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Post-Operative Short-Term Outcomes of Robotic-Assisted Sacrocolpoperineopexy versus Sacrocolpopexy

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Abstract

Study Objective: Sacrocolpopexy has traditionally been the gold standard for apical prolapse repair. Sacrocolpoperineopexy has become increasingly prevalent for multi compartmental pelvic organ prolapse repair; however the impact of more radical pelvic dissections required for mesh along the entire vaginal length is unknown. This study aims to compare peri-operative outcomes associated with Robotic-Assisted Sacrocolpoperineopexy (R-ASCPP) compared to Robotic-Assisted Sacrocolpopexy (R-ASCP) with concomitant vaginal prolapse repair.

Design: Retrospective cohort study.

Setting: Academic-affiliated community hospital.

Patients: Cases of R-ASCPP were compared to R-ASCP with concomitant anterior-posterior (A/P) compartmental repair controls between January 2013 and January 2019. A total of 126 women were identified.

Interventions: N/A

Measurements and main results: Cases of R-ASCPP (n=83) were compared to R-ASCP with A/P repair controls (43) in 2:1 ratio. Total operative time was 36 min shorter on average for cases (214 min *vs.* 250 min, p<0.05), with similar quantitative blood loss between groups (1.8 g/dL *vs.* 2.1 g/dL, p=0.61). Both cases and controls had similar narcotic requirements in the post-anesthesia care unit (PACU) (1.72 MME *vs.* 2.13 MME, p=0.59) and the entire hospital admission (17.30 MME *vs.* 20.79 MME, p=0.81). Cases trended toward larger Post-Void Residual (PVR) bladder volumes (204 cc *vs.* 122 cc, p=0.12), with a larger percentage discharged with outpatient catheterization (32.5% *vs.* 14.3%, p<0.05). Patient demographics were similar among groups.

Conclusion: R-ASCPP is a well-tolerated procedure, however, is associated with a statistically significant propensity for acute urinary retention. Surgeons should consider counseling R-ASCPP patients about the increased incidence for elevated PVRs requiring either intermittent or indwelling catheterization. Future investigation is warranted to better understand, prevent, and treat this increased incidence in a large population of R-ASCPP patients.

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Introduction

Sacrocolpopexy (SCP) currently serves as the criterion gold standard for pelvic organ prolapse [1]. It has traditionally been performed for repair of apical prolapse, with concomitant Anterior-Posterior (A/P) vaginal repair in order to address multi-compartmental pelvic organ prolapse [2]. Due to the high success of the SCP for apical support, the inherent weakness of native vaginal tissue, coupled with the more widespread use of robotic surgical platforms for prolapse repair, Robotic-Assisted Sacrocolpoperineopexy (R-ASCPP) has emerged as a natural evolution from the Robotic-Assisted Sacrocolpopexy (R-ASCP) [3]. R-ASCPP involves a radical approach where the mesh used for fixation provides continuous graft support along the entire vaginal vault; it extends all the way down to the perineal body posteriorly, and the bladder neck anteriorly [4,5]. Due to the involvement of deep pelvic viscera and disruption of the dense autonomic nerves during the pelvic dissections required in a R-ASCPP, the effect of this procedure on bladder and bowel function from neurologic denervation has raised concern as to the impact of R-ASCPP compared to standard R-ASCP similar to a radical *vs.* simple hysterectomy for oncologic indications [6]. Furthermore, evidence for quality of life outcome markers between R-ASCPP and R-ASCP is lacking in the medical literature [7].

The aim of this study is two-fold: to compare short-term peri- and post-operative outcomes between R-ASCPP and R-ASCP with A/P vaginal repair, and to offer recommendations for the safe surgical use of R-ASCPP for those surgeons inclined to use this procedure for multi compartmental pelvic organ prolapse repair.

Materials and Methods

After obtaining approval from the University at Buffalo (Buffalo, New York, USA) Institutional Review Board, we identified all women with pelvic organ prolapse who had undergone surgical repair *via* a R-ASCPP or R-ASCP with concomitant Anterior-Posterior (A/P) compartmental repair at Millard Fillmore Suburban Hospital (Williamsville, New York, USA) between January 2013 to January 2019. This was done by identifying those women with the appropriate diagnosis code (ICD-10 N81.9 for female genital prolapse, unspecified) and respective surgical procedure codes (CPT57425 for laparoscopic colpopexy, CPT57260 for combination anterior-posterior repair, and HCPCSS2900 for surgical techniques requiring use of robotic surgical system). Specific cases of R-ASCPP were separated from R-ASCP with A/P repair controls by review of each individual operative report. All identified R-ASCPP and R-ASCP with A/P repair participants were later further stratified based on the presence of additional concomitant surgical procedure codes including a) both a supracervical hysterectomy with bilateral salpingo-oophorectomy (SCH+BSO) (CPT58542), b) SCH+BSO with placement of a Transobturator (TOT) midurethral sling (CPT57288), or c) as a stand-alone procedure. All other patients with unaccompanied or concomitant procedures not listed as aforementioned above were excluded from our study. Primary outcomes include third-void post residual (PVR) bladder volumes (cc), and percentage of patients requiring discharge home with outpatient catheterization. Secondary outcomes include total operative time (min), total recovery time in the post-anesthesia care unit (PACU) (min), narcotic medication requirements as measured by Morphine Milligram Equivalents (MME) both in the PACU and the entire hospital admission, quantitative blood loss as measured by the difference in pre- and post-operative hemoglobin (delta g/dL), Length of Stay (LOS) (days), and readmission within one month due to surgical complications. Patient demographics including age (years), Body Mass Index (BMI), and prior abdominal surgeries were also compared. Categorical data was analyzed by the Fisher Exact Test, and continuous data was analyzed by the Mann-Whitney U-Test, Van Elteren Test and Cochran-Mantel-Haensel Test, where appropriate. The data was analyzed with consultation from a PhD data scientist.

Results

A total of 126 women were identified during the study period. Cases of R-ASCPP (n=83) were compared to matched R-ASCP with A/P repair controls (n=43) in 2:1 ratio. Patient demographics are described in Table 1. Mean age at the time of surgery was 62.3 years for both cases and controls (Standard Deviation (SD) 10.6 and 8.5 years, respectively), with a mean body mass index of 28.5 kg/m^2 (SD 4.4) and 27.8 kg/m^2 (SD 3.9), respectively. Cases and controls had a median parity of 2 and 3 respectively, both with an Interquartile Range (IQR) of 1. Perioperative data comparing R-ASCPP versus R-ASCP with A/P repair are presented in Table 2. The total operative time was 36 minutes shorter on average for cases *vs.* controls (214 ± 45 min *vs.* 250 ± 37 min, p<0.05) with a similar quantitative blood loss between groups (-1.8 ± 1.9 g/dL *vs.* -2.1 ± 2.0 g/dL, p=0.61). Both cases and controls spent similar time recovering in the PACU (119 ± 58 min *vs.* 107 ± 33 min, p=0.29), with similar narcotic requirements both in the PACU (1.7 ± 2.4 MME *vs.* 2.1 ± 3.1 MME, p=0.59) and during the entire hospital admission (17.3 ± 15.4 MME *vs.* 20.8 ± 22.8 MME, p=0.81). Cases retained larger PVR volumes (median 130 ± 236 cc *vs.* 67 ± 164 cc, p=0.12) than controls, with a larger percentage requiring discharge home with outpatient catheterization (32.5% *vs.* 14.3%, p<0.05). LOS was similar between cases and controls (1.2 ± 0.6 days, p=0.25).

Sub-group analysis between cases and controls based upon concomitant procedures are shown in Table 3. All cases of R-ASCPP were compared to R-ASCP with A/P repair controls as either a) a stand-alone procedure, or with concomitant procedures that either included b) a SCH+BSO, or c) a SCH+BSO with additional TOT midurethral sling placement. When compared across the entire stratified analysis, cases continued to require less operative time than controls (178 ± 35 min *vs.* 221 ± 29 min, p<0.05). When isolated as a stand-alone procedure, cases required less PACU narcotic requirements than controls (0 ± 0 MME *vs.* 1.83 ± 1.99 MME, p<0.05), and case patients also required a shorter length of stay as compared to controls (1.0 ± 0 days *vs.* 1.25 ± 0.45 days, p<0.05). When cases and controls underwent procedures where all previously aforementioned concomitant procedures were included, the percentage of patients requiring discharge home with outpatient catheterization was greater for cases than controls (47.4% *vs.* 16.7%, p<0.05); when weighted for the number of women in each arm and magnitude of effect size using the Cochran-Mantel-Haenszel test, this p-value remained consistent (p<0.05). All other peri-operative values when stratified for concomitant procedures were similar between groups.

Table 1: Patient Demographics.

	Age	BMI (kg/m^2)	Gravidy	Parity	Smoking History (%)	Prior Laparotomy (%)	Prior Hernia Repair (%)
R-ASCP	62.3	27.8	3	3	65.1	23.3	9.3
R-ASCPP	62.3	28.5	3	2	37.3	26.5	6

R-ASCP: Robotic-Assisted Abdominal Laparoscopic Sacrocolpopexy; R-ASCPP: Robot-Assisted Abdominal Laparoscopic Sacrocolpoperineopexy

Table 2: Perioperative Sacrocolpopexy versus Sacrocolpoperineopexy Data.

	Total Operative Time (Minutes)	Total PACU Time (Minutes)	PACU Narcotics (MME)	Floor Narcotics (MME)	Δ Hgb (g/dL)	3rd Void PVR (cc)	Discharge with Catheterization (%)	Length of Stay (days)	Readmission/ ED Visit in 1 Month (%)
R-ASCP	250	107	2.13	20.79	2.09	122.28	14.3	1.23	7.3
R-ASCPP	214	119	1.72	17.3	1.84	204.79	32.5	1.16	2.4
p value	<0.05	0.29	0.58	0.81	0.61	0.47	<0.05	0.25	0.33

R-ASCP: Robotic-Assisted Abdominal Laparoscopic Sacrocolpopexy; R-ASCPP: Robot-Assisted Abdominal Laparoscopic Sacrocolpoperineopexy; PACU: Post Anesthesia Care Unit; MME: Morphine Milligram Equivalents; Hgb: Hemoglobin

Table 3: Perioperative Sacrocolpopexy versus Sacrocolpoperineopexy Stratified by Concomitant Procedures Data.

	A/P			A/P + Hyst			A/P + Hyst + TOT			
	R-ASCP	R-ASCPP	p value	R-ASCP	R-ASCPP	p value	R-ASCP	R-ASCPP	p value	Stratified p value
Operative Time (Mins)	220.8	178	<0.05	247.5	208	<0.05	270.8	238.1	<0.05	<0.05
PACU Time (Mins)	119	115.8	<0.63	101.5	118.3	0.56	103.4	122.2	<0.15	<0.30
Blood Loss (Delta Hgb g/dL)	1.8	1.8	0.82	1.6	2.1	0.32	2.6	1.7	0.14	0.55
PACU Narcotics (MME)	1.8	0	<0.05	2.7	2.6	0.92	2	2.1	0.22	0.56
Hospital Stay Narcotics (MME)	18.5	16.6	0.94	25.7	15.7	0.22	19.1	18.7	0.54	0.77
PVR Bladder Volume (cc)	126.3	65.2	0.2	71.1	148.2	0.34	151.8	277.5	0.06	0.21
Discharge Home with Catheter (%)	25	19.1	0.68	0	20.8	0.15	16.7	47.4	<0.05	<0.05
Length of Stay (days)	1.3	1	<0.05	1.3	1.2	0.71	1.2	1.2	0.98	0.22
Readmission Rate/ED Visit in 1 Month (%)	10	4.8	1	8.3	4.2	1	5.3	0	0.33	0.19

R-ASCPP: Robotic-Assisted Abdominal Laparoscopic Sacrocolpopexy; R-ASCPP: Robotic-Assisted Abdominal Laparoscopic Sacrocolpoperineopexy; A/P: Anterior-Posterior Paravaginal Compartmental Repair; Hyst: Hysterectomy; TOT: Transobturator Midurethral Sling Placement; PACU: Post Anesthesia Care Unit; PVR: Post Void Residual

Discussion

Pelvic organ prolapse is often caused by a global pelvic floor dysfunction that may negatively impact a patient's quality of life disrupting sexual, genitourinary, and/or gastrointestinal function. Of those experiencing symptoms, there is an 11.1% lifetime risk of requiring surgical correction and the necessity for extensive pelvic organ prolapse repair is anticipated to increase by 45% over the next thirty years [2,8,9]. To that end, the optimal surgical technique at this time continues to be a large topic of debate [10]. Sacrocolpopexy has long been the standard of management for apical pelvic organ prolapse. In contrast, sacrocolpoperineopexy provides an opportunity to resolve perineal descent syndrome as originally intended in addition to anterior, posterior, and apical prolapse along the entire length of the vagina in one procedure [3]. Current evidence at this time supports similar clinical outcomes among various techniques for repair [11]. Whereas open abdominal approaches for prolapse repair were typically commonplace, the advent of robotic-assisted surgery has also allowed greater accessibility into the lower pelvis; these new minimally invasive options are quickly being heralded as the new standard of care [12]. To our knowledge, no prior study on R-ASCPP has reported the incidence of acute post-operative urinary retention compared to R-ASCP as a stand-alone procedure. Our results conclude that there is a two-fold association (HR 2.89, 95% CI [1.09 to 7.70]) between R-ASCPP and acute urinary retention in contrast to standard R-ASCP (32.5% *vs.* 14.3%, p<0.05). This is likely due in part to the denervation associated with such radical pelvic dissections for mesh attachment. Similar proposals for the mechanism of these findings have been discussed in radical *vs.* simple hysterectomies for oncologic indications where radical pelvic dissection is also needed [6,13]. Based on this finding, we recommend surgeons counsel R-ASCPP patients about the increased incidence of transient acute urinary retention and possible necessity for outpatient catheterization, *via* intermittent or indwelling catheterization to avoid complications associated with untreated acute urinary retention such as acute kidney injury. In this study we also aimed to compare perioperative outcomes of R-ASCPP *vs.* R-ASCP with A/P repair. Cases of R-ASCPP required less total operative time versus R-ASCP with A/P repair (214 ± 45 min *vs.* 250 ± 37 min, p<0.05) (Table 2), likely accounting for the addition of the separate vaginal prolapse repair procedures following the robotic console time. The particular technique and approach to multi-compartmental repair however were not found to be associated with statistically different peri-operative outcomes including recovery time immediately in the PACU, total length of stay, narcotic requirements required at various times during the patients' hospital course, or readmission for surgical complications between R-ASCPP and R-ASCP with A/P repair. These findings were similar to previously published studies in the medical literature [14]. When sub-stratified by concomitant procedures, it was noted that R-ASCPP and R-ASCP with A/P repair alone may be impacted by the total individual procedures performed at the time of surgery. Those with all concomitant procedures including SCH+BSO and TOT sling placement were the only subgroup with statistically significant urinary retention (Table 3). Yet, when taking into account the sample and effect size using the Cochran-Mantel-Haenszel analysis, this gives us confidence as to the continued statistical significance and implications of such findings. The subgroup analysis comparing peri-operative outcomes based on stringent inclusion/exclusion criteria of concomitant procedures involved offers strength to our study. Additional procedures may include further inherent dissection and disruption of pelvic visceral structures and peritoneum, thus masking the true effect of sacrocolpoperineopexy dissection alone on the outcomes *vs.* sacrocolpopexy. This method enables us to clarify and correct for those confounding procedures. Limitations of this study include the retrospective nature of our cohort study and small sample sizes for comparison which may decrease the intended power and generalizability of our results and conclusions. However, given the trends discovered both in considering all patients in this study as well as in subgroup analysis, this pilot study may serve to further the medical evidence regarding R-ASCPP, while concurrently providing a nidus for future larger studies with regards to long-term outcomes.

Conclusion

Robotic-assisted laparoscopic sacrocolpoperineopexy is a well-tolerated procedure. It remains a viable surgical option for the correction of perineal descent syndrome as well as multi compartmental pelvic organ prolapse. Due to the inherent nature and requirements for deeper dissection in order to repair and support pelvic tissue, transient autonomic denervation of bladder function may occur, and surgeons should consider and counsel women on the potential need for outpatient catheterization. Future research will elucidate whether R-ASCPP has long-term outcomes benefit for prolapse repair versus traditional sacrocolpopexy.

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