Perioperative adverse events after minimally invasive abdominal sacrocolpopexy

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OBJECTIVE: Our first objective was to compare peri- and postoperative adverse events between robotic-assisted laparoscopic sacrocolpopexy (RSC) and conventional laparoscopic sacrocolpopexy (LSC) in a cohort of women who underwent these procedures at a tertiary care center. Our second objective was to explore whether hysterectomy and rectopexy at the time of sacrocolpopexy were associated with these adverse events.

STUDY DESIGN: This was a retrospective cohort study of women who underwent either RSC or LSC with or without concomitant hysterectomy and/or rectopexy from 2006-2012. Once patients were identified as either having undergone RSC or LSC, the electronic medical record was queried for demographic, peri-, and postoperative data.

RESULTS: Four hundred six women met study inclusion criteria. Mean age and body mass index of all the women were 58 ± 10 years and 27.9 ± 4.9 kg/m^2. The women who underwent RSC were older (60 ± 9 vs 57 ± 10 years, respectively; $P = .009$) and more likely to be postmenopausal (90.9% vs 79.1%, respectively; $P = .05$). RSC cases were associated with a higher intraoperative bladder injury rate (3.3% vs 0.4%, respectively; $P = .04$), a higher rate of estimated blood loss of ≥500 mL (2.5% vs 0, respectively; $P = .01$), and reoperation rate for pelvic organ prolapse (4.9% vs 1.1%, respectively; $P = .02$) compared with LSC. Concomitant rectopexy was associated with a higher risk of transfusion (2.8% vs 0.3%, respectively; $P = .04$), pelvic/abdominal abscess formation (11.1% vs 0.8%, respectively; $P < .001$), and osteomyelitis (5.6% vs 0, respectively; $P < .001$). The mesh erosion rate for all the women was 2.7% and was not statistically different between LSC and RSC and for patients who underwent concomitant hysterectomy and those who did not.

CONCLUSION: Peri- and postoperative outcomes after RSC and LSC are favorable, with few adverse outcomes. RSC is associated with a higher rate of bladder injury, estimated blood loss ≥500 mL, and reoperation for recurrent pelvic organ prolapse; otherwise, the rate of adverse events is similar between the 2 modalities. Concomitant rectopexy is associated with a higher rate of postoperative abscess and osteomyelitis complications.

Key words: minimally invasive sacrocolpopexy, perioperative adverse events, rectopexy

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Uterovaginal prolapse and posthysterectomy vaginal apex prolapse are highly prevalent conditions in women[1] that are associated with significant morbidity and a negative impact on quality of life.[2] Surgical options to treat symptomatic pelvic organ prolapse (POP) include vaginal and abdominal approaches. Abdominal sacrocolpopexy, an operation that places mesh on the anterior and posterior vagina to suspend it to the sacrum, is considered the gold standard for vaginal apex prolapse repair and has demonstrated superior anatomic outcomes compared with vaginal suspension procedures.[3,4] However, abdominal sacrocolpopexy is associated with higher morbidity and longer time to return to activities of daily living when compared with vaginal approaches.[4]

Robotic-assisted laparoscopic sacrocolpopexy (RSC) and conventional laparoscopic sacrocolpopexy (LSC) have become alternatives to the open abdominal approach as these procedures aim at bridging the gap between the advantages of vaginal surgery, namely decreased morbidity and faster patient recovery, with the surgical success rates of abdominal sacrocolpopexy.[3,5,6] Additionally, minimally invasive abdominal sacrocolpopexy may be beneficial for young, sexually active women with symptomatic POP, as the procedure restores normal pelvic anatomy and maintains vaginal length.[7]

Recently, there has been a focus on comparing short- and long-term outcomes of minimally invasive approaches to sacrocolpopexy. Most of these studies have looked at outcomes in cohorts of patients after RSC and have demonstrated that the robotic approach appears safe and effective with limited risk of complications and good long-term efficacy.[8-11] Data on efficacy and short-term outcomes after LSC remain scarce, with the exception of several uncontrolled case series and retrospective cohort studies[12-16] and 2 randomized trials, one of which compared RSC and LSC procedures[17] and the other compared abdominal sacrocolpopexy with LSC.[18] Although efficacy outcomes data do exist, there are currently no large studies

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that compare peri- and postoperative adverse events of sacrocolpopexy performed both robotically and with conventional laparoscopy. Therefore, the primary objective of this study was to compare peri- and postoperative adverse events between RSC and LSC in a large cohort of women who underwent these procedures at a tertiary care center. Secondary aims were to explore whether hysterectomy and rectopexy at the time of sacrocolpopexy were associated specifically with these adverse events.

Materials and Methods

This study evaluated a retrospective cohort of women who underwent either RSC or LSC with or without concomitant hysterectomy and/or rectopexy at a tertiary care urogynecology center from 2006-2012. After institutional review board approval was obtained for this study, women were identified by their assigned postoperative *Current Procedural Terminology* codes for laparoscopic colpopexy (57425) and abdominal colpopexy (57280) for the 4 surgeons who perform minimally invasive abdominal sacrocolpopexy at our institution. This captured both RSC and LSC procedures and those procedures that had been converted to open abdominal cases. Women were excluded if they had undergone either open abdominal or laparoscopic uterosacral colpopexy or laparoscopic hysteropexy and if the open abdominal sacrocolpopexy was planned and not a conversion from the minimally invasive approach. Women from our previously published randomized controlled trial,[17] in which women were enrolled from 2007-2009, were included in this cohort of women because we aimed to capture all women who underwent minimally invasive sacrocolpopexy from 2006-2012. Once patients were identified as either having undergone RSC or LSC at our institution, the health system-wide electronic medical record was queried for demographic, perioperative, and postoperative data. Adverse events were considered related to the surgical case if they occurred intraoperatively, in the immediate postoperative period (30 days), or up to 12 months after the index surgery for certain outcomes. Adverse events were analyzed not only independently but also as a composite rate, which was defined as a grade 3 or higher complication by the Clavien-Dindo Grading System[19] for surgical complications. A *grade 3 complication* was defined as a complication that required surgical, endoscopic, or radiologic imaging/intervention (with or without anesthesia). A *grade 4 complication* was one that was considered life-threatening. Long-term outcomes such as recurrent POP and recurrent and de novo stress urinary incontinence (SUI) were included, regardless of time of presentation.

Four of our providers performed minimally invasive abdominal sacrocolpopexy at some point during the 2006-2012 study period. One provider had been full-time faculty many years before the start of the study period. The other 3 surgeons joined the practice out of fellowship from 2006-2011. All surgeons had performed >50 RSC and LSC cases either in fellowship or in practice before the start of this study. Our providers perform RSC and LSC using 2 pieces of light-weight polypropylene mesh. All women are positioned in low lithotomy position using Allen stirrups so that there is access to the vagina during the operation. An end-to-end anastomosis (EEA) sizer is placed in the vagina for manipulation of the apex and in the rectum for delineation of the rectovaginal septum. A Foley catheter is placed in the bladder for continuous drainage throughout the operation. After intraperitoneal access is gained and laparoscopic or robotic ports are placed and the robot is docked to the patient, the sacral promontory is identified, and the presacral space is entered and dissected until the anterior longitudinal ligament is cleared over S1-2, which serves as the attachment point for the graft. Dissection caudally through the peritoneum and subperitoneal fat is carried down to the level of the posterior cul-de-sac. The vagina is elevated cephalad with the EEA sizer; the peritoneum overlying the anterior vaginal apex is incised transversely, and the bladder is dissected off of the anterior vagina with sharp dissection, creating at least a 4-cm area for mesh fixation. Similarly, the peritoneum overlying the posterior vagina is incised, and dissection is performed overlying the vagina and extending into the posterior cul-de-sac, creating at least a 4- to 5-cm area for mesh attachment. Once dissection is complete, the mesh is fashioned into 2 arms that are approximately 4×15 cm in size. The graft is attached to the posterior vaginal wall with 4-6 permanent sutures or delayed-absorbable no. 0 or 2-0 sutures in an interrupted fashion, approximately 2 cm apart from each other. Sutures are placed through the fibromuscular tissue of the vagina, but not through the underlying epithelium. The graft extends approximately halfway down the posterior vaginal wall. The second arm of the graft is then attached to the anterior vaginal wall in a similar fashion. Delayed absorbable sutures are used for the most distal stitches close to the bladder to decrease the risk of permanent suture erosion into the bladder. The vagina is then elevated with the EEA sizer toward the sacrum, and appropriate suspension without tension is determined by visualization and with a vaginal examination before attachment of the graft to the sacrum. The graft is trimmed to the appropriate length and then sutured to the anterior longitudinal ligament at the level of S1-2 with 2-3 permanent no. 0 or 2-0 monofilament sutures. The peritoneum is then closed over the exposed graft with absorbable sutures. A cystoscopy in performed to ensure no bladder or ureteral injury.

Patients were included if they underwent concomitant POP and/or SUI procedures at the time of sacrocolpopexy, which included hysterectomy (vaginal or laparoscopic), cystocele repair, rectocele repair, and midurethral sling placement. At our institution, we favor supracervical hysterectomy at the time of sacrocolpopexy to reduce the risk of mesh erosion. Total hysterectomy is performed if there is an indication for it, as in the case of abnormal cervical disease or if the patient specifically requests it after reviewing the risks and benefits. Concomitant rectopexy was also performed (in patients with concurrent rectal prolapse) by a colorectal