Original Article

Surgical Outcomes of Laparoscopic Sacrocolpopexy and Sacrohysteropexy for Apical Prolapse Repair

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Abstract:

Objective: *To evaluate outcomes of laparoscopic sacrocolpopexy (LSC) and sacrohysteropexy (LSH) regarding success rates, recurrence rates, and perioperative complications.* ***Materials and Methods:*** *Retrospective cohort study of women undergoing LSC and LSH for symptomatic pelvic organ prolapse (POP) (≥ stage 2) was conducted at Kameda Medical Center, Japan between July 2013 and June 2015. All procedures were performed by one urogynecologist. Supracervical hysterectomy was performed in all women prior to LSC. Self-cut polypropylene mesh was used for mesh reinforcement. Information regarding patients' demographics, preoperative assessment, perioperative complications, and surgical outcomes were analyzed. Anatomical success rate was defined as prolapse (points Aa, Ap, and C) located above hymen at 1-year follow-up.* ***Results:*** *LSC was performed in 43 patients while LSH was undertaken in 16. The mean age was 62.8 ± 9.1 years old. Patients undergoing LSC presented more advanced stage prolapse and POP-Q measurements than those in the hysteropexy group. The mean operative time spent for LSH was significantly shorter than the time spent for LSC. Bladder perforation was the only major complication encountered. At 1-year follow-up, significant improvement in POP-Q measurements was demonstrated in all compartments for both groups. The overall success rate was 89.8% (86% LSC and 100% LSH; p value 0.176). The anatomical success specifically for apical compartment was 96.6%.* ***Conclusion:*** *LSC and LSH are feasible and effective procedures for POP repair especially apical compartment. However, high competency in laparoscopy is required to ensure safety and success. Appropriate patient selection for both procedure is a practical point of concern. Long-term follow-up is necessary.*

Keywords: ● *Pelvic organ prolapse* ● *Laparoscopic* ● *Sacrocolpopexyc* ● *Sacrohysteropexy*

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นิพนธ์ต้นฉบับ

ผลลัพธ์การผ่าตัดแก้ไขคนไข้ที่มีภาวะอวัยวะอุ้งเชิงกรานหย่อนส่วนบนด้วยวิธีผ่านกล้องโดยใช้ตาข่ายยึดช่องคลอดกับเอ็นกระดูกสันหลัง

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บทคัดย่อ

วัตถุประสงค์ *เพื่อศึกษาถึงผลลัพธ์ อัตราการกลับเป็นซ้ำและภาวะแทรกซ้อนของการผ่าตัดแก้ไขภาวะอวัยวะอุ้งเชิงกรานหย่อนส่วนบนด้วยวิธีผ่านกล้องโดยใช้ตาข่ายยึดช่องคลอดกับเอ็นกระดูกสันหลัง* ***วิธีการศึกษา*** *เป็นการศึกษาแบบวิเคราะห์เปรียบเทียบย้อนหลังจากบันทึกในประวัติของคนไข้โรคอวัยวะอุ้งเชิงกรานหย่อนตั้งแต่ระยะที่ 2 เป็นต้นไปซึ่งได้มารับการผ่าตัดด้วยวิธีผ่านกล้องโดยใช้ตาข่ายยึดช่องคลอดกับเอ็นกระดูกสันหลังทั้งแบบตัดมดลูกและเก็บมดลูก ตั้งแต่เดือน กรกฎาคม พ.ศ. 2556 ถึง มิถุนายน พ.ศ. 2558 ที่คาเมดะ เมดิคอล เซ็นเตอร์ ประเทศญี่ปุ่น การผ่าตัดทำโดยแพทย์เฉพาะทางด้านนรีเวชระบบทางเดินปัสสาวะเพียงท่านเดียว ในรายที่ตัดมดลูกจะทำการตัดแบบเก็บปากมดลูกไว้ก่อนใช้ตาข่ายยึดช่องคลอดกับเอ็นกระดูกสันหลัง ตาข่ายที่ใช้จะเป็นชนิดที่นำมาตัดแต่งเอง ข้อมูลของคนไข้ที่นำมาวิเคราะห์ได้แก่ ปัจจัยทางประชากร การประเมินคนไข้ก่อนผ่าตัด (POP-Q) ข้อแทรกซ้อนในขณะผ่าตัดและผลลัพธ์ของการผ่าตัด อัตราความสำเร็จทางกายวิภาคคือ ตำแหน่งของจุด Aa Ap และ C อยู่เหนือต่อ เยื่อพรหมจารีใน 1 ปีของการตรวจติดตามคนไข้* ***ผลการศึกษา*** *คนไข้จำนวนทั้งสิ้น 59 รายอายุเฉลี่ย 62.8 ± 9.1 ปี ใช้การผ่าตัดด้วยวิธีผ่านกล้องทุกราย ในจำนวน 59 ราย 43 ราย ตัดมดลูก และที่เหลืออีก 16 รายเก็บมดลูกไว้ โดยคนไข้ในกลุ่มที่ตัดมดลูกมาด้วยระยะของโรคที่มากกว่าในรายที่เก็บมดลูก ค่าเฉลี่ยระยะเวลาในการผ่าตัดของคนไข้กลุ่มที่ตัดมดลูกใช้เวลาในการผ่าตัดนานกว่ากลุ่มที่เก็บมดลูกอย่างมีนัยสำคัญ ในการศึกษานี้พบภาวะแทกซ้อนจากการผ่าตัดเพียงอันตรายต่อกระเพาะปัสสาวะเท่านั้นแต่ไม่พบภาวะแทรกซ้อนอื่นๆ เช่น อันตรายต่อลำไส้ หรือท่อไต จากการตรวจติดตามใน 1 ปี พบว่าอาการของโรคดีขึ้นอย่างมีนัยสำคัญจากการตรวจวัดค่า POP-Q ของการผ่าตัดทั้ง 2 วิธี อัตราความสำเร็จทั้งหมดอยู่ที่ร้อยละ 89.8 (86% ในรายที่ตัดมดลูก และ 100% ในรายที่เก็บมดลูก) ความสำเร็จทางกายวิภาคโดยเฉพาะในส่วนด้านบนอยู่ที่ร้อยละ 96.6* ***สรุป*** *การผ่าตัดแก้ไขภาวะอวัยวะอุ้งเชิงกรานหย่อนด้วยวิธีผ่านกล้องโดยใช้ตาข่ายยึดช่องคลอดกับเอ็นกระดูกสันหลังทั้ง 2 วิธีนี้ สามารถทำได้อย่างมีประสิทธิภาพสูง ภาวะแทกซ้อนจากการผ่าตัดต่ำ ผลลัพธ์เป็นที่น่าพอใจโดยเฉพาะการหย่อนที่ส่วนบน แต่อย่างไรก็ตาม การผ่าตัดวิธีนี้ต้องอาศัยทักษะและความชำนาญในการผ่าตัดผ่านกล้องที่ดี จึงจะประสบผลสำเร็จรวมไปถึงการคัดเลือกคนไข้ที่เหมาะสม การติดตามคนไข้ในระยะยาวเป็นส่งจำเป็นที่จะต้องศึกษาต่อไปในอนาคต*

คำสำคัญ: ● *อวัยวะอุ้งเชิงกรานหย่อน* ● *การผ่าตัดผ่านกล้อง* ● *การผ่าตัดยึดช่องคลอดกับเอ็นกระดูกสันหลัง* ● *การผ่าตัดยึดมดลูกกับเอ็นกระดูกสันหลัง*

เวชสารแพทย์ทหารบก 2562;73(1):3-13.

ได้รับต้นฉบับ 24 พฤศจิกายน 2562 แก้ไขบทความ 18 ธันวาคม 2562 รับลงตีพิมพ์ 6 มกราคม 2563

ต้องการสำเนาต้นฉบับติดต่อ พ.อ. เกรียงศักดิ์ ศิริศักดิ์พาณิชย์ กองสูตินรีเวชกรรม โรงพยาบาลพระมงกุฎเกล้า ถนนราชวิถี เขตราชเทวี กรุงเทพฯ 10400

Introduction

Surgical correction for pelvic organ prolapse (POP) has gained popularity due to an increase in aging population worldwide. It has been estimated that the surgical workload related to pelvic organ prolapse may increase by 46% over the next four decades.[1] The principle of POP surgery is to restore normal vaginal anatomy and normalize the function of bladder and bowel. In general, pelvic reconstructive surgery can be divided into vaginal and abdominal procedures. The abdominal approach can be performed either as laparotomy or laparoscopy. With high success rates of 74-99%, abdominal sacrocolpopexy (ASC) is now considered the gold standard for the surgical management of apical pelvic organ prolapse.[2-4] Previous studies have shown that ASC is a reliable operation which provides durable outcome, lower recurrent rates, and less dyspareunia, while maintaining vaginal length and axis when compared with vaginal sacrospinous ligament suspension.[2-6] However, it is a relatively invasive procedure with higher morbidity due to the need for laparotomy.

In comparison with ASC, the laparoscopic sacrocolpopexy (LSC) and the uterine-preserving sacrohysteropexy (LSH) procedures are considered less invasive for the treatment of apical pelvic organ prolapse. With the advantage of image magnification through laparoscope, LSC and LSH can provide superior visualization of surgical fields which can help reduce the risk of intraoperative adverse events, especially vital structure damage and massive hemorrhage. Other benefits of minimally invasive surgery include less postoperative pain, rare wound complication, shorter hospital stay, and faster recovery.[7,8] Despite of having comparable effectiveness when compared with ASC, both LSC and LSH are time-consuming procedures which require a long learning curve and high competency in laparoscopy, specifically in retroperitoneal dissection and suturing, in order to ensure safety and success.[5,7-9] With women's longer life expectancy and a tendency towards the need for more permanent solution, the numbers of carried-out laparoscopic apical suspension procedures have remarkably increased. As a result, there have been more published data on LSC and LSH nowadays. However, only a few have compared the operative outcomes of these two procedures. The purpose of this study was, therefore, to report a single surgeon's experience on both LSC and LSH in terms of success rates, recurrence rates, and perioperative complications.

Materials and methods

With the Institutional Review Board's ethical approval (18-074), a retrospective cohort study of women undergoing LSC and LSH at Kameda Medical Center, Kamogawa, Japan between July 2013 and June 2015 was carried out. Women who presented with symptomatic POP were assessed for prolapse severity and location according to the Pelvic Organ Prolapse Quantification (POP-Q) system.[10] POP-Q examination was performed during maximum valsalva effort while patients were in lithotomy position. Those with symptomatic prolapse stage II or greater were offered laparoscopic reconstructive procedures. The decision whether to undergo LSC or LSH was mainly based on patients' preference after thorough counseling regarding the risks and benefits of each individual procedure. The exclusion criteria included previous history of hysterectomy and incomplete medical records. Both stage and location of POP were determined according to the POP-Q system.

The information regarding patients' baseline characteristics, preoperative assessment, perioperative adverse events, and postoperative outcomes were recorded. Massive hemorrhage requiring blood transfusion, vascular injury, as well as injury to bladder, ureter, and bowel were considered as major intraoperative adverse events.

Conversion from laparoscopy to laparotomy was defined as a minor complication. Additionally, deep venous thrombosis (DVT), pulmonary embolism (PE), bowel ileus, small bowel obstruction, wound infection, and mesh erosion were regarded as postoperative adverse outcomes. Post-operatively, patients were scheduled for reviews at 6 weeks, 6 months, 1 year, and annually thereafter. At each follow-up visit, re-evaluation of clinical symptoms and POP-Q measurements were conducted.

Surgical technique

All surgical procedures were performed by the senior author (MN) who was specialized in minimally invasive surgery. Both LSC and LSH were performed under general anesthesia, utilizing four laparoscopic ports. The primary 10-mm port for accommodating the laparoscope was introduced through the base of umbilicus using open entry technique. Three ancillary ports were created under direct vision at the left iliac fossa and suprapubic region using 5-mm trocars, and at the right iliac fossa using a 10-mm trocar. Supracervical hysterectomy was initially performed in every woman undergoing LSC prior to mesh reinforcement.

After identification of sacral promontory, the retro-peritoneal dissection to expose the anterior longitudinal presacral ligament was carefully undertaken to avoid injury to the middle sacral vessels. The dissection was then continued along the right pelvic side wall by staying medially to the right ureter and the right uterosacral ligament into the right pararectal, rectovaginal, and left pararectal spaces. The pararectal space on both sides was gently dissected to identify the puborectalis muscle. Then the vesicovaginal space was dissected down to the lower one-third of the anterior vagina wall at the level of the bladder neck.

The mesh reinforcement was performed using two strips of self-cut type 1 polypropylene monofilament mesh (Gynemesh, Ethicon, Inc., Somerville, NJ, USA) (Figure 1). In LSC, the posterior strip of the mesh was

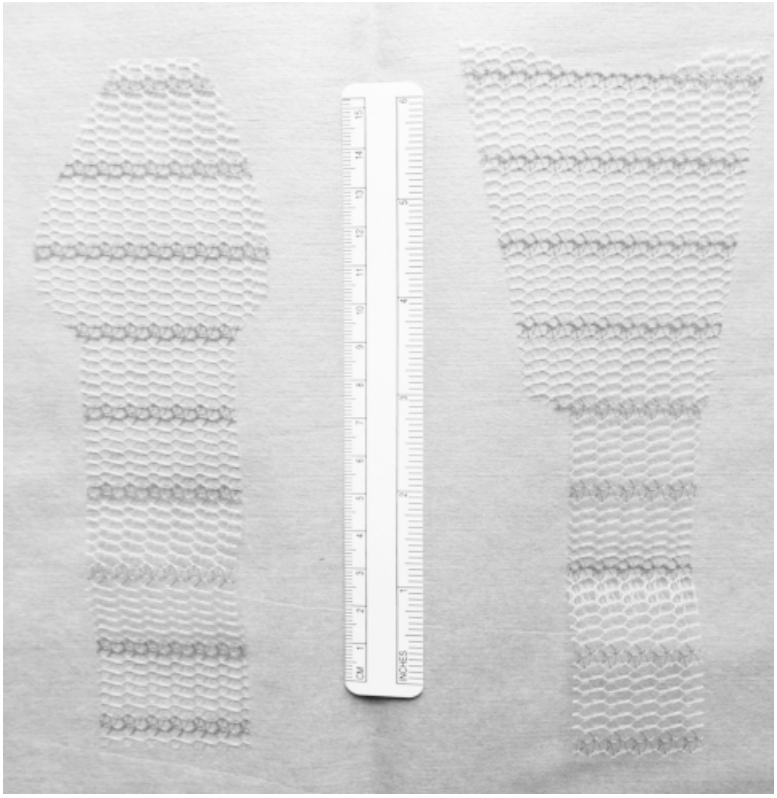

Figure 1 Shape of two separated self-cut meshes, anterior (left) and posterior (right).

sutured distally to the puborectalis muscle on both sides using a non-absorbable suture, one stitch on each side. The anterior strip of the mesh was fixed to the anterior vagina wall, from anterior vaginal fornix down to the bladder neck level, with non-absorbable sutures. Both strips of the mesh were then sutured together at the level of remaining isthmic portion. The excess of the posterior strip was removed, leaving the long anterior strip to be placed along the right pelvic side wall with appropriate tension and attached to the presacral ligament at the level of sacral promontory using two stitches of non-absorbable suture. In case of uterine preservation technique or LSH, the anterior strip of the mesh was fixed to the upper one-third of anterior vaginal wall with mesh arms passing from front to back through the pars flaccida of the broad ligament to be attached to the posterior vaginal wall, in adjacent to the posterior strip of the mesh. After excising the excess of the mesh, re-peritonealization using continuous absorbable suture to completely cover the mesh was achieved. The vaginal pack and the indwelling catheter were placed at the end of the procedure and were routinely removed within 24 hours and 72 hours, respectively, after the operation. The acceptable post-void residual urine was 150 mL or under. If post-void residual urine was over 150 mL, the catheter was re-inserted and another trial of void was repeated in the office within a week or two.

Outcome measures

The primary objective of our study was to evaluate the overall surgical outcomes of laparoscopic apical prolapse repair procedures, both LSC and LSH, in terms of success rates, recurrence rates, and perioperative complications. The objective cure was defined as the prolapse (points Aa, Ap, and C) located above the hymen at 1-year post-operative follow-up. In addition, we also aimed to report any different outcomes between the two procedures as our secondary objective.

Statistical analysis

Statistical data were analyzed using the SPSS version 23.0 (SPSS, Chicago, IL, USA). The data were presented as mean ± standard deviation (SD), or median (range), or median (IQR) for continuous variables, and number (%) for categorical variables. Differences in the frequency of events between groups were analyzed using Chi-square test or Fisher's exact test. Independent t-test or Mann-Whitney U test were used to compare continuous variables between groups. Wilcoxon signed-rank test was applied to assess the significance of the difference between preoperative and postoperative POP-Q measurements. The p value of less than 0.05 was considered statistically significant.

Results

During the study period, a total of 72 women diagnosed with symptomatic POP of at least stage 2 were offered laparoscopic pelvic floor reconstruction, either LSC or LSH. Thirteen patients were excluded from the study, of which 12 were found to have incomplete medical records and one was shifted from laparoscopic to transvaginal approach due to severe intra-abdominal adhesions, leaving only 59 patients for data collection and analysis, including 43 LSC and 16 LSH patients.

Information regarding patients' baseline characteristics and pre-operative POP evaluation were summarized in Table 1. The overall mean age was 62.8 ± 9.1 years. Patients who chose to undergo LSH were significantly younger than those who underwent LSC (57.1 ± 8.7 vs 64.9 ± 8.3; p = 0.002). There was no statistically significant difference in terms of BMI and numbers of parity when compared between the two groups. For pre-operative POP staging, almost 90% of patients in the LSC group were diagnosed as having advanced stage POP (stage III-IV) which remarkably outnumbered those in the LSH group (88.4% vs 50.0%;

Table 1 Baseline characteristics

	Overall (n = 59)		LSC (n = 43)		LSH (n = 16)		p-value
	n	%	n	%	n	%	
Age (y)							0.017*[C]
< 60	19	32.2%	10	23.3%	9	56.3%	
60-69	22	37.3%	16	37.2%	6	37.5%	
≥ 70	18	30.5%	17	39.5%	1	6.3%	
Mean ± SD	62.80 ± 9.06		64.93 ± 8.33		57.06 ± 8.65		0.002*[T]
Parity							0.600[C]
1	7	11.9%	4	9.3%	3	18.8%	
2	31	52.5%	23	53.5%	8	50.0%	
≥ 3	21	35.6%	16	37.2%	5	31.3%	
BMI (kg/m^2)							0.530[F]
<18.5	3	5.1%	3	7.0%	0	0%	
18.5-24.9	37	62.7%	25	58.1%	12	75.0%	
≥ 25	19	32.2%	15	34.9%	4	25.0%	
Mean ± SD	23.51 ± 3.02		23.68 ± 3.02		23.04 ± 3.06		0.475[T]
Preop POP stage							
Early (II)	13	22.0%	5	11.6%	8	50.0%	0.003*[F]
Advanced (III-IV)	46	78.0%	38	88.4%	8	50.0%	
Preop POP location							0.251[F]
Apical	1	1.7%	0	0%	1	6.3%	
Anterior + Apical	5	8.5%	3	7.0%	2	12.4%	
All compartment	53	89.8%	40	93.0%	13	81.3%	
Preop POP-Q							
Mean ± SD							
Aa	+1.1 ± 1.5		+1.5 ± 1.2		0.0 ± 1.6		0.085[T]
Ba	+3.1 ± 2.9		+3.7 ± 2.8		+1.5 ± 2.3		0.183[T]
C	+2.2 ± 3.5		+2.9 ± 3.6		+0.1 ± 2.1		0.009*[T]
Ap	-0.1 ± 1.4		0.0 ± 1.6		-0.6 ± 0.9		0.035*[T]
Bp	+0.6 ± 1.9		+0.7 ± 2.1		0.0 ± 1.4		0.223[T]
gh	4.6 ± 0.8		4.7 ± 0.9		4.3 ± 0.6		0.106[T]
pb	3.4 ± 0.6		3.4 ± 0.6		3.3 ± 0.6		0.283[T]
TVL	8.3 ± 0.8		8.4 ± 0.8		8.2 ± 0.8		0.574[T]

C = p-value Chi-Square test; F = p-value Fisher's Exact Test; T = p-value Independent t-test; *Significant at the 0.05 level; LSC = Laparoscopic sacrocolpopexy; LSH = Laparoscopic sacrohysteropexy

Table 2 Operative outcomes

	Overall (n = 59)	**LSC (n = 43)**	**LSH (n = 16)**	***p*-value**
Estimated blood loss (mL)				
Median (IQR)	20 (10-40)	20 (10-50)	17.5 (10-35)	0.519[M]
Operative time (min)				
Mean ± SD	275.68 ± 65.28	286.84 ± 68.54	245.69 ± 44.80	0.030*[T]
Postop POP stage				
N (%)				0.004*[F]
0 or I	42 (71.2)	26 (60.5)	16 (100)	
II	15 (25.4)	15 (34.9)	0 (0)	
III	2 (3.4)	2 (4.7)	0 (0)	
Postop POP-Q				
Mean ± SD				
Aa	-2.4 ± 1.2	-2.2 ± 1.4	-2.9 ± 0.3	< 0.001*[T]
Ba	-2.2 ± 1.4	-1.9 ± 1.5	-2.8 ± 0.4	0.002*[T]
C	-6.7 ± 1.9	-6.6 ± 2.0	-7.2 ± 1.5	0.809[T]
Ap	-1.9 ± 0.8	-1.7 ± 0.8	-2.4 ± 0.5	0.142[T]
Bp	-1.9 ± 0.8	-1.7 ± 0.8	-2.4 ± 0.5	0.142[T]
gh	3.9 ± 0.7	3.9 ± 0.7	3.6 ± 0.9	0.022*[T]
pb	3.4 ± 0.6	3.4 ± 0.6	3.3 ± 0.6	0.603[T]
TVL	8.6 ± 1.0	8.6 ± 0.8	8.8 ± 1.3	0.016*[T]
POP-Q difference				
Median (min,max)				
Aa	-4 (-6, 0)	-4 (-6, 0)	-2.5 (-6, 0)	0.087[M]
Ba	-5 (-13, 0)	-5 (-13, -1)	-4 (-9, 0)	0.062[M]
C	-8.5 (-18, 0)	-9 (-18, 0)	-7 (-13, -4)	0.018*[M]
Ap	-2 (-5, 1)	-2 (-5, 1)	-2 (-4, 0)	0.706[M]
Bp	-2 (-10, 0)	-2 (-10, 0)	-3 (-6, 0)	0.761[M]
gh	1 (-3, 1)	-1 (-3, 1)	-1 (-2, 1)	0.882[M]
pb	0 (-1, 2)	0 (-1, 2)	0 (-1, 1)	0.457[M]
TVL	0 (-2, 4)	0 (-2, 2)	0 (-1, 4)	0.535[M]

F = p-value Fisher's Exact Test; T = p-value Independent t-test; M = p-value Mann-Whitney U Test

*Significant at the 0.05 level; Difference = Postop - Preop, LSC = Laparoscopic sacrocolpopexy;

LSH = Laparoscopic sacrohysteropexy

p = 0.003). Similar results were obtained when prolapse severity was quantified by POP-Q examination. Patients in the LSC group were found to have more advanced POP-Q measurements than those in the uterine preserving group, especially in the apical (point C) and the posterior (point Ap) compartments.

Statistical analysis of operative outcomes revealed the mean operative time of 275.68 ± 65.28 minutes and the median blood loss of 20 (10-40) milliliters (Table 2). No substantial difference in terms of intra-operative blood loss was found between LSC and LSH groups. However, the operative time spent for LSH was undoubtedly shorter than the time spent for the concurrent LSC and supracervical hysterectomy cohort (245.69 ± 44.80 vs 286.84 ± 68.54 minutes; p = 0.030). With the surgical techniques of attaching the mesh arms anteriorly at

the level of the bladder neck and posteriorly onto the puborectalis muscle, no additional vaginal repair was required.

When evaluating intra-operative adverse events, there was only an incidence of bladder perforation which occurred during LSH procedure in a patient with a history of previous cesarean section. This was successfully repaired with laparoscopic water-tight double-layer closure technique without postoperative sequelae. No other serious complication such as massive hemorrhage requiring blood transfusion, major organ injuries, or vascular injury was encountered. For post-operative complications, one patient complained of having abdominal distention that was diagnosed as bowel ileus and was conservatively managed with success. No major complications such as small bowel obstruction, deep venous thrombosis, pulmonary embolism, wound infection, and mesh erosion was found.

After surgery, patients were scheduled to return for follow-up at 6 weeks, 6 months, 12 months, and annually thereafter. The mean follow-up time was 369.47 + 25.60 days with no significant difference between LSC and LSH groups (Table 4). At 1-year post-operative visit, significant improvement in POP-Q measurements was clearly demonstrated in all three compartments (point Aa, Ba, C, Ap, and Bp) for both groups (Table 3). All patients in the LSH group were found to have prolapse reduction to stage 0 or I, whereas 40% of the LSC group still manifested some degree of prolapse (stage II or III). The final POP-Q measurements in the anterior compartment (point Aa and Ba), genital hiatus (gh), and total vaginal length (TVL) were substantially improved among patients undergoing LSH when compared to those in the LSC group. However, when specifically evaluating in terms of changes in POP-Q scores between the two groups, LSC seemed to be more effective in correcting apical descent than hysteropexy procedure (POP-Q difference for point C -9 vs -7; p = 0.018) (Table 2).

Table 3 Pre and Post-operative POP-Q measurements

POP-Q	Overall (n = 59)			LSC (n = 43)			LSH (n = 16)		
	Pre	Post	*p*-value	Pre	Post	*p*-value	Pre	Post	*p*-value
Aa	1 (-3, 3)	-3 (-3, 1)	< 0.001*	1 (-1, 3)	-3 (-3, 1)	< 0.001*	0.5 (-3, 3)	-3 (-3, -2)	0.001*
Ba	2 (-3, 10)	-3 (-3, 2)	< 0.001*	3 (-1, 10)	-3 (-3, 2)	< 0.001*	2 (-3, 6)	-3 (-3, -2)	0.001*
C	1 (-1, 10)	-7 (-10, 0)	< 0.001*	2 (-1, 10)	-7 (-9, 0)	< 0.001*	-1 (-1, 6)	-7 (-10, -5)	< 0.001*
Ap	0 (-3, 3)	-2 (-3, 0)	< 0.001*	0 (-3, 3)	-2 (-3, 0)	< 0.001*	-1 (-2, 1)	-2 (-3, -2)	0.001*
Bp	0 (-3, 9)	-2 (-3, 0)	< 0.001*	0 (-3, 9)	-2 (-3, 0)	< 0.001*	0 (-2, 3)	-2 (-3, -2)	0.001*
gh	4 (3, 7)	4 (2, 5)	< 0.001*	5 (3, 7)	4 (2, 5)	< 0.001*	4 (3, 5)	4 (2, 5)	0.013*
pb	3 (2, 4)	3 (2, 5)	0.835	3 (2, 4)	3 (2, 5)	0.637	3 (2, 4)	3 (2, 4)	0.655
TVL	8 (7, 10)	9 (7, 11)	0.072	8 (7, 10)	9 (7, 10)	0.326	8 (7, 10)	9 (7, 11)	0.090

Data are presented as Median (min,max); *p*-value from Wilcoxon Signed Ranks Test; *Significant at the 0.05 level; LSC = Laparoscopic sacrocolpopexy; LSH = Laparoscopic sacrohysteropexy

Table 4 Postoperative Follow-up

	Overall (n = 59)		LSC (n = 43)		LSH (n = 16)		*p*-value
	n	%	n	%	n	%	
F/U (days)							
Mean ± SD	369.47 ± 25.60		368.70 ± 29.36		371.56 ± 10.68		0.706[T]
Anatomical success							
overall	53	89.8	37	86.0	16	100.0	0.176[F]
anterior	53	89.8	37	86.0	16	100.0	0.176[F]
posterior	57	96.6	41	95.3	16	100.0	1.000[F]
apical	57	96.6	41	95.3	16	100.0	1.000[F]
Stage of recurrence							0.597[F]
no recurrence	53	89.8	37	86.0	16	100	
II	4	6.8	4	9.3	0	0	
III	2	3.4	2	4.7	0	0	
Location of recurrence							
anterior	6	10.2	6	14.0	0	0	0.176[F]
posterior	2	3.4	2	4.7	0	0	1.000[F]
apical	2	3.4	2	4.7	0	0	1.000[F]

F = *p*-value from Fisher's Exact Test; T = p-value from Independent t-test; LSC = Laparoscopic sacrocolpopexy; LSH = Laparoscopic sacrohysteropexy

At one-year follow-up, the overall success rate of laparoscopic POP repair in our series was 89.8% (53 out of 59) (Table 4). Patients in the hysteropexy group showed 100% success rate when compared to 86% of those in the LSC group (p = 0.176). With the hymen being the cut-off landmark for POP recurrence, 6 patients (10.2%) were objectively defined as having prolapse recurrence. Regarding the number and the site of prolapse recurrence, 6 (10.2%) recurred in the anterior compartment, 2 (3.4%) occurred in the posterior compartment, and 2 (3.4%) were found in the apex. Therefore, the objective cure rates of laparoscopic mesh augmented POP repair for each individual compartment were 89.8% for anterior wall prolapse, 96.6% for posterior wall prolapse, and 96.6% for apical prolapse. All prolapse-recurrent patients were successfully managed with conservative treatment without the need for re-operation.

Discussion

Comparable outcomes in terms of anatomical success were achieved for both LSC and LSH procedures, with overall success rate of 89.8%. Moreover, when particularly analyzing for anatomical success only in the apical compartment, the higher success rate of 96.6% (57 out of 59) was accomplished. Our results were similar to those reported by many previous studies[8,16] and have confirmed the feasibility and effectiveness of the laparoscopic apical prolapse repair.

When evaluating in terms of surgical adverse events, minimal intra- and post-operative complications were found. The only major intraoperative adverse event encountered was bladder perforation which inadvertently occurred in a case with postprocedural pelvic adhesions. As a result, more watchful steps and meticulous laparoscopic dissection should be carried out when operating

on patients with previous abdominal surgery. Although significant longer operating time was reported in patients undergoing LSC, adding supracervical hysterectomy to laparoscopic apical suspension seemed to demonstrate a more favorable outcome for apical compartment prolapse with better improvement in point C score. This leaves us a question whether hysterectomy is necessary in repairing uterovaginal prolapse. Therefore, a decision to perform hysterectomy, either total or subtotal, should be carefully considered and thoroughly discussed with the patient based on current available evidences.[11-13]

One of the most common postoperative complications following sacrocolpopexy is vaginal mesh erosion, in which the incidence was reported from 0-10% according to previous literatures.[14] An important risk factor for mesh complication is concomitant total hysterectomy which can predispose the vaginal cuff to mesh erosion through the opening in the vagina.[15] With laparoscopic supracervical hysterectomy performed in every patient undergoing LSC, this seemed to be a preventive measure for mesh erosion in our study, yielding 0% of mesh erosion rate at 1-year post-operative visit. However, a long-term follow-up period may be required since mesh erosion may occur at variable times after surgery.

The most common site of POP recurrence was the anterior compartment which occurred among 6 patients in the LSC group (10.2%). This reflected the findings from Sergent et al.[17] who also demonstrated the highest anatomical failure rate of 11.2% in the anterior compartment. Patients in the hysteropexy group seemed to have more favorable outcomes, though not significantly, in terms of postoperative POP-Q measurements and anatomical success than those in the LSC group with 100% success rate. This might be the consequence of less advanced preoperative POP stage prior to undergoing prolapse repair procedures.

The limitations of our study are relatively short-term follow-up, small sample size, and the nature of retrospective study that could have bias in data collection and interpretation. The 3:1 proportion of our study population which was an uncontrollable factor of this retrospective trial could definitely cause bias and deviation when comparing results between LSC and LSH groups. As a result, we aimed only to report the comparative outcomes of LSC and LSH as the secondary, not the primary objective. Finally, our results could be regarded as reliable sources of information with minimal variety since there was only one surgeon with uniform surgical experience and skills performing both laparoscopic procedures.

Implementation

With excellent outcomes of LSC and LSH procedures regarding high anatomical success and less complications, which are comparable to the results of many previous studies, these two laparoscopic apical prolapse repair procedures may be implemented as another surgical options for POP repair among Thai patients. However, this study, as well as other studies, was conducted in different population and environment setting. Thus, careful consideration in terms of genetic factor, patient beliefs and expectations, economy, and the country's healthcare policy are required.

Conclusion

In summary, both LSC and LSH are feasible and effective minimally invasive procedures for POP repair with a very high success rate. Moreover, they can be considered as safe procedures if performed by the experienced hands with high competency and surgical skills in laparoscopic surgery, especially in laparoscopic dissection and suturing. Long-term follow-up and more randomized trials are also essential for future development and standardized management guidelines of pelvic organ prolapse.

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