

ORIGINAL RESEARCH:**Prevention of vaginal vault prolapse occurrences post vaginal and abdominal hysterectomy. An evidence based case report.****Suskhan Djusad**Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Indonesia,
Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia**ABSTRACT****Objectives:** To determine efficacy of the procedures which were performed during hysterectomy in preventing any complication, in the form of vaginal vault prolapse.**Materials and Methods:** Articles were searched through the databases, such as PubMed, Scopus, EBSCO-host, and Cochrane Library; resulting in three full text articles which were relevant to be critically reviewed. Those articles then were critically reviewed based on validity, importance, and applicability based on critical review tools from University of Oxford Centre-for Evidence Based Medicine (CEBM) 2011.**Results:** Findings from the articles showed that prevention procedures during hysterectomy such as McCall culdoplasty, Shull suspension, laparoscopic USP and ULS were effective in preventing future vaginal vault prolapse in women who underwent hysterectomy. Among the four procedures; McCall culdoplasty and Shull suspension provide the highest efficacy as prevention procedures. Other than that, both methods were capable to increase quality of life and sexual function post hysterectomy.**Conclusion:** Vaginal vault prolapse prevention procedures such as McCall culdoplasty, Shull suspension, laparoscopic USP and ULS were effective in preventing a vaginal vault prolapse. However, additional literatures are needed to support the utilization of these methods in clinical setting.**Keywords:** Prevention; vaginal vault prolapse; vaginal hysterectomy; abdominal hysterectomy**ABSTRAK****Tujuan:** Menilai efektifitas tindakan pencegahan selama proses histerektomi dalam mencegah terjadinya komplikasi berupa vaginal vault prolapse.**Bahan dan Metode:** Pencarian literatur dengan menggunakan database PubMed, Scopus, EBSCO-host, serta Cochrane Library yang menghasilkan 3 artikel full text yang relevan untuk dilakukan telaah kritis lebih lanjut. Ketiga artikel tersebut kemudian ditelaah secara kritis berdasarkan kriteria validity, importance, serta applicability berdasarkan alat telaah kritis keluaran Centre-for Evidence Based Medicine (CEBM) University of Oxford tahun 2011.**Hasil:** Pencarian literatur menunjukkan hasil bahwa prosedur pencegahan selama proses histerektomi seperti McCall culdoplasty, Shull suspension, laparoskopik USP, serta ULS memiliki efektifitas dalam mencegah vaginal vault prolapse dikemudian hari pada wanita yang menjalani prosedur histerektomi. Diantara ke-4 metode tersebut, McCall culdoplasty dan Shull suspension memberikan efektifitas yang paling tinggi dalam pencegahan. Selain itu, kedua metode tersebut juga mampu meningkatkan kualitas hidup dan fungsi seksual pasca histerektomi.**Simpulan:** Prosedur pencegahan vaginal vault prolapse seperti McCall culdoplasty, Shull suspension, laparoskopik USP, serta ULS ditemukan memiliki efektifitas dalam mencegah vaginal vault prolapse. Akan tetapi, dibutuhkan literatur tambahan untuk mendukung penggunaan metode-metode ini pada setting klinis.**Kata kunci:** Pencegahan; vaginal vault prolapse; histerektomi vaginal; histerektomi abdominal**Correspondence:** Suskhan Djusad, Department of Obstetrics and Gynecology, Dr. Cipto Mangunkusumo Hospital, Faculty of Medicine, Universitas Indonesia, Email: suskhan007@yahoo.co.id

INTRODUCTION

Vaginal vault prolapse is a condition in which the top of the vagina loses its normal shape or position, resulting in sagging or dropping of the part down into the vaginal canal or outside the vagina.¹ International Continence Society defined vaginal vault prolapse as descent of the vaginal cuff below a point that is 2 cm less than total length of the vagina above the hymen.² Vaginal vault prolapse may occur as a complication of vaginal or abdominal hysterectomy procedure. Hysterectomy can increase vaginal vault prolapse occurrence risk up to 5.5 times higher than other etiologies. The incidence of this complication was about 0.2-43%.^{1,3} Other than hysterectomy, the vaginal vault prolapse incidence due to other etiologies was about 1.8%.⁴

In a normal condition, during an increased abdominal pressure, the vagina is held in its proper position by supporting structures such as levator plate and endopelvic fascia (cardinal and uterosacral ligaments). A vaginal vault prolapse develops if there is laceration, stretching, or other causes that are generally weakened those supporting structures. Because of these, the vagina loses its original axis position during an increased intraabdominal pressure, then the prolapse occurs.¹ Vaginal vault prolapse shows as a medium or long term failure of the supporting mechanisms and results from an amalgamation of intrinsic defects such as weakness of tissue collagen and impairment of pelvic floor along with its nerve supply during childbirth.⁵ A vaginal vault prolapse is frequently related with other part abnormalities such as cystocele, rectocele, or enterocele.⁶ It can lead to anorectal, sexual, and urinary dysfunction; thus reducing the patient’s quality of life.² Vaginal vault prolapse symptoms consist of dyspareunia, bulging sensation in the vagina, low back pain, recurrent urinary tract infections, voiding and penetration difficulties. Other symptoms related to defecation problems include encopresis, constipation, and incomplete evacuation. The severity of prolapse can be evaluated through abdominal and pelvic examination and objectively assessed by POP-Q scoring system.⁴

Up until now, no agreement has been established yet about the right curative procedure to manage a vaginal vault prolapse. There is still an ongoing debate about whether a vaginal, abdominal, or combined hysterectomy procedure is the most appropriate one in treating

the complication. Each procedure has its own advantages, weaknesses, and specific indications. Therefore, it is better to perform prevention procedures before a vaginal vault prolapse is seen. Vaginal vault prolapse prevention can be done by attaching pelvic supporting structures such as cardinal and uterosacral ligament to vaginal membrane post vaginal hysterectomy. Other than preventing a vaginal vault prolapse, this procedure can also prevent enterocele formation along reducing the patient’s discomfort after surgery.¹ Another procedure can be performed to prevent vaginal vault prolapse occurrences. This literature review was made to assess the efficacy of vaginal vault prevention procedures. Hopefully, this literature review can give an illustration related to proper action needed to be done in order to avoid the development of a vaginal vault prolapse post vaginal or abdominal hysterectomy.

Clinical scenario

A 35-year-old woman will undergo a hysterectomy procedure. A hysterectomy procedure may lead to several complications; one of those is a vaginal vault prolapse. As an obstetrician and gynaecologist, you have read that a vaginal vault prolapse can be prevented by performing prevention procedures during hysterectomy. You want to know the efficacy of those prevention procedures in preventing vaginal vault prolapse in the future.

MATERIALS AND METHODS

In order to obtain knowledge related to the efficacy of vaginal vault prolapse prevention procedures which were performed during hysterectomy, a literature search was carried out based on the clinical question mentioned. The literature search was performed through online databases, such as PubMed, Cochrane, Scopus, and EBSCO-host in June 8th, 2019. The keywords and synonyms used in the literature search were as follows: “hysterectomy”, vaginal or abdominal hysterectomy or vaginal hysterectomy”, ”prevention and control or secondary prevention or avoidance”, “pelvic organ prolapse or vaginal vault prolapse”. Those keywords then were used in the literature searching strategy as shown as in Table 2.

Table 1. PICO for Clinical Question

Population	Intervention	Control	Outcome
Women who are planned to undergo hysterectomy	Vaginal vault prolapse prevention procedure	Without prevention procedure or other vaginal vault prolapse prevention procedures	Vaginal vault prolapse occurrence

Table 2. Literature searching strategy

Database	Keywords	Results
PubMed	(((((("Hysterectomy"[Mesh]) OR "Hysterectomy, Vaginal"[Mesh]) OR Hysterectomy abdominal[Title/Abstract]) OR abdominal hysterectomy[Title/Abstract]) OR vaginal hysterectomy[Title/Abstract])) OR hysterectomy[Title/Abstract])) AND (((("Pelvic Organ Prolapse/prevention and control"[Mesh])) OR "Secondary Prevention"[Mesh]) OR ("prevention and control" [Subheading])) OR prevention[Title/Abstract]) OR avoidance[Title/Abstract]) OR secondary prevention[Title/Abstract])) AND (((("Pelvic Organ Prolapse"[Mesh]) OR pelvic organ prolapse[Title/Abstract]) OR vaginal vault prolapse[Title/Abstract])	142
Scopus	(TITLE-ABS-KEY (hysterectomy OR vaginal AND hysterectomy OR abdominal AND hysterectomy OR hysterectomy AND vaginal OR hysterectomy AND abdominal) AND TITLE-ABS-KEY (prevention OR prevention AND control OR secondary AND prevention OR avoidance) AND TITLE-ABS-KEY (pelvic AND organ AND prolapse OR vaginal AND vault AND prolapse))	1
EBSCO-host	AB (hysterectomy OR vaginal hysterectomy OR abdominal hysterectomy OR hysterectomy vaginal OR hysterectomy abdominal) AND AB (prevention OR prevention and control OR secondary prevention OR avoidance) AND AB (pelvic organ prolapse OR vaginal vault prolapse)	13
Cochrane Library	"hysterectomies" OR hysterectomy OR vaginal hysterectomy OR abdominal hysterectomy OR hysterectomy vaginal OR hysterectomy abdominal in Title Abstract Keyword AND "preventional" OR prevention OR prevention and control OR secondary prevention OR avoidance in Title Abstract Keyword AND "pelvic organ prolapse" OR pelvic-organ prolapse OR vaginal vault prolapse in Title Abstract Keyword - (Word variations have been searched)	37

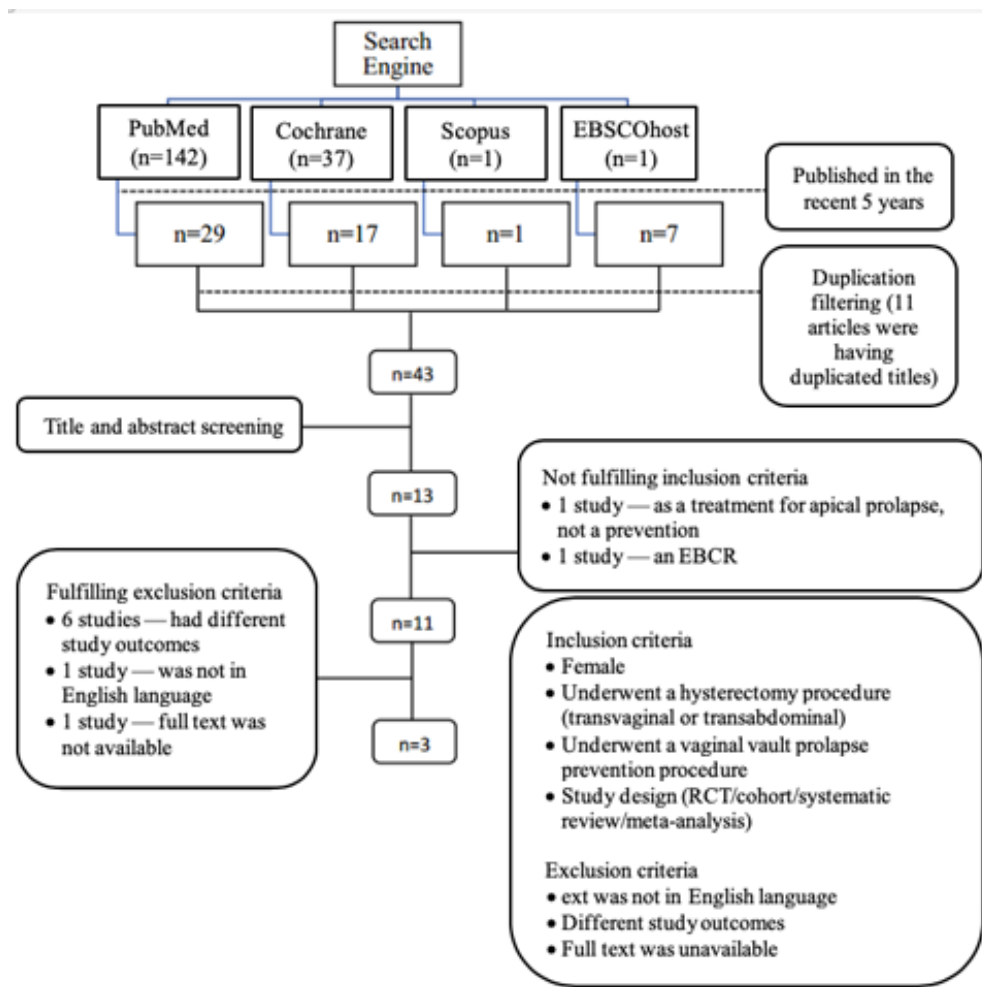


Figure 1. Literature Searching Strategy Algorithm

Search selection process

After the search process was done, the collected literatures then were selected. First, the selection was begun by screening of the titles and abstracts. The title and abstracts of the literature were selected by excluding the literatures which were having inappropriate clinical question and the duplicated ones. Duplication here means the literatures with same or identical titles and the literatures included in the systematic review or meta-analysis which were already used in this study. The inclusion criteria consists of: any literature which had female subjects who underwent both vaginal or abdominal hysterectomy procedure along with vaginal vault prolapse prevention procedure; any systematic review and meta-analysis; and all were published in the recent 5 years. Meanwhile, the exclusion criteria was literatures which were using languages other than English and having incompatible outcomes with this literature. The complete literature selection process were as shown as in Figure 1.

Critical Review

From the literature selection process, three literatures were collected to be critically reviewed. Those three articles were cohort studies (2 retrospective cohorts and 1 prospective cohort). Critical review were performed by using critical review tool from University of Oxford Centre-for Evidence Based Medicine (CEBM) 2011.

RESULTS AND DISCUSSION

Summary from all three articles chosen were shown in Table 3, meanwhile the critical review results of those literatures were shown in Table 4.

All three studies have level of evidence IV. This is due to the cohort model was used for therapeutic study, which would have achieved a higher level of evidence if they were performed with a randomized controlled trial as a study design. In terms of validity, the three studies did not perform randomization because of the inapplicable study design. Studies by Schiavi et al.⁷ and Niblock et al.⁸ used retrospective cohort design meanwhile the study by Pal et al.⁹ only had one trial group. In their studies, Schiavi et al.⁷ and Niblock et al.⁸ used two groups with same characteristics which have been proven not to differ significantly by a series of statistical calculation. All three studies have a loss to follow-up rate or drop-out rate less than 20%. The studies by Schiavi et al.⁷ and Pal et al.⁹ did not use intention-to-treat analysis. Both studies excluded the loss to follow-up participants and did not consider the lost participants as having any event.

In terms of importance, the study performed by Schiavi et al.⁷ shows lower percentage in post hysterectomy vaginal vault prolapse occurrences in both groups; the group underwent modified McCall culdoplasty (1%) and the group underwent Shull suspension (0.5%). The two procedures also successfully made an improvement in quality of life and sexual function during follow-up period that were significantly different between pre-procedure and post-procedure, proven by POP-Q, TVL, P-QoL, ICIQ-UI-SF, PISQ-12, FSFI, and FSFS scores. Both procedures did not show any significant difference regarding prevention efficacy, quality of life improvement, or perioperative complication. However, Shull procedure is proven better in terms of sexual function. Along with Schiavi et al.⁷, the study by Niblock et al.⁸ also showed a low percentage in vaginal vault prolapse occurrence following McCall culdoplasty procedure (0%). Otherwise, in USP procedure, vaginal vault prolapse occurrence rate following hysterectomy were higher (16.4%). There is no significant difference between the two procedures in terms of perioperative complications. Although, there is a significant difference in hospitalization period in which the hospitalization period for USP procedure is shorter. In contrast with the two studies beforehand, the study by Pal et al.⁹ only assessed ULS procedure. The rate of vaginal vault prolapse occurrences following ULS procedure is 8.3%.

From the three critically reviewed studies, all of them have weak level of evidences to be considered as a base of evidence. This is due to the retrospective cohort designs used by the studies which did not perform any randomization and blinding so that they are susceptible to bias. Furthermore, all the three studies did not publish the sample calculation so that the number of samples cannot be stated adequate. The strength of the study performed by Schiavi⁸ is the adequate follow-up period, with a mean of follow-up period 8.9 years and a minimal of 5 years. However, the team which was in charge of data collection was the same team as the one that performed surgeries, thus there was a potential observer and data bias.

In addition, one of the sexual function scoring tools was translated from Italian to English and has not been validated yet. Another strength of this study is that both participant groups were having same characteristics which have been confirmed before the study had started. Unfortunately, in the assessment of the same characteristics, the information about distribution of the prolapse stage found in the participants was not included, nor the distribution of anterior or posterior vaginal wall prolapses which was found in some participants.

Table 3. Articles' Characteristics^{7,8,9}

Literature (year), country	Study Design	Sample Characteristics	Intervention	Outcomes	Results
Schiavi et al. (2018), Italy ⁷	Cohort	Women with mean age 59.13±8.14 (McCall) and 60.46±7.83 (Shull) who experienced uterine prolapse (hysterocele) ≥ 3 rd stage (with or without anterior or posterior compartment prolapse). There is no significant difference between characteristics of the two groups. A total of 200 subjects underwent McCall procedure, meanwhile a total of 214 subjects underwent Shull procedure.	Both groups received vaginal vault prolapse prevention procedure as an intervention during hysterectomy, whereas one group underwent modified McCall culdoplasty procedure and the other group underwent Shull suspension procedure. Median of follow-up period is 8.9 years with a minimal limit of 5 years.	Primary outcome in the form of efficacy and safety assessment of both procedures in preventing post hysterectomy vaginal vault prolapse and compares the two procedures. Secondary outcome in the form of long term effects of the procedures to quality of life and sexual function which were assessed using POP-Q*, TVL†, P-QoL‡, ICIQ-UI-SF§, PISQ-12 , FSFI¶, dan FSDS**.	Vaginal vault prolapse occurs in 1% women (McCall) dan 0.5% women (Shull). There is no significant difference in safety of both procedures (amount of blood loss, intraoperative complications, ureteral/bowel/ bladder injuries, hemoperitoneum and abscess). 85.5% women (McCall) and 92.4% women (Shull) felt better. A decrease in POP-Q (p<0.001) in both groups were found without any differences between them. TVL were lower in both groups (p<0.001) with bigger decrease was found in McCall group. P-QoL dan ICIQ-UI-SF were increased in both groups (p<0.001) without any differences between the two groups. PISQ-12, FSFI, dan FSDS were increased in both groups (p>0.001) with a difference between the two groups, whereas Shull group gave better results.
Niblock et al. (2017), Ireland ⁸	Cohort	Women with vaginal prolapse. Mean age of the women underwent McCall culdoplasty is 59 years, whilst mean age of the women underwent USP†† is 52.3 years. Some women who also had anterior or posterior vaginal prolapse were given an additional procedure (anterior/posterior colporrhaphy). There is no difference of characteristics between the two groups except age differences (p<0.001). The McCall group consists of 73 subjects, meanwhile the USP group consists of 70 subjects.	Both groups received intervention in the form of vaginal vault prolapse prevention where one group underwent McCall culdoplasty procedure during vaginal hysterectomy, whilst the other group underwent USP procedure during laparoscopic hysterectomy. Mean of follow-up period in McCall group is 36 months (5-84 months), while the mean of follow-up period in USP group is 41 months (7-71 months)	Primary outcomes of this study are assessments of the efficacy of both procedures in preventing vaginal vault prolapse occurrence and comparison between the two groups. Secondary outcomes of this study are the hospitalization time and perioperative complications.	0% of the McCall group and 16.4% of the USP group experienced vaginal vault prolapse post hysterectomy—statistically significant (p<0.001). Hospitalization time in USP group significantly shorter compared to McCall group (p<0.001). Other than that, there is no difference between both groups in terms of perioperative complications.
Pal et al. (2018), India ⁹	Cohort	Women with stage III-IV uterovaginal prolapse (stages were determined using POP-Q). The total number of women participated in this study is 51 subjects.	There is only one group in this study. The group underwent modified extraperitoneal ULS procedure with the mean of follow-up period is 2.3 years.	Efficacy of the modified extraperitoneal ULS‡‡ procedure as a prevention of vaginal vault prolapse post vaginal hysterectomy	8.3% of the total participants experienced vaginal vault prolapse after the procedures, meanwhile about 91.6% participants did not experienced vaginal vault prolapse during the follow up period.

*POP-Q: Pelvic Organ Prolapse Quantification System; †TVL: Total Vaginal Length; ‡P-QoL: Prolapse Quality of Life Questionnaire; §ICIQ-UI-SF: The International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form; ||PISQ-12: The Pelvic Organ Prolapse/Urinary

Incontinence Sexual Questionnaire Short Form; ¶FSFI: The Female Sexual Function Index; **FSDS; The Female Sexual Distress Scale; ††USP: Uterosacral Plication; ‡‡ULS: Uterosacral Ligament Suspension.

Table 4. Articles' critical review^{7,8,9}

Author (tahun)	Validity					Importance				Applicability		
	Level of Evidence	Number of Samples	Randomization	Same Group Characteristics	Same Intervention	Loss to follow-up (%)	Intention To-treat Analysis	Blinding	VVP (follow-up) Percentage	Differences Between Two Groups	Same Characteristics	Feasible
Schiavi et al. (2015) ⁷	IV	414	-	+	+	2.8 %	-	-	1% (McCall) vs 0.5% (Shull) (mean 8.9 years)	(McCall vs Shull) P-QoL = 31.77 vs 30.94 (p=0.34) ICIQ-UI-SF = 5.32 vs 4.83 (p=0.09) TVL = 2.16 vs 0.87 cm (p<0.001) PISQ-12 = 36 vs 38 (p=0.003) FSFI = 29 vs 31 (p=0.04) FSDS = 8 vs 8 (p=0.24)	+	+
Niblock et al. (2017) ⁸	IV	143	-	+	+	0%	n/a	-	0% (McCall) vs 16.4% (USP) (mean 36 months vs 41 months)	McCall vs USP Hospitalization time = 3.6 vs 1.8 (p<0.001)	+	+
Pal et al. (2018) ⁹	IV	51	n/a	n/a	n/a	5.9 %	-	n/a	8.3% (ULS) (mean 2.3 years)	n/a	+	+

These facts resulted in hesitation regarding the similar characteristics between the two groups. Though was having several weaknesses, this study succeeded in showing the efficacy of McCall culdoplasty and Shull suspension methods in order to prevent a long term vaginal vault prolapse. Moreover, this study showed that both methods were safe other than significantly improving quality of life and sexual function following a hysterectomy due to prolapse.

In contrast to Schiavi et al.⁷, the study performed Niblock et al.⁸ had a shorter follow-up period, with a mean of follow-up was 36 months for McCall culdoplasty group and 41 months for laparoscopic USP group; whilst the shortest follow-up period is 5 months. The relatively short follow-up periods could be a source of bias due to the possible occurrence of vaginal vault prolapse in this period was still low. Also, the difference in follow-up periods between the two groups could be another source of bias in this study. Another weakness of this study is that there was no sample calculation and the similar characteristics between the two groups were still questioned. Even though, this study shows that the McCall culdoplasty procedure had a high efficacy in

preventing a vaginal vault prolapse with an incidence rate of 0%. On the other hand, laparoscopic USP technique had a low efficacy in preventing a vaginal vault prolapse with an incidence rate of 16.4% with a mean follow-up period of 41 months.

In comparison with the two studies beforehand, the study performed by Pal et al.⁹ has the weakest evidence; because it was a descriptive study and lack of comparison group. In addition, this study were held with a few participants without any calculation of the number of sample earlier. Follow-up time were relatively short, with a mean of 2.3 years. Even though, this study shows a rather good efficacy of ULS technique in preventing a vaginal vault prolapse with an incidence rate of 8.3%.

The main weakness of this EBCR is an unspecified clinical question, resulting in different comparison groups in each of the selected studies. Moreover, lack of the study that uses vaginal vault prolapse prevention as a primary prevention before the prolapse occurred leads to lack of complete information regarding potential of those procedures. Only few hysterectomies were done because of other causes beside the prolapse. Another

weakness is in the filtered studies, no studies have compared potency of the vaginal vault prolapse prevention procedures when they are performed during vaginal hysterectomy to their potency when it is performed during an abdominal one. Some studies show that the risk of post-hysterectomy prolapse is higher in women who underwent vaginal than abdominal hysterectomy so there was a potency of higher efficacy in the prevention procedure that were done during abdominal hysterectomy than a vaginal one.^{10,11,12}

The results obtained in this study shows that one of the recommended prevention procedures is McCall culdoplasty. This goes parallel with a study by Robinson et al.⁶, which found that McCall culdoplasty is superior in preventing a vaginal vault prolapse compared to other procedures such as Moschowitz closure or laparoscopic USP. McCall culdoplasty were capable to prevent vaginal vault prolapse in 89.2% patients, 2 years after vaginal hysterectomy procedure. About 10% of rest experienced stage I vaginal vault prolapse that were unnecessary to be corrected by operative procedures. Also, McCall culdoplasty could restore sexual function and pleasure in 89.2% patients, 2 years after the procedure. Other than preventing vaginal vault prolapse, McCall culdoplasty could prevent enterocele formation for at least 3 years after the procedure.¹³ The study shows that this procedure can also be performed in abdominal hysterectomy. Although, there need to be a standard definition regarding McCall culdoplasty procedure that can be performed, reminding that many studies made several modifications and variations in suture materials in performing this procedure.

CONCLUSION

Vaginal vault prolapse prevention which was performed in conjunction with hysterectomy procedure; such as McCall culdoplasty, Shull suspension, laparoscopic USP and ULS; were found to be effective in preventing vaginal vault prolapse occurrence in the future. Amongst the four methods, McCall culdoplasty and Shull suspension method was discovered to be having the highest efficacy. Besides its capability of preventing vaginal vault prolapse, those two methods also increase the quality of life and sexual function of the women who had experienced pelvic organ prolapse and underwent a hysterectomy procedure. Even though, the quality and number of the literatures supporting those findings is still limited that further studies with better quality are needed to promote vaginal vault prolapse prevention procedures in a clinical setting.

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