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# Supracervical Robotic-Assisted Laparoscopic Sacrocolpopexy for Pelvic Organ Prolapse

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## ABSTRACT

**Background:** Supracervical robotic-assisted laparoscopic sacrocolpopexy (SRALS) is a new surgical treatment for pelvic organ prolapse that secures the cervical remnant to the sacral promontory. We present our initial experience with SRALS in the same setting as supracervical robotic-assisted hysterectomy (SRAH).

**Methods:** Women with vaginal vault prolapse and significant apical defects as defined by a Baden-Walker score of ≥3 who had not undergone hysterectomy were offered SRALS in combination with SRAH. A chart review was performed to analyze operative and perioperative data. Outcome data also included patients who underwent robotic-assisted laparoscopic sacrocolpopexy (RALS) without any other procedure.

**Results:** Thirty-three patients underwent RALS, including 12 patients who underwent SRALS. All SRALS were performed following SRAH in the same setting. The mean follow-up for the RALS and SRALS patients was 38.4 months and 20.7 months, respectively. One patient in the RALS group had an apical recurrence. There were no recurrences in the SRALS group.

**Conclusions:** SRALS is effective for repair of apical vaginal defects in patients with significant pelvic organ prolapse who have not undergone previous hysterectomy. Complications are few and recurrences rare in short- and medium-term follow-up. Greater follow-up and numbers are needed to further establish the role of this procedure.

**Key Words:** Robot, Sacrocolpopexy, Prolapse, Supracervical hysterectomy.

## INTRODUCTION

Hysterectomy is one of the most common surgical procedures performed in the United States with approximately 600 000 cases performed annually.[1] Although this procedure is most commonly performed via an open abdominal or vaginal approach, laparoscopic hysterectomy has been increasing in popularity since it was first described.[1,2] In keeping with technological advances, robotic-assisted hysterectomy and its results have since been reported as an effective means to overcoming the technical limitations of laparoscopic total hysterectomy (TLH).[3,4]

The majority of hysterectomies are performed for benign uterine pathology.[5,6] Because of the benign nature of the disease, supracervical or subtotal hysterectomy through a laparoscopic or open approach has been introduced. The supracervical hysterectomy removes only the uterus and leaves the cervix with the intention of preserving sexual, urinary, and bowel function. However, a Cochrane review[7] and professional committee opinion[8] on supracervical hysterectomy do not advocate this procedure over total hysterectomy based on the lack of data suggesting preserved sexual and urinary function along with the risk of postoperative symptoms related to the remaining cervical stump, such as vaginal bleeding and pelvic pain. While these are reported potential postoperative results,[9] long-term outcomes of laparoscopic supracervical hysterectomy (LSH) have demonstrated high patient satisfaction rates, because the cervical symptoms are temporary and of minimal severity when these symptoms occur.[10] Supporters of LSH also contend that this procedure is not as difficult to perform as TLH is and has a lower risk of injury to adjacent organs, such as the ureters or bladder.[2,11,12]

One of the benign gynecological conditions for which a hysterectomy may be undertaken is pelvic organ prolapse (POP).[13] Pelvic organ prolapse is a common female problem with 30% of women 50 years to 89 years of age presenting with POP-related symptoms, and 11% of women undergoing a corrective procedure for POP by age 80.[14,15] These POP repair procedures are most commonly vaginal sacrospinous ligament fixation and abdominal sacrocolpopexy. Although abdominal sacrocolpopexy has longer operative and recovery times, recurrence rates are lower than that of the sacrospinous

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ligament fixation procedure.[16] Recovery time has since decreased with the introduction of the laparoscopic sacral colpopexy by Nezhat[17] in 1994 while retaining high success rates.[18] The introduction of robotic-assisted laparoscopic sacrocolpopexy has added the laparoscopic advantages of shorter operative and recovery times by negating the technical difficulties of conventional laparoscopy while maintaining high success rates.[19–21]

Supracervical robotic-assisted laparoscopic sacrocolpopexy (SRALS) is a new minimally invasive surgical option for apical pelvic organ prolapse that can be performed in the same setting as supracervical robotic-assisted hysterectomy (SRAH). We present our preliminary results and technique of SRALS performed immediately following SRAH and in conjunction with updated outcomes of patients who underwent robotic-assisted laparoscopic sacrocolpopexy (RALS) without a concurrent procedure.

## PATIENTS AND METHODS

The charts of 33 consecutive patients who underwent robotic-assisted POP repair from July 2005 through June 2009 were reviewed. Supracervical robotic-assisted laparoscopic sacrocolpopexy in the same setting as SRAH was performed in 12 of these patients while the other 21 patients underwent RALS after previously having undergone total hysterectomy. All patients were preoperatively evaluated with a history and physical examination. All patients had a minimum apical vaginal vault prolapse of Baden-Walker grade 3. Following SRAH, which was offered to patients for treatment of their high grade POP, SRALS was performed during the same operating room session. Existing cystoceles or rectoceles were not repaired in this setting.

### Procedure

The patient is placed in the modified lithotomy position. The shoulders are padded and the patient is secured with padding and 3-inch silk tape placed in an X pattern across the anterior chest. Security of positioning is assured when there is no movement of the patient placed in a steep Trendelenburg position.

Laparoscopic instrument ports are then placed in the abdomen. Initially, a Veress needle is placed immediately supraumbilically, which is subsequently replaced with a 12-mm camera following intraperitoneal insufflation. Under direct vision, two 8-mm, robotic instrument ports are placed laterally and inferiorly to the camera port. These 2 ports are placed approximately one handbreadth away from the camera port to prevent collision between robotic arms. A third 8-mm robotic instrument port is placed inferiorly and far to the left to be used by the fourth arm for retraction, if needed. A 12-mm port is placed inferiorly and on the far right near the iliac crest to be used by the assistant surgeon.

The robot is docked between the patient's legs, although side-docking is possible and preferred with the new version of the robotic platform. Supracervical robotic-assisted hysterectomy is performed, during which the bladder is dissected away from the uterus and vaginal cuff by first incising the overlying peritoneum. Dissection is then performed inferiorly and laterally through this peritoneal incision to separate the uterus from the bladder. Once the outline of the uterocervical junction is visualized, the uterus is removed via electrocautery. The cervical stump is left in place. The uterosacral ligaments are also spared to maximize pelvic organ support. The proximal end of the cervical stump is oversewn in a simple interrupted fashion with 0 polyglactin suture. The excised uterus is then placed in the right pericolic gutter to be morcellated following completion of SRALS.

The sacral promontory is then identified posterior to the sigmoid colon, and the overlying tissue is dissected away and multiple 2-0 nonabsorbable monofilament sutures are preplaced in the periosteum **(Figure 1)** for eventual fixation of the graft. Approximately 4cm of the sacral promontory is exposed in a longitudinal direction. A polypropylene Y-graft (AMS, Minneapolis, MN) is placed through the assistant port and trimmed to the appropriate tension-

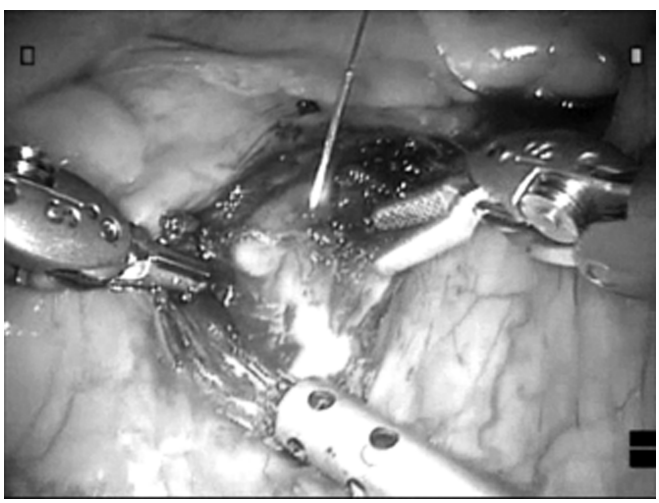

**Figure 1.** Dissection of and 2-0 permanent monofilament suture placement into sacral promontory.

free length. Since this length is different per patient, it is determined by placing the cervical stump in an anatomically appropriate position by using a hand-held vaginal retractor and trimming the graft to the length that will maintain this position. One arm of the Y-graft is fixed to the posterior aspect of the cervical stump in a simple interrupted fashion with approximately six to eight 2-0 polyglactin sutures as shown in **Figure 2**. The other Y-graft arm is fixed to the anterior aspect of the cervical stump in a similar fashion. Exposure for this portion of the procedure is aided by a vaginal retractor. The tail of the Y-graft is then fixed to the sacral promontory with 2-0 nonabsorbable monofilament suture in a simple interrupted fashion. The graft is retroperitonealized by closing the retroperitoneum over the graft with 3-0 polyglactin suture in a running fashion.

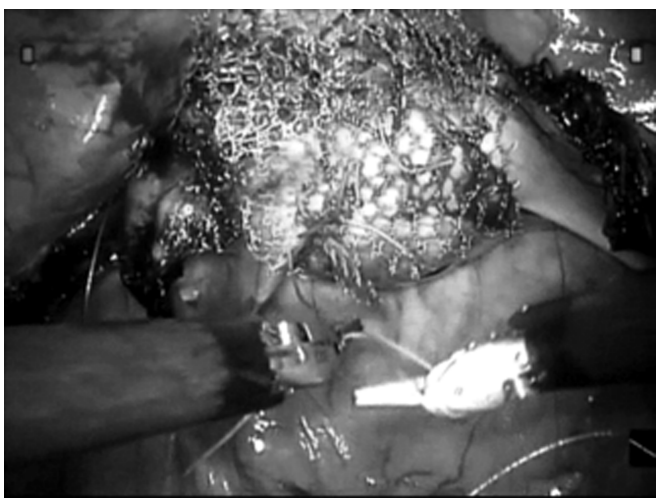

**Figure 2.** Fixation of Y-graft arm to posterior aspect of cervical stump with 2-0 polyglactin suture.

## RESULTS

A total of 33 patients had a robotic-assisted sacrocolpopexy for surgical treatment of Baden-Walker grade 3 or greater apical vaginal vault prolapse. Twenty-one of these patients had previously undergone total hysterectomy, and therefore, were treated with RALS. The other 12 patients were treated with SRAH and SRALS in the same setting for correction of their high grade POP. The ages, body weight, operative time, estimated blood loss, preoperative-to-postoperative hemoglobin change, length of follow-up, and complications are shown in **Table 1**.

The average operative time for the RALS procedure was 194 minutes. The average operating room time for the combined SRAH and SRALS procedures was 284 minutes. Operating room times included induction of anesthesia, robot docking, and awakening from anesthesia. The additional time for the combination procedure is likely an overestimation from including anesthesia time and robot docking, because specific procedure times were not uniformly available for review. This extra time also can be attributed both to the order of the procedures, because the SRAH required initial dissection, and to supracervical excision of the uterus prior to undertaking dissection for and completion of the supracervical sacrocolpopexy. This additional procedure also resulted in a mean estimated blood loss (EBL) of only 68mL more than the mean 50mL

**Table 1.**
Roobotic-assisted Laparoscopic Sacrocolpopexy (RALS) & Supracervical Robotic-assisted Laparoscopic Sacrocolpopexy (SRALS) Results

| | RALS | SRALS with SRAH |
|---|---|---|
| Number of patients | 21 | 12 |
| Mean age (range) | 65 years (43–86) | 59 (39–66) |
| Mean body weight (range) | 72.2 kg (53–112) | 68.4 kg (53–104) |
| Mean operative time (range) | 194 minutes (137–280) | 284 minutes (236–346) |
| Mean estimated blood loss (range) | 50 mL (25–150) | 108 mL (50–225) |
| Mean hemoglobin change (range) | −0.4 g/dL (−0.3—2.3) | −1.0 g/dL (−0.1—2.7) |
| Mean follow up (range) | 38.4 months (11–50) | 20.7 months (3–30) |
| Complications[a] | 1 | 1 |
| Apical prolapse recurrences | 1 | 0 |

[a]One patient for both RALS & SRALS developed small bowel obstruction secondary to entrapment of a loop of bowel beneath the mesh graft in the first postoperative week. Neither patient required bowel resection. There were no mesh erosions.

EBL in the RALS series. This marginally larger EBL was likely due to the extra dissection and organ excision having taken place in the SRAH portion, and was not associated with any intraoperative or postoperative complications or blood transfusions. There were no procedures performed to correct cystocele or rectocele at the time of RALS or SRALS. All but 2 of the RALS patients were discharged on postoperative day 1. These 2 patients with conservatively managed known third-degree heart block and postoperative fever, respectively, were discharged on postoperative day 2. All SRALS patients were discharged to home on postoperative day 1.

There has been only one apical recurrence after RALS, which occurred at 7 months and was corrected with subsequent sacrospinous ligament fixation. This apical recurrence was due to early separation of the Y-graft from the sacral promontory when absorbable suture was used early in the RALS series. Permanent suture has since been used for all other sacral promontory fixations. There has been one complication secondary to RALS. One patient developed a small bowel obstruction on postoperative day 5 secondary to a loop of small bowel trapped posterior to the Y-graft. Small bowel resection was not necessary. There has been one similar complication in the SRALS series. On postoperative day 6, one patient developed a small bowel obstruction secondary to a loop of small bowel trapped behind the Y-graft. On exploratory laparotomy, the loop of small bowel was viable and did not require resection. How small bowel migrated posterior to the graft is unknown, because this Y-graft, like all of the others, was retroperitonealized. All grafts continue to be retroperitonealized. There have been no mesh erosions with RALS or SRALS. There have been no complaints of adverse changes to urinary or sexual function with RALS or SRALS.

## DISCUSSION

Abdominal sacrocolpopexy for repair of apical vaginal vault prolapse is an improvement on previous methods, such as anterior abdominal fixation.[22,23] Although abdominal sacrocolpopexy for POP repair was initially accompanied by longer operative times, higher morbidity, longer hospital stays, and longer recovery times than vaginal repair was, recurrence rates and resultant dyspareunia have been significantly lower.[16,24,25] However, technological advancements have enabled the development of laparoscopic sacrocolpopexy,[17] which has decreased the procedure's morbidity and hospital stay,[18,26] but requires significant practice for proficiency. Subsequently, sacrocolpopexy was introduced using the robotic-assisted laparoscopic approach, which eased the technical burden. Robotic sacrocolpopexy also maintained low morbidity and recovery times of laparoscopy while retaining the high success rates of the original procedure.[19–21] In these robotic-assisted laparoscopic sacrocolpopexy outcome reports, the patients had previously undergone hysterectomy, which also has been reported using robotics.[3,4]

In addition to augmenting the current literature on RALS, this is also the first series on SRALS in combination with SRAH. Our data update previously reported outcomes for RALS[21] and are consistent with other reported outcomes on RALS in posthysterectomy patients.[19,20] Operative time, blood loss, morbidity, hospital stay, complication rate, and recurrence rates were low, even with significant follow-up periods. This series' data also demonstrate that SRALS in the same setting as SRAH for the correction of apical vaginal vault prolapse is effective. Morbidity, hospital stay, and complication rates are low, and there have been no recurrences or mesh erosions with SRALS. Operating room time and blood loss were increased compared with those in RALS. Mean overall operating room time was approximately 90 minutes longer for SRALS with SRAH, and mean EBL was only 68mL more than RALS. Like RALS, SRALS does not correct other anatomic defects, such as cystocele or rectocele. However, with high success rates, follow-up periods up to 30 months, SRALS with SRAH may be an effective treatment option for high-grade apical vaginal vault prolapse. These results are especially significant for patients with apical POP who are already undergoing supracervical hysterectomy for benign uterine pathology. Considering the results of both RALS and SRALS, we also reason that SRALS alone would be effective in patients who have previously undergone supracervical hysterectomy.

While the interpretation of these data is limited by its retrospective collection and small number of patients, this description and the results of SRALS with SRAH can be important for future treatment options of apical vaginal vault prolapse. Despite the relative increase in operative time and blood loss, there have not been any complications directly related to this combination procedure. This is important because approximately 3% of women, which is likely an underestimation, in the United States have symptomatic POP with rates increasing with age.[27] While approximately 11% of these women will have surgical correction by age 80,[15] over half of this population will have surgery before age 60 years.[28] A notable portion of these surgeries will be hysterectomies, as 15% of hysterectomies in the United States are performed for POP[13]

with the largest proportion in age younger than 60 years.[28] Thus, a high surgical treatment rate at a relatively young age is an important aspect of POP and emphasizes the need to maximize success rates to minimize future procedures for recurrence. Pelvic organ prolapse repair at the time of hysterectomy has been attempted with uterosacral ligament fixation.[29] However, symptomatic recurrence at rates of 12.5% and 4.6% were noted for laparoscopically and vaginally approached uterosacral ligament fixation, respectively. A Cochrane review has also shown that an abdominal sacrocolpopexy is better than a vaginal sacrospinous colpopexy regarding recurrence rate and postoperative symptoms.[16] The high surgical treatment rate for POP makes SRALS in the same setting as SRAH a good option for treatment. These 2 procedures use the same approach and are known to be effective for apical vaginal vault prolapse correction. The marginal expected increases in operative time and blood loss along with long-term follow-up without apical prolapse recurrence also serves the purpose of using a combined procedure approach to maximize success rates and potentially minimize secondary procedures with the patient under anesthesia. Moreover, minimal postoperative symptoms regarding sexual and urinary function are another benefit that may be considered. Should patients have benign uterine pathology along with apical vaginal vault prolapse, this combination procedure of SRAH with SRALS could be offered as effective concomitant treatment.

## CONCLUSION

SRALS in combination with SRAH may be a reasonable option to repair apical vaginal vault defects in patients with high-grade pelvic organ prolapse and benign uterine pathology requiring treatment, and merits further consideration and formal evaluation. Hospital stay was routinely limited to 1 day. Complications for both RALS and SRALS are minimal. As previously noted for RALS, cystocele and rectocele are not treated with SRALS. Short- and medium-term follow-up demonstrate good success rates for both RALS and SRALS with SRAH, but larger numbers of patients are needed to firmly establish the role of these procedures in the treatment of apical vaginal vault prolapse.

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