Vaginal vault prolapse and recurrent surgery: A nationwide observational cohort study

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Abstract

Introduction: In surgical repair of pelvic organ prolapse the recurrence rate is about 30% and the importance of apical support was recently highlighted. In surgical randomized controlled studies, the external validity can be compromised because the surgical outcomes often depend on surgical volume. Therefore, we sought to study outcomes of surgical treatment in patients with vaginal vault prolapse in a nationwide setting with a variety of surgical volumes.

Material and methods: This is a nationwide cohort study. All patients with a vaginal vault prolapse undergoing surgery, between January 1, 2015 and December 31, 2018, were identified from the Swedish National Quality Register of Gynecological Surgery, GynOp. The primary outcome was the frequency of recurrent pelvic organ prolapse surgery within 2 years postoperatively. Secondary outcomes included patient-reported vaginal bulging, operative time, estimated blood loss and 1-year postoperative complications.

Results: In 1812 patients with vaginal vault prolapse, 538 (30%) had a sacrospinous ligament fixation (SSLF) with graft, 441 (24%) underwent SSLF without graft, and 200 (11%) underwent minimally invasive sacrocolpopexy (SCP) or sacrocervicopexy (SCerP). A significantly higher proportion of patients undergoing recurrent pelvic organ prolapse surgery was seen in SSLF without graft than in SSLF with graft (adjusted odds ratio [aOR] 2.2, 95% CI 1.4–3.6). Patient-reported sensation of vaginal bulging 1 year after surgery was higher in the SSLF group without graft than in the SSLF group with graft (aOR 1.9, 95% CI 1.3–2.8) and in the SCP/SCerP group (aOR 2.0, 95% CI 1.1–3.4). Finally, we found a significantly higher rate of complications 1 year after surgery in SSLF without graft (aOR 2.3, 95% CI 1.2–4.2) and in SSLF with graft (aOR 2.2, 95% CI 1.2–4.2) compared with SCP/SCerP.

Conclusions: In patients with vaginal vault prolapse, SSLF without graft was associated with a higher frequency of recurrent pelvic organ prolapse surgery compared...
1 | INTRODUCTION

Hysterectomy for obstetric, benign or malignant indications is one of the most frequent gynecological procedures, with an estimated incidence rate of 351 per 100,000 person-years. Over time, the shift to more minimally invasive surgery raises the question of how the pelvic floor can be affected by surgery. The risk of apical prolapse after hysterectomy increases compared with non-hysterectomized controls but varies according to different studies. Age, parity, obesity and chronic lung conditions are other risk factors in the development of pelvic organ prolapse (POP). Vaginal hysterectomy has been linked to an increased risk for POP surgery later in life.

By definition, apical prolapse, which can be graded by the Pelvic Organ Prolapse Quantification system (POP-Q) classification, is described as a descent of the uterus, the vaginal vault or the cervix after a total/subtotal hysterectomy. In surgical repair of POP, the recurrence rate is about 30% and the importance of apical support was recently highlighted. Due to various surgical procedures and techniques, it is difficult to standardize an optimal treatment protocol for this group of patients.

Sacrospinous ligament fixation (SSLF) without graft, first described in 1958, is achieved by identifying the sacrospinous ligament by absorbable or non-absorbable sutures to the vaginal vault. SSLF is a conventional surgical method to repair apical prolapse. A meta-analysis showed an overall subjective failure rate of 10.3%. Newer surgical techniques of SSLF with graft placement via minimally invasive instruments have been developed but they are associated with specific complications, such as mesh erosion. The first sacrocolpopexy (SCP) was performed in 1962. This method allows the remaining cervix (Sacrocervicopexy [SCerP]) or the vaginal vault (SCP) to be attached to the sacral promontory with a synthetic mesh. This was accomplished initially by laparotomy and later by laparoscopy, the latter introduced in 1994.

Robotically assisted laparoscopic surgery was approved in 2007 and a meta-analysis by Hudson et al. in 2014 showed a low relapse and complication rate using this method. Maher et al. published a Cochrane review in 2016, and concluded that SCP/SCerP be recommended in patients with vaginal vault prolapse. A favorable symptomatic outcome was found in SCP/SCerP compared with vaginal methods. Additionally, SCP/SCerP was associated with a lower rate of dyspareunia, urinary incontinence and mesh exposure. The review compared transvaginal procedures and a mixture of uterine prolapses and vaginal vault prolapses to SCP via laparotomy or laparoscopy. Moreover, in surgical randomized controlled studies (RCTs) the external validity may be compromised, as the surgical outcomes often depend on surgical volume. Most surgeries in RCTs are performed by high-volume surgeons. Therefore, we sought to study outcomes of surgical treatment in patients with vaginal vault prolapse in a nationwide setting with a variety of surgical volumes. In this population-based register study we aimed to compare the efficacy of common surgical methods in women with vaginal vault prolapse.

2 | MATERIAL AND METHODS

The investigation is a nationwide observational cohort study with a study population identified from the National Quality Register of Gynecological Surgery (GynOp). A complementary evaluation of medical records of most patients with apical prolapse undergoing laparoscopic or robotic prolapse surgery (454 out of 694) was completed to differentiate between the laparoscopic and robotic approaches, which decreased the number of missing data. The medical record review also enabled us to validate the register’s data. When comparing variables from Gynop and the medical records, we found that 84%-98% of the data matched. The GynOp was created in 1994. Data collection for prolapse surgeries was initiated in 2006 and 92%-98% of prolapse surgery was covered during the study period. The data are prospectively collected with questions answered by the patient before and 2 and 12 months after surgery for demographics, medical history and symptoms associated with female pelvic floor dysfunction. The surgeon reports data on admission, surgery and discharge, including the preoperative gynecological examination of the patient. When a patient reports a complication, a notification is sent to the surgeon or a dedicated gynecologist at the clinic. The gynecologist reads the medical record and sometimes sees the patient and then reports the complication to the register.
The study population includes all previously hysterectomized women undergoing prolapse surgery with point C ≥ 1 cm in relation to the hymen (stage II prolapse or worse). in the GynOp register between January 1, 2015 and December 31, 2018.

Only lightweight non-degradable polypropylene grafts fixed to sacrospinous ligament were included in the study: Nuviia®, UpHold®, Elevate®, Pinnacle®, Splentis®, Calister®. The grafts in SC/SCerP were three lightweight grafts (Artisyn®, Ultrapro®, Upsylon®) and two heavyweight grafts (Parietex Prosup®, Vypro®). We excluded the following surgical methods: colpocleisis, SCP/SCerP performed with laparotomy, anterior or posterior colporrhaphy with no apical compartment fixation procedure and vaginal repair with grafts other than those included in the study. SSLF without graft was not differentiated into uni- or bilateral SSLF.

The primary outcome in this study was the frequency of recurrent POP surgery within 2 years from the index procedure. A recurrent prolapse procedure was defined as any POP surgery recorded in the GynOp register up to 2 years post index surgery (December 31, 2020). A secondary outcome was patient-reported vaginal bulging at the 1-year follow-up questionnaire: "Do you experience a feeling of bulging or protrusion in the vaginal area?" The question was dichotomized from five alternatives (never or almost never into "no", and 1–3 times per month, 1–3 times per week and daily into "yes"). Usage of a vaginal pessary 1 year after surgery was also categorized as having a symptomatic POP.

Secondary outcomes also included operative time, estimated blood loss and 1-year postoperative complications (including minor, major and perioperative complications). Demographic and intraoperative variables include age, body mass index, American Society of Anesthesiologists Physical Status Classification (ASA) (grouped as ASA class 1–2 or 3–5), parity (grouped as 0, 1–2, ≥3 children), smoking habits, previous prolapse surgery, previous incontinence surgery, prolapse stage (grouped as stage I–IV defined by Pop-Q), concomitant anterior, posterior colporrhaphy or perineorrhaphy, hospital procedure volume (grouped as <50, 50–100 and >100, defined as the numbers of vaginal or minimally invasive apical prolapse repair/year), surgeon procedure volume (grouped as <10, 10–20 and >20, defined as the numbers of vaginal or minimally invasive apical prolapse repair/year).

2.1 | Statistical analyses

For statistical analysis the software STATA (Stata v 16.0, StataCorp LLC) was used. Frequencies and proportions were used to present categorical variables and medians and interquartile range for continuous variables. To analyze differences in baseline characteristics, univariable logistic, multinomial and quantile regression were used. In addition, in analyzing primary and secondary outcomes, a multivariable regression was conducted, including all variables from Table 1. Multivariable regression was performed in a stepwise procedure that excluded variables from the univariable model with a P-value >0.25. Restricted cubic splines with four knots were used for body mass index and age due to non-linearity. To obtain correct estimates for the standard errors in repeated measures we used clustered robust standard errors. Results from the univariable regression model are presented as crude odds ratios (cOR), and from the multivariable regression model as adjusted odds ratios (aOR) with 95% confidence intervals (CIs). P-values <0.05 were considered statistically significant.

2.2 | Ethics approval

The study was approved by the Research Ethics Committee at Karolinska Institutet, Stockholm, Sweden (Reference number 2018/18–31) on March 21, 2018 and conformed to the STROBE guidelines for observational studies (www.strobe-statement.org).

3 | RESULTS

Figure 1 depicts the flowchart of this study. In Sweden, 25,109 operations for POP were performed from January 1, 2015 to December 31, 2018. Of these, 9,967 (40%) were preoperatively diagnosed with an apical prolapse stage II or greater. In patients with apical prolapse, 8,155 (82%) had a uterine prolapse before surgery and 1,812 (18%) had a vaginal vault prolapse. In patients with vaginal vault prolapse, 538 (30%) had an SSLF with graft and 633 (35%) prolapse surgery with other surgical methods (eg other grafts or colporrhaphy with no apical fixation), 441 (24%) underwent SSLF without graft and 200 (11%) underwent minimally invasive SCP/SCerP.

Table 1 presents baseline characteristics of the study population. Patients with vaginal vault prolapse undergoing SSLF without graft (cCoef Q 3 years, 95% CI 0.3–6) and VM surgery (cCoef Q 3 years, 95% CI 0.2–6) were older than patients in the SCP/SCerP group. No significant differences were detected between SCP/SCerP, SSLF with and those without graft in ASA classification, body mass index and smoking habits. In the SSLF with graft group, patients had undergone a previous prolapse surgery more often than in the SSLF without graft group (cOR 3.1, 95% CI 2.3–4.1) or the SCP/SCerP group (cOR 2.2, 95% CI 3.0 1.6–3.2). Also, there was a higher rate of surgeon volume over 20 procedures per year in the SSLF with graft group compared with SSLF without graft (cOR 2.1, 95% CI 1.5–2.8) and SCP/SCerP groups (cOR 2.9, 95% CI 2.0–4.2). Prolapse stage IV was more frequent in the SCP/SCerP group than in the SSLF with graft group (cOR 2.3, 95% CI 1.5–3.6) or the SSLF without graft group (cOR 3.7, 95% CI 2.3–6.0). Moreover, the frequency of multiparous (≥3) patients was higher in the SCP/SCerP group than in the SSLF with graft group (cOR 2.4, 95% CI 1.7–3.4) or SSLF without graft group (cOR 2.3, 95% CI 1.6–3.3). Overall, concomitant vaginal surgery was more frequent in the vaginal groups (SSLF without graft—cOR 24.1, 95% CI 14.2–40.9; SSLF with graft—cOR 68.2, 95% CI 39.1–119.0) compared with SCP/SCerP in patients with vaginal vault prolapse.
Primary outcomes in patients with a vaginal vault prolapse are described in Table 2. A significantly higher proportion of patients underwent recurrent POP surgery within 2 years postoperatively in the SSLF without graft compared with the SSLF with graft groups (aOR 2.2, 95% CI 1.4–3.6). Patient-reported sensation of vaginal bulging 1 year after surgery, was higher in the SSLF without graft group than in the SSSLF with graft group (aOR 1.9, 95% CI 1.3–2.8) or the SCP/SCerP group (aOR 2.0, 95% CI 1.1–3.4). Comparing SSLF with graft with SCP/SCerP 1 year postoperatively, we did not find significant differences in recurrent POP surgery or patient-reported bulging sensation. There was a significantly higher rate of complications 1 year after surgery in SSLF without graft (aOR 2.3, 95% CI 1.2–4.2) and SSLF with graft (aOR 2.2, 95% CI 1.2–4.2) compared with SCP/SCerP. Likewise, patients undergoing SSLF without graft (aCoef Q 7 mL 95% CI 4–10) or SSLF with graft (aCoef Q 15 mL, 95% CI 11–19) had a higher blood loss than patients with SCP/SCerP. Finally, SCP/SCerP was associated with a longer operative time than SSLF without graft (aCoef Q 50 min, 95% CI 42–58) or SSLF with graft (aCoef Q 45 min, 95% CI 37–53).

Tables S1 and S2 present a subgroup analysis of recurrent POP surgery in patients with previous POP surgery or stage IV vaginal vault prolapse. The subgroup analysis did not change the primary outcome substantially. A subgroup analysis of complications subcategorized as intraoperative, mild and severe complications 1 year after surgery is shown in Table S3. No statistically significant differences could be found in intraoperative complications between SSLF with and without graft, and SCP/SCerP. The main part of the difference in complications 1 year after surgery between SSLF with graft and SCP/SCerP involved mild complications. However, when comparing complications 1 year after surgery in SSLF without graft and SCP/SCerP, this difference consisted of both mild and severe complications.

| TABLE 1 Baseline characteristics of the study population |
|--------------------------------------------------------|
| Sacrospinous ligament fixation with graft n = 538 | Sacrospinous ligament fixation without graft n = 441 | Lap/Rob sacrocolpopexy/sacrocervicopexy n = 200 |
| **Age** | **Body mass index** | **ASA** |
| 70 (64–76) | 70 (62–75) | 67 (59–72) |
| 26 (23–29) | 25 (23–28) | 25 (23–28) |
| **ASA** | **Parity** | **Smoking** |
| 1-2 | 6 (1.4) | 4 (1.0) | 0 |
| 3-5 | 484 (90.0) | 392 (88.9) | 184 (92.9) |
| 54 (10.0) | 49 (11.1) | 14 (7.1) |
| **Parity** | **Smoking** | **Previous prolapse surgery** |
| 0 | 31 (7.9) | 24 (6.3) | 10 (7.2) |
| 1-2 | 265 (62.5) | 239 (62.2) | 72 (48.0) |
| >2 | 153 (36.1) | 141 (36.7) | 78 (52.0) |
| **Previous prolapse surgery** | **Prolapse stage** | **Surgeon volume** |
| 416 (77.3) | II | <10 |
| 231 (52.5) | 156 (29.1) | 143 (26.6) | 159 (36.1) | 105 (52.5) |
| 12 (67.3) | 3 | 10–20 |
| 13 (52.0) | 106 (19.7) | 126 (28.6) | 22 (11.0) |
| 10 (30.0) | >20 | 289 (53.7) | 156 (35.4) | 73 (36.5) |
| **Hospital volume** | **Concomitant posterior colporrhaphy** | **Concomitant anterior colporrhaphy** |
| <50 | >100 | 230 (42.8) | 255 (47.4) | 177 (32.9) | 397 (73.8) | 95 (17.7) |
| 50–100 | >100 | 194 (44.0) | 153 (34.7) | 145 (32.9) | 240 (54.4) | 99 (22.5) |
| >100 | 14 (7.9) | 94 (21.3) | 0 |
| **Concomitant anterior colporrhaphy** | **Concomitant perineorrhaphy** | **Figures are frequencies (proportions) and median (interquartile range). n = frequencies.** |
| 95 (17.7) | 99 (22.5) | 6 (3.4) |

n = frequencies.
4 | DISCUSSION

The main findings in this study were a higher frequency of recurrent POP surgery (2 years post-surgery) in SSLF without graft compared with SSLF with graft, and higher subjective relapse (1 year post-surgery) in SSLF without graft compared with SCP/SCerP and SSLF with graft in patients with vaginal vault prolapse. Moreover, the complication rate 1 year after primary surgery (including pain and mesh erosions) was higher in SSLF without graft and SSLF with graft than SCP/SCerP. Secondary outcomes showed lower estimated blood loss but a longer operative time with SCP/SCerP than with the two vaginal methods.

The prevalence of hysterectomy in Sweden has been almost constant from 2008 to 2019. An estimation of the number of patients undergoing surgery for vaginal vault prolapse in relation to hysterectomized patients (all indications included) during our 4-year study period was 6.4% (1812/28384), which is in line with an Austrian study by Aigmueller et al. However, trends in repairing vaginal vault prolapse vary between countries. For instance, Zacche et al. report national data from England for 2015-2016 with only 3%-4% SSLF with graft, >50% SCP/SCerP and about 40% SSLF without graft.

In the Cochrane review from 2016, only 4% of patients required recurrent POP surgery in the SCP/SCerP group and 5%-18% in the vaginal group, which is not in agreement with our results, i.e., the frequency of recurrent POP surgery was in general much higher in our study (7.8%-18.1%). This discrepancy might be because we included all types of recurrent POP surgery, including perineorrhaphy and the wide range of surgical experience in a nationwide setting. Surgery success can also be defined differently depending on the patient's relapse compartment, which was not distinguished in this study. In a systematic review, a lower risk of objective failure and recurrent POP surgery was observed in the apical compartment in SCP/SCerP compared with vaginal procedures. Nevertheless, overall
recurrent POP surgery and subjective relapse were the same in the SCP/SCerP group vs vaginal procedures. A higher rate of stage 3–4 prolapse was detected in the SCP/SCerP group, a known significant risk factor for relapse.23

A large prospective observational cohort study on robotic-assisted laparoscopic prolapse surgery (n = 350) showed a symptomatic recurrence rate of 26.4% in patients with a vaginal vault prolapse undergoing SCP.24 Still, most of these patients did not have an anatomical relapse in the apical compartment (91%–98% success rate) and isolated cystoceles accounted for most of the reoperations. Even though the authors in a systematic review by Constantini et al. in 2016 recommended concomitant vaginal repair when performing SCP/SCerP, the rate of concomitant vaginal surgery has declined in minimally invasive SCP/SCerP.25 The rate of concomitant surgery in our study was comparably lower than that reported in other countries,24,26 possibly due to planning

**TABLE 2** Peri- and postoperative outcomes in patients with vaginal vault prolapse

| Outcome | Primary operation | n (%)/median (IQR) | cOR/coef Q\(^b\) (95% CI) | aOR/coef Q\(^b\) (95% CI) |
|---------|------------------|--------------------|----------------------------|---------------------------|
| **Sacrospinous ligament fixation with graft vs sacrospinous ligament fixation without graft\(^a\)** | | | | |
| Reoperations | SSLF+graft | 42 (7.8) | Ref. | Ref. |
| | SSLF−graft | 80 (18.1) | 2.6 (1.8–3.9) | 2.2 (1.4–3.6) |
| Sensation of a bulge | SSLF+graft | 81 (18.8) | Ref. | Ref. |
| Daily/1–3 times/week | SSLF−graft | 114 (33.7) | 2.2 (1.6–3.1) | 1.9 (1.3–2.8) |
| Operative time (min) | SSLF+graft | 58 (42–80) | Ref. | Ref. |
| | SSLF−graft | 57 (40–75) | -1\(^b\) (-5–3) | -5\(^b\) (-9 to -1) |
| Estimated blood loss (mL) | SSLF+graft | 25 (20–50) | Ref. | Ref. |
| | SSLF−graft | 20 (10–30) | -5\(^b\) (-9 to -1) | -8\(^b\) (-11 to -5) |
| Complications in total 1 year after surgery | SSLF+graft | 111 (24.7) | Ref | Ref |
| | SSLF−graft | 94 (27.2) | 1.1 (0.8–1.6) | 1.0 (0.7–1.5) |

| **Sacrospinous ligament fixation with graft vs Lap/Rob sacrocolpopexy/sacroccervicopexy\(^a\)** | | | | |
| Reoperations | SSLF+graft | 42 (7.8) | Ref. | Ref. |
| | SCP/SCerP | 31 (15.5) | 2.2 (1.3–3.5) | 1.3 (0.7–2.5) |
| Sensation of a bulge | SSLF+graft | 81 (18.8) | Ref. | Ref. |
| Daily/1–3 times/week | SCP/SCerP | 31 (22.6) | 1.3 (0.8–2.0) | 1.0 (0.5–1.7) |
| Operative time (min) | SSLF+graft | 58 (42–80) | Ref. | Ref. |
| | SCP/SCerP | 90 (60–140) | 32\(^b\) (21–43) | 45\(^b\) (37–53) |
| Estimated blood loss (mL) | SSLF+graft | 25 (20–50) | Ref. | Ref. |
| | SCP/SCerP | 10 (0–25) | -15\(^b\) (-19 to -11) | -15\(^b\) (-19 to -11) |
| Complications in total 1 year after surgery | SSLF+graft | 111 (24.7) | Ref | Ref |
| | SCP/SCerP | 27 (14.2) | 0.5 (0.3–0.8) | 0.4 (0.2–0.8) |

| **Lap/Rob sacrocolpopexy/sacroccervicopexy vs Sacrospinous ligament fixation without graft\(^a\)** | | | | |
| Reoperations | SCP/SCerP | 31 (15.5) | Ref. | Ref. |
| | SSLF−graft | 80 (18.1) | 1.2 (0.8–1.9) | 1.7 (0.9–3.2) |
| Sensation of a bulge | SCP/SCerP | 31 (22.6) | Ref. | Ref. |
| Daily/1–3 times/week | SSLF−graft | 114 (33.7) | 1.7 (1.1–2.8) | 2.0 (1.1–3.4) |
| Operative time (min) | SCP/SCerP | 90 (60–140) | Ref. | Ref. |
| | SSLF−graft | 57 (40–75) | -33\(^b\) (-44 to -22) | -50\(^b\) (-58 to -42) |
| Estimated blood loss (mL) | SCP/SCerP | 10 (0–25) | Ref. | Ref. |
| | SSLF−graft | 20 (10–30) | 10\(^b\) (5–15) | 7\(^b\) (4–10) |
| Complications in total 1 year after surgery | SCP/SCerP | 27 (14.2) | Ref | Ref |
| | SSLF−graft | 94 (27.2) | 2.2 (1.4–3.6) | 2.3 (1.2–4.2) |

Figures are frequencies (proportions) and median (interquartile range).

n, frequencies; cOR, crude odds ratio; SSLF, sacrospinous ligament fixation, SCP, sacrocolpopexy, SCerP, sacrocervicopexy.
aOR = adjusted odds ratio, all variables in Table 1 were adjusted for and then stepwise excluded if P-value >0.25.

\(^{a}\)Ref = Reference.

\(^{b}\)Coef Q = coefficient in quantile regression (50).
for a second surgery beforehand. In addition, the introduction of robotic-assisted laparoscopic SCP/SCerP started in 2015 in Sweden. Only occasional surgeries were performed before that time. The learning curve and the low surgeon volume might partly explain our results.

In our study, 24.3% (412/1812) of the participants had a vaginal prolapse repaired by sacrospinous fixation. In a review of 17 studies, a large variation in outcome was found due to varying definitions of cure. Moreover, there was a mixture of uterine and vaginal vault prolapse in these studies. Overall, 10.3% in that study failed to relieve symptoms, albeit with a short follow-up. In a Danish observational study from 2019, the results after uterine prolapse with SSLF without graft reported 32% recurrent POP surgery after 5 years. Even poorer results were seen in the systematic review by Coolen et al. The high numbers of SSLF without graft in our national cohort with a widespread use across the country and heterogeneous application of devices and sutures might explain the higher recurrent POP surgery and subjective relapses compared with other studies. Nonetheless, when SSLF without graft was compared with SSLF with graft and SCP/SCerP, the differences in relapses in our study were clear. Another finding is the high frequency of complications 1 year postoperatively in patients undergoing SSLF without graft. Goldberg et al. reported an 8% increased frequency of abdominal pain and 13%-16% increased back pain after anterior or posterior SSLF. A systematic review also showed a higher risk of postoperative nonsexual pelvic pain (9.9% vs 2.9%) in SSLF without graft compared with uterosacral fixation.

Our cohort had a high frequency of SSLF with graft surgery in vaginal vault prolapse compared with other observational studies. In a multicenter RCT in 2020, vaginal graft (Prolift) was compared with native tissue + SSLF to treat POP stages III or greater. The follow-up time was 5 years and the reoperation rate, due to recurrence, was 7.9% in the Prolift groups compared with 23.7% in the native tissue group with SSLF, which is inconsistent with our results. Although the authors found a high extrusion rate in the vaginal graft group 5 years after surgery, the patients' quality of life was still higher than in the native tissue group.

In an RCT, a Total Prolift (Gynecare, Ethicon) was compared with laparoscopic SCP/SCerP. As in our study, no difference in symptomatic relapse between the two methods could be found.

The problem with long-term complications and mesh erosion persists. Even if our study did not include larger meshes, the number of 1-year postoperative complications was high (24.3%) in the SSLF with graft group.

One strength of this study is the almost complete coverage of all prolapse surgery in Sweden in both public and private hospitals. The rate of missing data in GynOp was low, even in the questionnaires. Yet, there was a high accuracy in data quality when we compared data from GynOp with medical records in patients undergoing SCP/SCerP. Built into its observational design, a limitation of the study is the risk of confounding by indication, even after adjustment for all variables listed in Table 1. Another limitation is the lack of a postoperative objective examination and evaluation of postoperative POP-Q scores. Nevertheless, the subjective relapse and a need for reoperation must be considered more important for the patient. In addition, mesh erosion was not specified in the register, which is a problem when comparing our findings with other studies.

5 CONCLUSION

Sacrococcygeal hernia had a higher relapse rate than found in previous RCTs but should still be the first choice in vaginal vault prolapse given that the 1-year postoperative complication rate was low and the rate of the recurrent prolapse procedure was not inferior to vaginal lightweight graft. Recent studies show that vaginal grafts have a high risk of mesh erosions, but recurrent POP surgery and subjective relapses seem to be lower than other vaginal methods. In patients with a high comorbidity that prohibits laparoscopic procedures, a vaginal graft can be inserted if thorough information about complications is given beforehand. SSLF without graft is often used in vaginal vault prolapse, although the method is not yet standardized and the results vary. Moreover, the 1-year postoperative complication rate, including pain, was high in SSLF without graft. These data seriously question the role of SSLF without graft in the surgical treatment of women with vaginal vault prolapse.

CONFLICT OF INTEREST

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AUTHOR CONTRIBUTIONS

MB designed the study together with ME and MS. MB applied for ethical approval and collected data from the registers and medical records with support from ME, AD and MS. Also, MB analyzed the data with support from biostatistician AW, ME, MS and UJ. MB, UJ, IB and ME wrote the manuscript. The manuscript was revised by ME, MS, UJ, IB and AD, who also approved the final version.

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