

Comparison of Short-Term Outcome between Modified Extraperitoneal Uterosacral Ligament Fixation (MEUSL) and Sacrospinous Ligament Fixation (SSF) for Apical Vaginal Support

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ABSTRACT

Prevention of apical prolapse during prolapse surgery is crucial to ensure a good outcome of the surgery. The choice of the best method for apical support remains debatable. This is a study comparing the surgical outcome between modified extraperitoneal uterosacral ligament fixation (MEUSL) and sacrospinous ligament fixation (SSF). This is a case-control study involving 42 patients with stage three and four pelvic organ prolapse (POP) looking into surgical failure, prolapse recurrence, lower urinary tract symptoms (LUTS), and operative complications. The results were analyzed using an independent t-test for normally distributed continuous data and a chi-square test for categorical data. A logistic regression analysis was also performed to predict the outcome. A *p*-value of <0.05 was deemed significant. MEUSL is less likely to have surgical failure at six months with an OR of 7.25 ($p = 0.03$, CI 1.24–42.38). There is no difference in terms of lower urinary tract symptoms. Intraoperatively, MEUSL had a significantly higher blood loss as compared to the SSF group. MEUSL is an effective technique for the treatment of apical prolapse as it has a lower risk of surgical failure as compared to SSF. A future study regarding long-term outcomes between the two procedures is recommended to guide surgeons in choosing the best treatment option.

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1. INTRODUCTION

The incidence of POP is currently increasing along with the aging population, with a prevalence of 10.3% [1]. More procedures are being performed for the treatment of POP, especially vaginal hysterectomy, as many patients opted for the surgical option due to the debilitating effect of advanced POP. One of the long-term outcomes of this surgical intervention includes recurrent prolapse. De Lancey previously described the risk of prolapse post-vaginal hysterectomy as 5.5 times higher in those for whom the initial hysterectomy was done for genital prolapse. However, more recent studies have proven that vaginal hysterectomy alone is not a risk factor. However, the preexisting pelvic organ defect prior to previous prolapse surgery is proven to be significant [2], [3].

During a hysterectomy, the vagina will lose its Level I support as the uterosacral and cardinal ligaments are

being transacted. This loss of apical support is the reason behind the future recurrent prolapse. An apical support procedure is crucial in restoring the apical support, especially during hysterectomy, to prevent a future prolapse [4]. Even though the importance of the apical support procedure is acknowledged, the rate of re-establishment of apical support is still low among cases of hysterectomy. In his recent study, Lowder described that only one-third of surgeons performed apical support procedures in cases of hysterectomy for POP treatment [5].

Various procedures had been performed for apical support, including McCall Culdoplasty, SSF, intraperitoneal USL fixation, extraperitoneal USL fixation, and MEUSL. Each of these procedures has its risks and complications. McCall Culdoplasty risks ureteric kinking and ligation of the ureter as it is close to the uterosacral ligament [4]. SSF is a more common procedure performed for apical support,



but it is associated with the risk of de novo cystocele and recurrent anterior compartment prolapse up to 17%. It is also associated with nerve injury and buttock pain, with incidence between 6% to 13% [6]. Apart from the recurrent anterior prolapse, there is also a significant risk of bleeding from the pudendal artery, which is difficult to secure and may require radiological intervention [6]. High USL fixation is proven effective for apical support restoration. However, it carries a higher risk of ureteric injury, given the proximity of the ligament to the ureter [7]. Improvements had been made to this particular technique by Fatton and Dwyer [8], who performed an extraperitoneal USL fixation in order to reduce the risk of ureteric injury. MEUSL is a new technique modified from USL fixation and has been proven to have a low rate of post-hysterectomy vault prolapse and a low risk of ureteric injury [9].

As there are many approaches to apical support procedure, it is important to look for the best method with the greatest effectiveness while minimizing complications, as current evidence for the best apical support procedure is still limited. To date, no available study has compared the efficacy of MEUSL to SSF, the most common procedure performed for apical support. Given the significant complication of SSF and a lower post-hysterectomy prolapse in MEUSL, this study aims to compare the outcome of MEUSL and SSF in our local setting in the hope of guiding surgeons to choosing the better option for apical support procedure during hysterectomy.

2. MATERIALS AND METHODS

This is a cross-sectional study done on 42 women from 2014 to 2018. This study used a convenience sampling method, which included all women with stage 3 and 4 POP who underwent MEUSL and SSF procedures within the study period. Prolapse staging was done using the Pelvic Organ Prolapse Quantification system (POP-Q) [10]. The second author performed both MEUSL and SSF. The method of MEUSL is described below, while SSF was performed unilaterally on the right side using nonabsorbable polypropylene suture size 1 with double suture application delivered using a Capiro™ suture capturing device. Perioperative and follow-up assessment data at 6 months were obtained from patients' medical records.

The primary outcome of this study is a surgical failure, as defined by descending of at least two stages or

more, and recurrent anterior compartment prolapse, as defined by the presence of anterior compartment prolapse at least stage two at six months post-operation. The secondary outcomes include LUTS and operative complications. The LUTS evaluated are stress urinary incontinence (SUI), overactive bladder (OAB), and urge urinary incontinence (UI), while the operative outcomes being assessed include operating time, blood loss, buttock pain, and reoperation rate.

Data were analyzed using SPSS software version 25. Normally distributed parametric data were analyzed using an independent t-test, while nonparametric data were analyzed using a chi-square test. A logistic regression analysis was also performed to predict the outcome. A p-value of <0.05 was deemed significant. This study had the approval of the local research committee (IREC 2021-187).

2.1. Operative Technique for MEUSL

A tear-drop incision is made around the cervix. Anterior and posterior colpotomy is performed following dissection of the pericervical tissue using Marcaine-Adrenaline 0.5%. Dissection of the uterosacral ligament is done bilaterally. The uterosacral ligament is exposed up to 5 to 6 cm from the cervical attachment. The distal part, which is close to the cervix, is transected, ligated, and held with a non-absorbable Polypropylene suture no. 1 (Fig. 1a). Vaginal hysterectomy is then performed in the usual manner. This is followed by the closure of the peritoneum, which also incorporates both uterosacral ligaments at its intermediate portion, which will bring both ligaments extraperitoneally. The ligaments are flipped over, and two sutures are placed proximally above the first suture, roughly 0.5 cm apart through the right and left uterosacral ligament using a Polydioxanone suture no. 1 (Fig. 1b). The second and third suture joining both ligaments were tied and held, leaving one suture end on the left and another on the right side of the ligament (Fig. 1c).

Next, the anterior repair is performed. The last suture of anterior repair included the attachment to both uterosacral ligaments to anterior-apical repair. The excess vaginal wall is trimmed, and the anterior wall is closed halfway through. Exteriorization of the sutures holding the uterosacral ligament is done by bringing one of the suture ends outside to the vaginal wall, first anteriorly to the vault, second laterally to the vault, and third posteriorly to the vault (Fig. 2). These suture ends are tied together to their own pair, thus

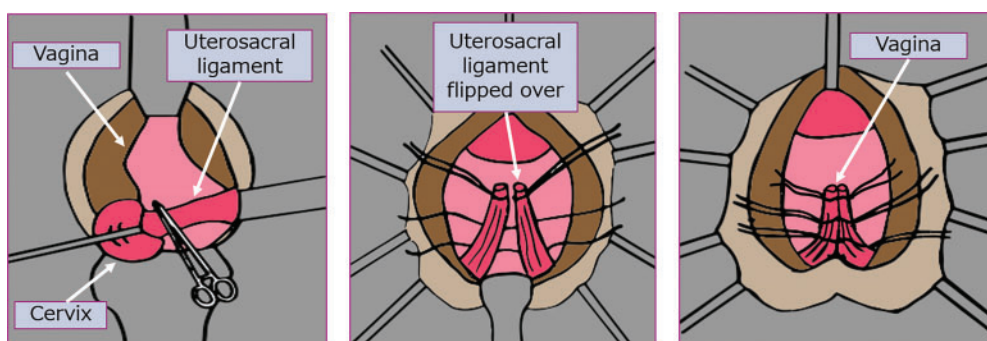


Fig. 1. Operative technique of MEUSL. a. USL is transected and ligated at the distal end. b. Both USLs are flipped over, and another two sutures are applied. c. Sutures on USL are tied together.

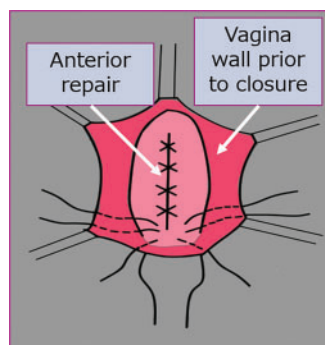


Fig. 2. After anterior repair, sutures from USL exteriorized to vaginal vault.

pushing up the vaginal vault to secure apical support. The anterior vaginal wall closure is then completed.

3. RESULTS

A total of 42 patients were included in this study. Twenty patients had MEUSL procedures, and another 22 had SSF. The mean age group of the study population is 63 years old (± 9.9), and they are mainly from the Malay ethnic group (83%). The mean parity is 5.6 (± 2.6), while the mean body mass index (BMI) is 27 kg/m² (± 4.7). Most of the study population had concomitant severe anterior compartment prolapse. In terms of age, BMI, parity, race, stage of prolapse, and baseline symptoms, there are no significant differences between the study groups (Tables I and II).

MEUSL has a significantly lower rate of surgical failure than SSF, while recurrent anterior compartment prolapse does not differ between the two groups, as shown in Table III. Intraoperative data is shown in Table IV, with blood loss significantly higher in MEUSL than in SSF. There is no difference in terms of overall POP staging and symptom recurrence at 6 months between the two procedures, as shown in Tables V and VI.

This study also revealed that within the SSF group, three patients had buttock pain post operation (12.5%), which subsided within two weeks. Another three patients had chronic groin pain; two of them were managed conservatively with lignocaine and steroid injection, while the other one, whose mobility was affected due to the pain, had her SSF and sling removed one-year post-operation after failed conservative management. There were no ureteric injuries and rectal perforation recorded throughout this study in both groups. One patient from the SSF group was

TABLE I: BACKGROUND CHARACTERISTICS OF THE STUDY POPULATION

	MEUSL n(%)	SSF n(%)	<i>p</i> value**
Age (year)*	62.3 (9.6)	64.5 (10.3)	0.53
BMI (kg/m ²)*	28.1 (4.9)	26.6 (4.3)	0.51
Parity*	5.6 (2.8)	5.6 (2.5)	0.25
Race			0.58
Malay	18 (42.8)	18 (42.8)	
Chinese	2 (4.8)	3 (7.2)	
Indian	0 (0)	1 (2.4)	

Note: **Chi square test; *mean(SD).

TABLE II: BASELINE CLINICAL CHARACTERISTICS OF THE STUDY POPULATION

	MEUSL n(%)	SSF n(%)	<i>p</i> value*
Overall POP stage			0.24
3	15 (35.7)	15 (35.7)	
4	5 (11.9)	7 (16.7)	
Anterior compartment stage			0.33
0	2 (4.8)	2 (4.8)	
2	4 (9.5)	3 (7.1)	
3	14 (33.3)	17 (16.7)	
Apical compartment stage			0.86
3	15 (35.7)	16 (38.1)	
4	5 (11.9)	6 (14.3)	
Posterior compartment stage			0.67
0	9 (21.4)	9 (21.4)	
1	4 (9.5)	2 (4.8)	
2	5 (11.9)	7 (16.6)	
3	2 (4.8)	4 (9.5)	
Diabetes	6 (14.3)	8 (19.0)	0.66
Baseline LUTS			
SUI	5 (11.9)	5 (11.9)	0.85
UII	3 (7.1)	3 (7.1)	0.90
OAB	2 (4.8)	4 (9.5)	0.44

Note: *Chi-square test.

TABLE III: PRIMARY OUTCOME RESULTS

	MEUSL n(%)	SSF n(%)	<i>p</i> value*
Surgical failure	4 (26.7)	11 (73.3)	0.043
Recurrent anterior compartment prolapses	4 (30.8)	9 (69.2)	0.143

Note: *Chi-square test.

TABLE IV: INTRAOPERATIVE DATA

	MEUSL n(%)	SSF n(%)	<i>p</i> value**
Duration of operation (min)*	159.8 (35.3)	140.9 (35.0)	0.70
Blood loss (ml)*	216 (206.0)	150 (218.0)	0.02
Procedure			
Vaginal hysterectomy	20 (50.0)	22 (50.0)	0.16
Anterior repair	20 (50.0)	22 (50.0)	0.16
Posterior repair	11 (64.7)	6 (35.7)	0.08
Perineorrhaphy	17 (54.8)	14 (45.2)	0.19
Mid urethral sling	0 (0)	4 (100)	0.04

Note: **Chi-square test; *mean(SD).

presented with recurrent prolapse a month post operation needing reoperation using vaginal mesh surgery.

We performed a simple logistic regression analysis (Table VII) to ascertain the effects of age, parity, race, BMI, POP staging at baseline, and apical support method on the likelihood of having a surgical failure. The apical support method is a significant factor in predicting the outcome with MEUL and is associated with a 7.25 lesser likelihood of having surgical failure compared to SSF (OR 7.25, $p = 0.03$ and CI 1.24–42.38).

TABLE V: POP-Q STAGING AT 6 MONTHS

	MEUSL n(%)	SSF n(%)	<i>p</i> value*
POP stage (overall)			0.13
0	15 (62.5)	9 (37.5)	
1	1 (33.3)	2 (66.7)	
2	4 (30.8)	9 (69.2)	
3	0 (0)	2 (100)	
Anterior compartment			0.36
0	15 (42.3)	11 (57.7)	
1	1 (33.3)	2 (66.7)	
2	4 (33.3)	8 (66.7)	
3	0	1 (100)	
Posterior compartment			0.33
0	20 (48.8)	21 (51.2)	
1	0 (0)	1 (100)	
Apical compartment			0.23
0	20 (51.3)	19 (48.7)	
2	0 (0)	1 (100)	
3	0 (0)	2 (100)	

Note: *Chi-square test.

TABLE VI: SYMPTOM RECURRENCE AT 6 MONTHS

	MEUSL n(%)	SSF n(%)	<i>p</i> value*
SUI	2 (66.7)	1 (33.3)	0.49
OAB	2 (50.0)	2 (50.0)	0.92
UII	0 (0)	1 (100.0)	0.33

Note: *Chi-square test.

TABLE VII: SIMPLE LOGISTIC REGRESSION ANALYSIS FOR SURGICAL FAILURE

	Odds ratio	<i>p</i> -value	95% CI	
			Lower limit	Upper limit
Age	1.00	0.99	0.88	1.14
Parity	0.81	0.37	0.52	1.28
BMI	0.89	0.38	0.69	1.15
Baseline POP-Q	1.73	0.58	0.25	12.25
Procedure (MEUSL/SSF)	7.25	0.03	1.24	42.38

4. DISCUSSION

This study successfully proved the hypothesis with a significantly lower surgical failure rate ($p = 0.043$) 6 months post-operation in the MEUSL group. This is consistent with other studies reporting a high success rate for apical support utilizing uterosacral ligament [9]. However, no other studies have compared this newly described modification technique. The OPTIMAL trial compared the original technique of high USL fixation with SSF, which revealed no difference in the surgical success rate at two and five years [11], [12]. The modification of the procedure by fixing both ligaments together using delayed absorbable sutures allows more support to the pelvic floor muscle by merging the ligaments to the center to provide support during fixation of the vaginal vault. In addition, the combination of anterior-apical repair assisted in preventing recurrent prolapse, especially in the anterior compartment. Perineorrhaphy was also performed in most cases in the MEUSL group, adding more support to reduce recurrence by reducing the genital hiatus.

Recurrent anterior compartment prolapse is highly associated with SSF. However, our study could not prove the significance even though the recurrences were higher in the SSF group [13]. Concurrent mid-urethral sling surgery performed in the SSF should also lead to a lower recurrence rate; however, this is not the case in this study. This is contributed by the baseline staging of POP in this group, which was mostly advanced in the anterior compartment (Stage 3). The only patient who needed reoperation for prolapse recurrence was also from the SSF group.

In terms of intraoperative complication, blood loss is significantly increased in the MEUSL group as it needed extensive dissection to expose an intermediate portion of the ligament. There is a limited study to compare blood loss with Pal & Bandyopadhyay, who reported an average blood loss of 100–300 ml in USL fixation, similar to our study, which reported 216 ml [9].

LUTS recurrence was similar at 6 months follow-up, similar to the literature, which reported no difference in the urinary distress symptoms between SSF and USL fixation evaluated after 2 years follow-up [12]. No ureteric injury was reported in either group. Even though the original USL fixation is associated with a higher risk of ureteric injury by up to 13%, a safer option is achieved by performing an extraperitoneal fixation [8], [14].

Twelve point five percent of our patients who underwent SSF had transient buttock pain postoperatively, which is a known complication with a reported rate between 2%–4% of persistent pain after 6 weeks [13], [15]. The three patients with chronic groin pain all had concomitant sling surgery along with the SSF, which explains the persistence of the pain [16].

MEUSL is a relatively easy procedure as it requires no specialized equipment compared to SSF, which needs a suture-capturing device. SSF is also technically more difficult with the need to dissect the rectovaginal and pararectal space, with consequent hemorrhage as a common complication [17]. Given the simplicity of the procedure, MEUSL can also be performed by a general gynecologist in any center, allowing more apical support procedures to be performed, thus lowering the risk of recurrent prolapse.

This study has some limitations, as it has a small sample that might not represent a larger population in terms of outcome results. More than one procedure was performed in the same setting, which became a confounding factor that may have affected the results. The analysis was only for a short term of 6 months, and more data was needed in a long-term period in order to justify the effectiveness between the two modalities, as many other studies only describe the technique using high USL fixation and not the modified one which seemed to have better outcome [18], [19].

5. CONCLUSION

MEUSL has a lower rate of surgical failure with minimal complication as compared to SSF. The simplicity of the procedure will allow more surgeons to perform an apical support procedure. A current study is ongoing to look into comparison of the long term outcome between these two procedures.

ABBREVIATIONS

POP	Pelvic organ prolapse
USL	Uterosacral ligaments
SSF	Sacrospinous ligament fixation
MEUSL	Modified extraperitoneal uterosacral ligament fixation
LUTS	Lower urinary tract symptoms
BMI	Body mass index

CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest.

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