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Indications for the Safe Performance of Laparoscopic Sacrocolpopexy (LSC) for Pelvic Organ Prolapse (POP)

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Abstract

Objective: Laparoscopic Sacrocolpopexy (LSC) is thought to be an ideal surgical procedure for pelvic organ prolapse. However, the indications for LSC and factors affecting the safety of the operation are not clear. We therefore retrospectively analyzed our previous cases.

Methods: A total of 183 women with symptomatic prolapse who underwent LSC were retrospectively evaluated. The complications, operative time, volume of bleeding, and factors related to the surgical outcome that were increased + 1.5 S.D. above the mean were examined. Postoperative infection was defined by CRP elevation on postoperative day 3. We evaluated complications that occurred in the 2 years after surgery.

Results: The mean and mean + 1.5 S.D of operation time, bleeding volume and postoperative day 3 CRP were (189.1, 240) min, (61, 162) ml and (2.5, 4.2) ml/dl, respectively. The operation time and bleeding volume tended to be increased in cases with large uterine fibroid. The CRP levels tended to be high in cases with intraperitoneal adhesion. Although the standard operative procedure of LSC includes supravaginal hysterectomy, uterine preservation was possible in two cases, and three patients underwent total hysterectomy. With the exception of 3 cases of bladder injury, there were no other complications. Eleven cases showed postoperative recurrence. Postoperative vaginal wall erosion was found in 1.8%. Stage 2 recurrence was confirmed in 3.6% that were followed for two years.

Conclusion: LSC is an effective method for treating POP. On the other hand, the pre-operative evaluation of patients is very important for the safety of the procedure.

Keywords: Indications; Laparoscopic sacrocolpopexy; Pelvic organ prolapse

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Introduction

Pelvic Organ Prolapse (POP), which affects the quality of life, is a common disease among elderly women. In the United States POP was surgically treated in approximately 200,000 patients [1]. It is reported that 6.6% of women of 20 to 29 years of age have some form of prolapse. The rate increases to 55.6 % at 50 to 59 years of age. Overall rate incidence of POP is 30.8% [2]. In women's health care, care for POP has become incredibly important. There are many approaches to the treatment of POP. Laparoscopic Sacrocolpopexy (LSC) is a surgical procedure that is considered to be associated with a low rate of recurrence and a high success rate. A recent review reported that the post-LSC reoperation rate for POP was only 2.2% [3]. However, the indications and factors affecting the safety of the operation are not clear. Our hospital has treated more than 180 cases of POP. In the present study, we investigated the indications for POP and factors affecting the safety of the operation.

Materials and Methods

A total of 183 women with symptomatic prolapse who underwent LSC between 2014 and 2018, were retrospectively analyzed. Complications, the operative time, and the volume of blood loss during surgery, and factors related to the surgical outcome (values >mean + 1.5 SD) were examined. Postoperative infection was defined by an elevated CRP level (>mean + 1.5 SD) on postoperative day 3. We evaluated the complications and the rate of recurrence in the 2 years after surgery. The patient was placed in Trendelenburg position under general anesthesia. A camera port was inserted through a 5-mm umbilical incision trocar, a 12 mm trocar was placed on the left side of the anterior superior spina iliaca, and 5-mm trocar was placed on the left side. Additionally, a 5-mm trocar was placed on the left side of the umbilical camera port incision. We usually perform supracervical hysterectomy (with or without bilateral salpingo-oophorectomy). Using a rectal probe, posterior

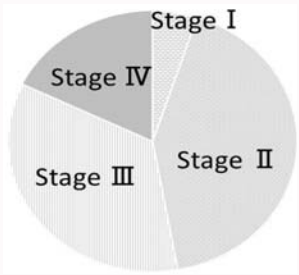

Figure 1: Pre-operation POP-Q stage. In 95% of the patients, the POP score was higher than grade 2.

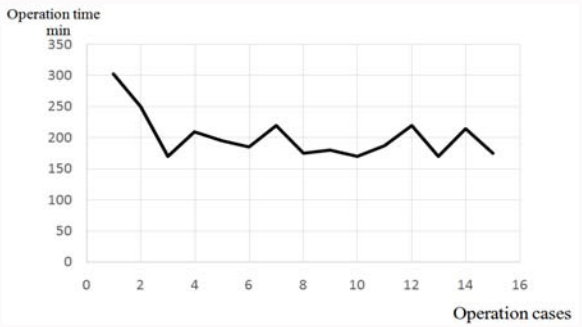

Figure 2: Learning curve in LSC technique. For surgeons who are beginners in performing LSC but not in laparoscopic operations, the operation time is significantly decreased.

virginal wall dissection between the rectum and vagina was completed to the levator ani muscle fascia. Dissection to the levator ani muscle fascia was only performed for cases with rectocele. In cases without rectocele, posterior vaginal wall dissection was made until the upper 2/3 of the vaginal wall. On the other hand, the anterior vaginal wall dissected to the Aa point, which was 3 cm from the external urethral meatus corresponding to the urethrovesical crease. Two-part double mesh was placed posteriorly and anteriorly. Nonabsorbable suture was used for tying the mesh at the distal endpoint of both the vaginal wall and the remaining cervix. The mesh was fixed between the remaining cervix and the anchored distal vaginal wall using a large number of absorbable sutures. We made a right-side retroperitoneal tunnel from the sacral promontory to the Douglas pouch. This tunnel was not fully opened. Identification of the sacral promontory was completed by mobilizing the colon to the upper left side of the pelvis. Using feedback of attachment, the sacral promontory was easily recognized and injury of the descending aorta was avoided. By using a retroperitoneal tunnel, the mesh joined the cervix and sacral promontory. Fixation of the mesh to the sacral promontory was achieved with two nonabsorbable sutures. Any excess mesh was trimmed and the peritoneum was closed so that no mesh was left exposed. Finally, the remaining uterus body and sometimes the adnexa were removed after supracervical hysterectomy using a 12-mm tracer. To avoid adhesion, we use an adhesion barrier in all cases. The protocol for the research project has been approved by a suitably constituted Ethics Committee of the institution within which the work was undertaken and that it conforms to the provisions of the Declaration of Helsinki in 1995 (as revised in Brazil 2013).

Results

The patients' demographic data are as follows (Table 1). The mean age of patients was 68.5 (range 33 to 88) years and the mean body mass index was 24 (range 16.3 to 33.3). There were no cases of conversion to laparotomy; all LSC operations were safely performed. The mean operation time, amount of bleeding, and postoperative CRP on day 3 were 189.1 min, 61 ml, and 2.5 ml/dl, respectively. The mean POP-Q stage of the patients before surgery was 2.6. In 95% of the patients, the POP score was higher than grade 2 (POP-Q classification) (Figure 1). Although the standard operative procedure of LSC includes supravaginal hysterectomy, two patients had uterine preservation, and three cases had total uterine hysterectomy due to cervical dysplasia. In one case (0.5%; 1/183), we could not achieve fixation at the sacral promontory, because the aorta covered the promontory. Eleven patients developed postoperative recurrence. Among these cases the following procedures were performed by other surgeons: TVM (n=4), round ligamentopexis (n=4), MaCall operation (n=1), VTH + colpoperineoplasty (n=1) and LeFort operation (n=1). Forty-four patients had a history of abdominal

Table 1: Patients demographic data.

Patients demographic data	
Variable	Mean ± SD (range) N=183
Age	68.5 ± 9.7 years (33 to 88)
BMI	24 ± 3.1 kg/m^2 (16.3 to 33.3)
Operative time	189.1 ± 32.2 min (115 to 303)
Blood loss	61 ± 84.4 ml (5 to 700)
postoperative Day 3 CRP	2.5 ± 1.5 mg/dl (1.1 to 7.8)
POP-Q stage	2.6 ± 0.8 (1 to 4)

Table 2: Characteristics of 183 LSC procedure.

Previous prolapsed surgical history	11cases
TVM	4 cases
Round ligamentopexis	4 cases
MaCall	1 cases
VTH + colpoperineoplasty	1 cases
Le Fort	1 cases
Previous abdominal surgical history	**44 cases**
Abdominal hysterectomy	10 cases
Abdominal supravaginal hysterectomy	1 cases
Others	33 cases

surgery, including abdominal hysterectomy (n=10) and abdominal supracervical hysterectomy (n=1) (Table 2). Three patients had a history of hysterectomy, with two of them demonstrating bladder injury. The mean + 1.5 SD operation time and volume of bleeding were 240 min and 162 ml, respectively. The operation time and bleeding volume tended to increase in cases with large uterine fibroid. The other reasons for an increased operation time included adhesion of the abdominal cavity and complete uterus prolapse. The mean + 1.5 SD CRP value on postoperative day 3 was 4.2 ml/dl. CRP tended to be high in cases with intraperitoneal adhesion (Table 3). Among 111 cases that were followed for two years, postoperative vaginal wall erosion was found in 2 of the 111 patients (1.8%). Stage 2 recurrence, which was not subjectively recognized, was confirmed in 4 of the 111 cases (3.6%). Regarding urinary incontinence after the LSC operation, *de novo* urinary stress incontinence was observed in 10 of the 111 cases (9%).

Discussion

In 1957, Arthure HG first described the performance of abdominal

Table 3: Increased Reason for average value of +1.5 SD

(Upper range) >mean + 1.5 SD	Reason
Operation time (303-) >240 min	Large Uterine fibroid; 3 cases
	460 g, 580 g, 680g (fibroid weight)
	Adhesion; 2 cases
	Douglas closed
	Bowel adhesion around sacral promontory
	Complete uterus prolapse; 2 cases
	Others; 4 cases
Blood loss (350-) >162 ml	Large Uterine fibroid; 4 cases
CRP in postoperative day 3 (7.3-) >4.2 mg/dl	110 g to 680 g (fibroid weight)
	Complete uterus prolapse; 2 cases
	Adhesion; 4 cases
	Complete Douglas pouch closed
	Around adhesion of sacral promontory
	Abdominal wall adhesion
	Uterine fibroid; 2 cases
	145 g, 680 g (fibroid weight)
	Others; 4 cases

sacrocolpopexy [4]. Snyder T and Fox SD achieved a high success rate of 93% to 100% with this procedure [5,6]. Thus, it was considered to be excellent for genital prolapse repair. Recently however, surgical techniques have been improved by the transition to minimally invasive surgery. Dorsey J first reported on the performance of LSC in 1993 [7]. Despite a long operation time, the complication and overall success rates of LSC were similar to those observed with an abdominal approach [8]. On the other hand, the blood loss, hospital stay, and postoperative pain, were all less than that observed for open surgery. This superiority makes LSC a standard operation for pelvic organ prolapse. However, the indications for LSC and the factors affecting the safety of the operation have not been reported. In general, LSC procedures involve a long operation time. Some published papers reported that it took between 181 min and 510 min to perform [9-11]. Our mean operation time was in line with these reports. Pelvic organ prolapse is known to frequently occur in elderly people. From the viewpoint of invasion, a short time operation is more secure and ideal. Laparoscopic suturing, which is often described as one of the most time-consuming procedures, is very often used in LSC. We think that the suturing technique is associated with the long operation time. Thus, an efficient technique can reduce the operative time. We showed the learning curve for LSC operators in the initial step (Figure 2). In this study, one expert surgeon whose suture technique was very fast performed this procedure. For surgeons who are beginners in performing LSC but not in laparoscopic operations, the operation time is significantly decreased after 5 or 6 operations, and after additional experience, it become stable. Certainly, LSC has a special procedure in the deep pelvic area, which is associated with some difficulty. These factors are possible reasons for the extension of the operative time. However, this learning curve improvement means that the operative times of certain expert operators who are experienced in performing laparoscopic surgery, will stabilize with after a relatively small number of operations. Although LSC is considered to be a long and difficult operation, it is not difficult for expert surgeons.

Our mean operation time and mean time + 1.5 SD was 189.1 and 240, respectively. The reasons for the increase in the second value included large uterine fibroid (n=3), adhesion (n=2), complete uterus prolapse (n=2). We usually perform supracervical hysterectomy to allow for easy mesh fixation, thus, it is necessary for the uterine body remaining after supracervical hysterectomy to be morcellated from the abdominal cavity. In cases involving a large uterine fibroid, morcellation takes longer. Major blood loss was not observed during the LSC procedure. During the operation, blood loss mainly occurred when the uterine artery was ligated. The reason for this was the limited working space (a characteristic of laparoscopy) due to the large uterine fibroid, which made ligation difficult. Elevated CRP on postoperative day 3 was observed in cases with adhesion of the abdominal cavity. Adhesiotomy, which is an invasive procedure, takes a long time and increases the CRP level. In the present study, postoperative recurrence was observed in 11 patients. Many publications have reported on the same pelvic prolapse surgery techniques for many years; however, it is not certain which method is the most suitable for POP. When recurrence develops after operations to treat POP, it may be because the gynecologist encountered trouble during treatment. In our study, although there were some cases of recurrence, LSC was successfully and safely performed. Thus, LSC is considered to be an especially effective approach for recurrence in various cases. We experienced 3 cases that were complicated by bladder injury. No other complications occurred and there were no cases of conversion to laparotomy. The post-operative complication rate in LSC was not higher than that in laparotomy [12], but it was clearly related to surgeon's experience. POP with a history of uterine total hysterectomy was one of the best indications for LSC. However, bladder injury occurred in 2 of the 3 cases after total uterine hysterectomy. After total hysterectomy, the vagina was sandwiched between the bladder and the rectum. This change will induce local adhesion among these organs. To avoid bladder injury and to easily recognize the dissection area, we tried to inject some saline into the bladder; however, bladder injury sometimes occurred. Thus, the post-hysterectomy state makes it difficult to

recognize the anterior vaginal wall of the dissection area, which is located between the bladder and vagina, leading to an increased risk of bladder injury. Although supravaginal hysterectomy is a standard operative procedure, two patients hoped for uterine preservation, and three cases simultaneously underwent total uterine hysterectomy. The LSC procedure has the merit enabling the preservation of the uterus [13]. In one case we could not perform sacral promontory fixation, because the promontory was covered by the aorta. In this case, the mesh which nearly went through the front of the sacral promontory and it was fixed to the posterior peritoneum. Fortunately, no recurrence was detected at a 10-month follow-up examination. Mesh erosion occurred as a complication of LSC in 1.8% of our cases. In some studies, the incidence of mesh erosion was reported to be 2% to 10% [14-16]. Mesh erosion is caused by a combination of bacterial infection and devascularization of the vaginal cuff [17]. Avoiding vaginal injury in hysterectomy might reduce the incidence of erosion. Thus, we generally perform supravaginal hysterectomy unless the removal of the cervix is required. Prolapse recurrence with POP grade 2 (POP-Q classification) occurred in 3.6% of patients; no cases showed a higher grade. In the patients with grade 2 recurrence, there were no significant subjective symptoms of prolapse. DeLancy described a vaginal supporting mechanism, and reported LSC to be an effective procedure to achieve level one support [18]. Fixation of the cervix to the sacral promontory caused level one stability. This stability may have been responsible for the low rate of recurrence of pelvic organ prolapse. Even if recurrence developed, no significant subjective symptoms developed due to the level one stability. In all cases we insert mesh from the Aa point of the anterior vaginal wall. The deep insertion of the mesh improved not only level 1 defect but also level 2 defects. This concurrent level 2 revision, which reduces the rate of recurrence, is an advantage of the LSC procedure. In our study, recurrence developed within three months, which was a relatively short time. Post-LSC recurrence might occur at soon after surgery. The long-term insertion of mesh might cause adhesion and semi-permanent fixation with pelvic tissue. This might be a reason for the low rate of recurrence after LSC. The de novo urinary stress incontinence rate was 9%. In some reviews, the urinary stress incontinence rate was estimated to be approximately 18% [19]. The benefit of simultaneous prophylactic surgery to reduce this symptom remains unclear. Thus, we do not routinely recommend concurrent prophylactic surgery for urinary stress incontinence.

In conclusion, LSC is applicable in the treatment of recurrent cases and after total uterine hysterectomy. LSC is a highly useful procedure for treating pelvic organ prolapse in general. In cases after hysterectomy, the risk of bladder injury may be high, and in cases of suspected fibroid merger or adhesion, the operation time and bleeding volume may increase. Thus, pre-operative evaluations are very important for the safety of LSC procedures.

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