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Laparoscopic lateral suspension: a single-site and single-surgeon experience

Claudia Mang*, Hansjörg Huemer, Ariane Birkenmaier and Jörg Humburg*

Abstract

Background: In the reconstructive surgery for pelvic organ prolapse (POP), different newer mesh fixation techniques as an alternative to sacrocolpopexy has been developed. In order to gain more data about the different techniques, it is important to analyze success and recurrence rates of surgical procedures.

Methods: Collection and analysis of data from patients treated with laparoscopic lateral suspension (LLS). Patients were followed up for 6 weeks after surgery. Consultations were continued, if needed, up to 2.5 years. Main outcome measures were anatomic results, POP recurrence, mesh exposure and reoperation rate, and potential risk factors for relapse.

Results: Thirty-nine patients were treated between July 2015 and November 2017. In the first visit, one patient was diagnosed with an early relapse (success rate: 95%). Another six women relapsed during follow-up (mean, 13.5 months; success rate, 82%). Patients with recurrence were younger (62 vs. 68 years) and had initially a higher degree of prolapse, a higher parity (3.8 vs. 1.9), more previous surgeries, and longer operating times.
Early exposures were seen in 5.3% patients and raised up to 13% during follow-up; all but one were treated successful with local estrogen therapy. Risk factors for exposure were higher age and longer operating time.
The whole reoperation rate was 13%.

Conclusions: LLS might be a valid alternative to the laparoscopic sacrocolpopexy in women with prolapse in the anterior compartment and apical descent. Younger women with higher parity and higher degree of prolapse in the middle compartment had a higher recurrence rate after LLS.

Keywords: Laparoscopic lateral suspension, Mesh surgery, Pelvic organ prolapse

Introduction

The lifetime prevalence for pelvic organ prolapse (POP) is high [1–4] and the symptoms vary: voiding disorder, the sensation of a vaginal bulge, sexual dysfunction, obstructed defecation, or chronic back pain. In many cases, the stage of prolapse diagnosed does not correspond with the intensity of symptoms experienced by the patients and the impact on their quality of life [5]. When all conservative therapy options have been exhausted or failed, surgery is indicated. Due to the different available surgical approaches, the appropriate procedure can be selected according to the age of the patient, the POP stage, and its specific anatomy (e.g., cystocele, rectocele, enterocele, prolapse of the uterus, posthysterectomy vaginal vault prolapse) among other factors. Previous surgery, concomitant diseases, and the patient's personal expectations have to be considered as well. Surgery for POP can be done vaginally, laparoscopically, with robotics, or as open transabdominal surgery.

Sacrocolpopexy is the current gold standard for treatment of an apical prolapse [5] but may be complicated by obesity, cardiovascular or pulmonary comorbidities, or anatomical variations. Furthermore, sacrocolpopexy is associated with a higher perioperative risk of complications in comparison to vaginal surgery [6]. Fixing the mesh on the anterior on the sacrum is demanding due to the nearby big vessels, nerval plexus, and the colon. To avoid injury to these structures, different newer surgical mesh techniques like the laparoscopic lateral suspension (LLS) or the pectopexy [7] were developed and are discussed in literature.

* Correspondence: claudia.mang@gmx.ch; joerg.humburg@bethesda-spital.ch
Department of Obstetrics and Gynecology, Bethesda Spital Basel, Gellertstrasse 144, 4052 Basel, Switzerland

LLS, as developed by J.B. Dubuisson [8, 9] is a newer surgical technique and alternative procedure especially for apical and anterior POP repair whereby the mesh is fixed to the vagina or cervix, with two mesh arms connected laterally to the abdominal wall [10]. In case of an insufficient posterior compartment, LLS alone, without treatment of the posterior compartment, showed the risk that the patient may subsequently develop an enterocele or rectocele [11].

As the symptoms of POP vary widely and the expectations of patients differ according to their age and morbidity, it is important to collect and analyze more available data on outcomes, complications, and recurrence rates for this promising surgical technique.

Methods

Between July 2015 and November 2017, we treated 39 patients with a symptomatic and pronounced weakness of the anterior and/or apical compartment with LLS. All surgeries and consultations were performed by the same experienced urogynecologic surgeon (senior author of the study).

For this observational cohort study, preoperative, perioperative, and postoperative data were collected for all patients treated with LLS, also it is a heterogeneous group. Inclusion criteria for surgery were women with symptomatic apical descent and prolapse in the anterior compartment. Patients with a higher degree of prolapse in the posterior compartment (Baden–Walker System > I) were excluded.

Preoperative examinations yielded information regarding the stage of POP (Baden–Walker System [12]) and sonographic measurement of residual urine, asking for prolapse-related symptoms (feeling of heaviness on the lower abdomen, sensation of a lump in the vagina), questions about disturbing symptoms of lower urinary tract symptoms and constipation, previous surgery of POP, type of hysterectomy, body mass index, and parity.

Perioperative data included duration of intervention, planned concomitant operations, perioperative complications, blood loss, material used, and number of stitches.

Postoperatively, details on complications, pain, and length of hospital stay were collected. Six weeks postoperative, the results of the gynecological examination (stage of POP, exposures) and subjective well-being, absence of POP symptoms, consisting or new symptoms were inquired. After an inconspicuous follow up, further routine controls were arranged at their resident gynecologists or practitioners and patients return in cases of symptoms or complications.

All consultations data in the following months and up to 2.5 years postoperative were also registered if they were related to any surgery complication.

Main outcome measures were anatomic results, recurrence and mesh exposure rate, reoperation rate, and potential risk factors for relapse. Recurrence was defined as persistence of symptoms and prolapse beyond the hymen.

Surgical technique

LLS was performed as described by J.B. Dubuisson [10, 11, 13].

In a first step, the vesicovaginal and rectovaginal space were dissected; in some cases, an adhesiolysis was necessary. During surgery, an assistant helped expose the tissues with a vaginal manipulator. Then the cross- and t-shaped polypropylene mesh (TiLOOP® LLS Dubuisson, pfm medical ag, Köln, Germany) was inserted, placed over the dissected anterior and posterior vaginal wall, and fixed with simple, interrupted stitches (Polydioxanone (Ethicon PDS®), Polypropylene (Ethicon Prolene), and/ or Polyester (Ethicon ETHIBOND®) suture material was used). In uterus-preserving intervention, absorbable trackers were used additionally. Skin incisions were made on both sides about 2 cm above the iliac crest and 4 cm posterior to the anterior superior iliac spine to introduce laparoscopic forceps to create an extraperitoneal tunnel toward the round ligament. Once the peritoneal cavity was reached, the side arms of the mesh were slowly pulled out until the tension was satisfactory. The side arms were then cut at skin level to accomplish a tension-free mesh position. The peritoneum was closed completely over the mesh.

Statistical analysis

For data collection, Microsoft Excel 14.7.7 was used. Descriptive analyses were used to describe the data in percentages and average values. Statistical analyses (Chi-square test and ANOVA) were performed by IBM SPSS Statistics version 24. A p value < 0.05 was considered statistically significant.

Ethics

The study conforms with the essential requirements of the Swiss HFG (Humanforschungsgesetz, Swiss law regulating human research) and has been approved by the Swiss Ethics Committee.

Results

Thirty-nine women were treated with a laparoscopic lateral suspension between July 2015 and November 2017 with a median age of 68 years (range 44–82 years) and a BMI of 25 kg/m^2 (range 18–35). The median of parity was 2 (range 0–5).

Pre- and perioperative data

A total of 31 women (80%) had prior surgeries. Twenty-nine women (75%) had undergone a hysterectomy, in mean 15 years before (range 4–50 years); in 13 cases, the hysterectomy had been performed by laparotomy and in 15 cases by vaginal route and in one case by laparoscopy.

Two patients had been treated with a hysterosacropexy, 13 patients with a previous anterior colporrhaphy (mean 17 years prior; range 2–40 years), and 5 women with a Marshall-Marchetti-Krantz (MMK) colposuspension (mean 38 years prior; range 28–44 years). For urinary incontinence, 5 women had been treated with a retropubic sling (mean 10 years prior; range 6–12 years).

Women presenting with a prolapse of the middle compartment (vault and apical descensus) were selected for LLS with mesh. Tables 1 and 2 sum up preoperative symptoms and examination findings. Two patients, who in addition, presented with a bothersome stool-outlet symptomatic and a rectal prolapse, underwent a concomitant ventral D'Hoore rectopexy. In order to reduce the amount of mesh material inserted and fixed on the promontory, as well as to create a total repair of all compartments, a cross-shaped mesh was inserted and fixated as previously described. Later on a visceral surgeon performed a ventral D'Hoore rectopexy, and to avoid the formation of an enterocele, the two meshes were with nonabsorbable stitches connected.

In 18 patients (46.2%), only the lateral suspension was performed. In six women (15.4%), an additional supracervical hysterectomy was performed, and in 3 patients (7.7%), a total laparoscopic hysterectomy was performed. Extensive adhesiolysis was required in 5 patients (12.6%). Seven patients (17.9%) required anterior colporrhaphy because of a persisting cystocele (Baden–Walker > II) at the end of the procedure. This approach was discussed before the operation when informed consent was obtained from the patients suffering from a higher prolapse stage. Two patients (5.1%) received a ventral D'Hoore rectopexy, and 1 patient (2.6%) underwent a uterus-preserving surgery. In one case, the suture of a 3 mm lesion of the rectosigmoidal colon (2.6%) became necessary.

The mean time for the surgical intervention was 174 min (+/− 42 min) with a mean blood loss of 93 ml (+/− 56 ml). There was no conversion to laparotomy.

The suture material used was absorbable Polydioxanone (Ethicon PDS®) in 7 patients and nonabsorbable Polypropylene (Ethicon Prolene®) in 33; in 1 patient, both were used; an average of 8.5 stitches (range 5–12) was required. In 5 (12.8%) patients, an additional 2.4 stitches (range 2–4) of nonabsorbable polyester suture (Ethicon ETHIBOND®) were needed. In the uterus-preserving operation, absorbable trackers were used.

Thirty-four patients were given a combination of cefuroxime and metronidazole as an intraoperative antibiotic prophylaxis, while 5 received only cefuroxime.

Table 2 Preoperative and postoperative anatomic findings

Examination details	Preoperative n (%)	Postoperative n (%)
Cystocele		
0	4 (10.3)	24 (63.2)
1	2 (5.1)	8 (21.1)
2	7 (17.9)	6 (15.8)
3	24 (61.5)	0
4	2 (5.1)	0
Enterocele		
0	28 (71.8)	36 (94.7)
1	8 (20.5)	2 (5.3)
2	3 (7.7)	0
Apical/vault descensus		
0	0	35 (92.1)
Vault descensus		
1	0	1 (2.6)
2	22 (56.4)	0
3	7 (17.9)	0
Apical descensus		
1	0	1 (2.6)
2	5 (12.8)	0
3	5 (12.8)	1 (2.6)
Rectocele		
0	19 (48.7)	20 (52.6)
1	17 (43.6)	16 (42.1)
2	3 (7.7)	1 (2.6)
3	0	1 (2.6)

Table 1 Preoperative and postoperative symptoms in the first follow-up 6 weeks after surgery

Symptom	Preoperative *n* (%)	Follow-up: 6 weeks postoperative *n* (%)
Overactive bladder symptoms (urgency, urgency incontinence, frequency and nocturia)	5 (12.8)	3 (7.9)
Stress urinary incontinence	11 (28.2)	5 (13.2)
Voiding dysfunction	21 (53.8)	3 (7.9)
Residual urine (> 50 ml)	19 (48.7)	3 (7.9)
Constipation	14 (35.9)	10 (26.3)
Obstructed defecation	3 (7.7)	2 (5.3)
Stool incontinence	3 (7.7)	1 (2.6)

Six patients (15.4%) experienced intraoperative complications. In three occasions, the vagina was opened accidentally. Two superficial serosa lesions on the sigma, one rectosigmoidal lesion, and one bladder perforation occurred. One patient had a vaginal opening as well as a serosa lesion. All complications were related to the LLS and not to the concomitant procedures.

Immediately postoperative, three patients suffered from urinary tract infections, which were treated by oral antibiotics. One woman showed post-void residual urine volume (PVRV) with 190 ml (preoperative 280 ml) and preexisting overactive bladder. The PVRV decreased under a distigmine bromide therapy to values of 70 ml.

The median hospital stay was 4 days (range 2–9 days).

Postoperative data

Thirty-eight patients were seen for a postoperative visit at a mean of 5.8 weeks after surgery (range 5–9 weeks), one patient was lost to follow-up. The success rate of the surgery was 95% with the anatomical and functional results presented in Tables 1 and 2. One woman suffered a very early relapse. Two patients showed vaginal mesh exposure (5.3%); however, in one case, the exposure was so superficial that it healed successfully with a local estrogen therapy over 6 weeks.

Postoperatively, the patients were asked for disturbing lower urinary tract symptoms and constipation. There were no cases of de novo urinary incontinence or constipation reported. The number of women with voiding dysfunction was reduced from 53.8% preoperative to 7.9% postoperative; the incidence rate for stress urine incontinence was more than halved postoperatively (28.2 to 13.2%) (Table 1).

After 13.5 months (range 4–22 months), another 6 patients showed a recurrence (success rate 82 %) and three more patients presented with vaginal mesh exposure. The only patient that underwent a uterus-preserving surgery suffered an early relapse, and the postoperative visit showed an apical descensus grade III and a new rectocele grade III.

The other patients showed insufficiency in the anterior and middle compartment (Table 3): one patient presented with a cystocele grade II and two with a grade III and another three with vault descensus grade II and one grade III. Two of them were oligosymptomatic, and another patient showed an oligosymptomatic recurrence with a rectocele grade II.

Relapse cohort

Patients with recurrences were of higher parity (mean of 3.8 vs. 1.9 children) than non-relapsing patients. In the group with recurrences, three women (42.9%) had 4 children and two (28.6%) had 5. In the no-relapse group, only 6.2 % had 4 or 5 children.

Table 3 Anatomic findings for women with relapse (n = 7)

Examination findings	Preoperative n (%)	1st postoperative control n (all 7) (%)	Review mean 13.5-month postoperative n (all 6, without early relapse) (%)
Cystocele			
0	2	4	3
1	0	1	0
2	2	2	1
3	2	0	2
4	1	0	0
Enterocele			
0	4	5	4
1	2	2	2
2	1	0	0
Vault descensus			
0	0	5	2
1	0	1	0
2	2	0	3
3	2	0	1
Apical descensus			
1	0	0	
2	1	0	
3	2	1	
Rectocele			
0	3	2	1
1	3	4	3
2	1	0	1
3	0	1	1

On average, the patients with a recurrence were younger than those without relapse (mean of 62 years vs. 68 years) (Table 4).

The women with relapse had a slightly higher BMI with 25 kg/m2 versus 24 kg/m2.

Six of the seven women with relapse had a previous surgery: vaginal hysterectomy (four patients), supracervical hysterectomy (one patient), hysterosacropexy (one patient), TVT (tension-free vaginal tape) (one patient), and anterior colporrhaphy (three patients).

In the preoperative examination, the patient group with relapse showed a higher grade of descensus in the middle compartment. About 33% (4 of 12) patients originally presenting with a grade III vault or apical descensus experienced a postsurgical relapse. Only 11% (3 of 27 patients) with grade II vault and apical descensus had a relapse. A higher grade of cystocele had no critical influence.

There were no differences regarding the suture material used, but the average operation time was longer in

Table 4 Characteristics of women with versus women without relapse

	Women with relapse $n = 7$	Without relapse $n = 31$	p values
Age in years	62	68	0.177
BMI in kg/m^2	25	24	0.857
Parity	3.8	1.9	0.014
Pre-operations n (%)	6 (85.7)	26 (81.3)	0.975
Surgery time (min)	201	168	0.073

the relapse group (201 min vs. 168 min for the group without relapse). Two patients of the relapse group experienced intraoperative complications: a vaginal opening and both a serosal lesion. Two women in the relapse group underwent concomitant operations: a supracervical hysterectomy and an anterior colporrhaphy. One woman had a uterus-preserving operation. One of the seven patients in the relapse group showed vaginal exposure.

Mesh exposure *group*

In total five cases of mesh exposure were observed 6 weeks to 22 months post LLS (exposure rate: 13%).

On the average, the patients with vaginal mesh exposure were older, between 74 and 79 years old, with the exception of one 44-year-old patient. The patient group without exposure were on average younger (65.9 years vs. 70.0 years, $p = 0.497$).

There was again a slightly higher value of BMI with 25 kg/m^2 versus 24 kg/m^2 ($p = 0.839$). The parity was slightly lower with 1.4 (vs. 1.9, $p = 0.095$). Four of the five women (80%) had previous surgical interventions: two vaginal and two abdominal hysterectomies, three anterior and one posterior colporrhaphy, and one MMK.

The duration of the surgery was longer with the mean 197 min versus 170 min. One of the five patients in this group had a concomitant laparoscopic supracervical hysterectomy with adhesiolysis, and one patient underwent an anterior colporrhaphy. There were no intraoperative complications.

Further treatment

The patient with the early relapse received a supracervical hysterectomy and a cervicopromontofixation. In two patients a sacrocolpopexy and in one a colporrhaphy was required. Three patients with oligosymptomatic recurrences have declined further surgery at the moment.

The five patients with mesh exposure first received intense topical estrogen therapy which was successful in three cases. One patient was not disturbed by the exposure and declined further treatment. One patient had the visible part of the mesh resected and the vaginal tear successfully closed with a few stitches.

The total reoperation rate after lateral suspension was 13%.

Discussion

Beside the sacrocolpopexy as the current standard for POP surgery, some other surgical procedures like the laparoscopic lateral suspension or the pectopexy [7] were discussed in the literature.

Our study follows a fairly typical group of patients representative in its heterogenicity and the variety of challenges offered: interventions with or without prior hysterectomies, concomitant supracervical or total laparoscopic hysterectomy, or uterus-preserving lateral suspension with mesh as well as differences in age, frailty, BMI, and parity.

One patient wishing uterus-preserving surgery showed an early recurrence after only 6 weeks with a grade III apical descent and rectocele as well as a grade I enterocele. Preoperatively the gynecologic examination had shown a grade III apical descent but no rectocele or enterocele. The BMI of this mother of four was normal (21 kg/m^2). She was reoperated with a supracervical hysterectomy and a cervicopromontofixation. With one patient, it is not convincing that this method is not working; also this is in contrast to the results of a study [14] with 224 patients where the uterus-preserving lateral suspension showed a better outcome for the anterior compartment than LLS with mesh in association with a supracervical hysterectomy. Also Mereu et al. described high success rate of 94.3% in uterus-preserving surgery with mean follow-up of 20 months [15].

Overall, our postoperative data show a success rate of 95% at the first visit (on average 5.8 weeks postoperative) and of 82% after mean of 13.5 months. This is according to the results mentioned in the literature: Dubuisson et al. [13] give a 82.2% cure rate at a mean of 17.5 months, with one early apical prolapse and 8.2% new prolapses in the first year of follow-up.

In comparison, the recurrence rate for laparoscopic sacrocolpopexy is 5–23% [16, 17].

Our patients showed relapses in the anterior as well as in the apical compartment. In contrast to published data, we found no increased incident rate for de novo prolapses in the posterior compartment. A possible explanation could be that our group of patients were without predominant rectocele, and in two cases, a ventral D'Hoore rectopexy was done concomitantly.

Risk factors for recurrence were in our patients a higher parity, a higher number of previous surgical

interventions, and a slightly higher BMI, which are all also common risk factors for primary POP [18]. However, only the preoperative stage was confirmed as a risk factor for POP recurrence after surgical repair with native tissue in a systematic review [18]. For parity and BMI, no significant influence was detectable in the same review [18]. The literature also shows that women with prolapse grade III and higher had a significantly higher risk of prolapse recurrence after surgical repair without grafts [19]. This could be confirmed in our study. Patient with a more advanced stage of descensus in the middle compartment more often showed recurrent prolapses after LLS surgery. In the study of Whiteside et al. [20], not only women with more advanced prolapses but also younger women were at a higher risk for recurrences after vaginal repairs .

Vandendriessche et al. showed that older age at time of laparoscopic sacrocolpopexy is a factor reducing the risk of recurrence [21]. Our patients with recurrence are in the mean 62 years versus 68 years in the group without relapse.

The operating time was longer (201 vs. 168 min) in the relapse group. An explanation may be the higher number of prior surgeries, which can lead to more challenging anatomical sites due to adhesion or scarring, which makes it difficult to find the right anatomic plane or space to place the mesh correctly. This is according to the data published by Dubuisson, who also had a longer operating time in women with prior hysterectomy: 193 min for posthysterectomized women with lateral vault suspension [13] and 117 min in uterus-preserving LLS with mesh [10].

The exposure rate we found in our cohort was 5.3% at first visit, usually after 6 weeks after the intervention and 13% over time.

The literature reports vaginal mesh exposure rates after laparoscopic lateral suspension of 4.3–5.5% [11, 13]. These values are comparable to the mesh exposure after sacrocolpopexy in 5–10% of the cases [22, 23].

We noted risk factors as a higher age (70 vs. 76 years), which is associated with advanced vaginal atrophy and longer operating times (+ 27 min) probably due to more difficult intraoperative anatomic conditions and weakened tissues. In our cohort, a concomitantly performed total laparoscopic hysterectomy or a concomitant vaginal surgery did not lead to vaginal mesh exposure.

Compared to the figures reported, our exposure rate at 13% is higher, but most cases were detected early and could be treated successfully with topical estrogen therapy. Only one of our patients (2.6%) needed a partial vaginal mesh excision; this corresponds to the 2.7% mentioned by Dubuisson et al. [13].

Our total reoperation rate was 13% after a mean of 11.4 months after LLS. The total reoperation rate in the literature is lower with values of 7.3% [11] and 11% for the sub-cohort of previous hysterectomized women [13].

Our patients are older with a mean age of 68 years (vs. 63 years [13] and 58 years [11], having a slightly lower mean BMI (25.4 kg/m^2 vs. 26.7 kg/m^2) [13] but share the same mean parity of 2. Importantly, the incidence of prior POP surgery is much higher in our cohort with 41% compared to the figure of 16.6% found in the literature [11]. About 74% of our patients had had a hysterectomy prior to the LLS, while only 17.8% of the 417 patients described by Veit-Rubin et al. [11] are posthysterectomy. The sub-cohort of hysterectomized women with LLS by Dubuisson et al. [13] shows a higher reoperation rate with 11% compared to all patients with LLS [11]. The surgery after recurrence (on average 16.4 months after LLS, with a total follow-up time averaging 7.2 years) was more frequently performed by the vaginal route [11].

Conclusions

Our success rate of 95 % at first visit after the surgery and 82% in the follow-up until 22 months post-surgery confirm that LLS can be a valid alternative to laparoscopic sacrocolpopexy in women with apical descent and prolapse in the anterior compartment. This is particularly true in the presence of factors that elevate the risk of complications such as obesity, adhesions, diverticulosis, or vessel variations.

We are aware of the limitations of our study: the heterogeneity of our group, the small number of patients, and the absence of a control group complicates statistical analysis. These “flaws,” however, reflects the clinical reality and the inherent challenge to find the best treatment option for each individual.

One of the strengths of the study lies in the reproducibility of the results since a single surgeon performed all interventions.

We strongly suggest the creation of national registers for POP surgeries to collect more data as this still relatively new approach will yield more studies over time. Such registers would encourage more studies analyzing the outcome and long-term results.

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Authors’ contributions
CM provided data collection, data analysis, and manuscript writing; HH and AB contributed the editing of the manuscript; JH contributed the project development and manuscript editing. All authors reviewed and approved the final draft of the manuscript.

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Availability of data and materials
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate
The study conforms with the essential requirements of the Swiss HFG (Humanforschungsgesetz, Swiss law regulating human research) and has been approved by the Swiss Ethics Committee. A consent to participate from every patient is existing.

Consent for publication
Not applicable

Competing interests
The authors declare that they have no competing interest.

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