleagues[13] reported a mean operative time of 225 minutes and a mean blood loss of 100 mL. Hilger et al.[11] evaluated the surgical outcomes of 310 patients after abdominal or vaginal trachelectomy and observed a mean estimated blood loss of 606 and 193 mL, respectively. Our study presents favorable results: the mean and median operative times for RT were 218 and 186 min, respectively, and estimated blood loss was 81 mL.

The importance of preoperative planning in this group of patients cannot be overemphasized. Obtaining previous operative and pathology reports may play a pivotal role in regard to both counseling the patient and predicting the need for other surgical consultants, unique instrumentation, and alternative modes of peritoneal access. The presence of dense pelvic adhesions may necessitate ureteral stenting, as stated by Nezhat et al.[13] as they reported stenting in 50% of cases. In our series, we performed ureterolysis in all cases, whereas placement of ureteral stents was implemented in 2 cases.

We are aware of several limitations that are inherent in the retrospective nature of this study. Specifically, the number of cases presented is small, and hence, the generalization of our recommendations is limited. Moreover, the results may be skewed by our selection criteria for the robotic approach. Finally, no other approach to trachelectomy was compared to the study group.

CONCLUSION

Our study shows that trachelectomy can be considered a definitive therapy for patients with unrelieved symptoms after SCH. Trachelectomy is a potentially challenging surgery; however, our experience suggests that the robotic approach is a valuable means of achieving safe and reproducible outcomes.

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