



Full length article

## Efficiency of using a vaginal drain after hysterectomy: A systematic review



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## ABSTRACT

**Objective** Hysterectomy is the second most frequently performed surgical procedure for women of reproductive age topped only by caesarean section. Hysterectomies may be associated with a significant risk of ultrasonographically detected vault haematomas in up to 59% with consequent postoperative morbidity. The aim of this systematic review was to compare women who had a vaginal drain placed intraoperatively after a hysterectomy and the impact on peri and postoperative outcomes related to vault haematomas.

**Study Design** Electronic searches of AMED, BNI, CINAHL, EMBASE, HBE, HMIC, Medline, PsycINFO and PubMed, Cochrane register of controlled trials (CCTR), Cochrane database of systematic reviews (CDSR) CINAHL and Google scholar were performed. A systematic review and meta-analysis of studies comparing women with and without a vaginal drain after a hysterectomy and the impact on different outcomes was carried out.

**Results** Ten studies involving 1778 women, 811 with a vaginal drain and 967 without a drain, were included in the meta-analysis. This suggests that the use of a vaginal drain after hysterectomy may significantly reduce the incidence of vault haematoma (OR 0.22, 95% CI 0.08 - 0.57) and febrile morbidity (OR 0.54, 95% CI 0.40 to 0.73), non-significantly reduce the rate of usage of antibiotics (OR 0.80, 95% CI 0.46–1.42) and makes no difference to the length of hospital stay (MD 0.12, 95% CI -0.14 to 0.38).

**Conclusion** The use of a vaginal drain after hysterectomy could reduce the incidence of vault haematoma and febrile morbidity.

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### Introduction

Hysterectomy is the surgical removal of the uterus and is the second most frequently performed surgical procedure for women of reproductive age topped only by caesarean section [1]. Millions of procedures are performed annually throughout the world [2,3] with approximately 90% of them performed for benign conditions such as prolapse, menorrhagia, pelvic pain, fibroids and adenomyosis [4].

Among the different routes of hysterectomies, the vaginal route has the lowest morbidity and where possible, should be performed in preference to abdominal hysterectomy for benign gynaecological disease [5]. This is because it results in a quicker return to normal activities than abdominal. Although laparoscopic hysterectomies also result in a quicker return to normal activities they have a greater risk of damaging the bladder or ureter [5].

Hysterectomies are, however, associated with a significant risk of vault haematomas, with the vaginal route having a reported 25–59% incidence of ultrasound detected pelvic haematomas. [6,7] The incidence of clinically significant haematomas may be lower than those detected ultrasonographically but could lead to postoperative morbidity including prolonged hospital stay, return to theatres, readmission, need for antibiotics and post-operative febrile morbidity [8].

Surgical drains are used with the intention of decompressing or draining either fluid or air from the area of surgery. This is especially significant in premenopausal women with more vascular pedicles and higher chances of haematoma formation. Drains inserted following pelvic floor surgery can be inserted abdominally or vaginally. All hysterectomies irrespective of route require the vault to be opened, hence inserting a drain vaginally is more logical and avoids morbidity associated with an abdominal drain.

There are a limited number of randomised control trial data but no systematic reviews on the use of vaginal drains after hysterectomy. Considering the large number of hysterectomies being done worldwide, it is worthwhile investigating the use of

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vaginal drains to reduce postoperative morbidity related to the development of haematomas.

The aim of this systematic review was to determine if the use of vaginal drains after hysterectomy had an impact on different outcomes including development of vault haematoma, length of hospital stay, antibiotics usage and febrile morbidity in the immediate postoperative period.

## Materials and methods

This systematic review of the literature followed the MOOSE and PRISMA guidelines for the reporting of meta-analysis of Observational studies [9]. It was registered prospectively on the PROSPERO database (registration number: CRD42018096372).

The study population was defined as women undergoing any type of hysterectomy other than a radical hysterectomy. Radical hysterectomy was excluded to minimise the risk of selection bias. The intervention, i.e. the use of a vaginal drain inserted during the hysterectomy was compared to the control, which were hysterectomies that did not have a vaginal drain inserted. The outcomes studied were the development of vault haematoma, length of hospital stay, antibiotics usage and febrile morbidity in the immediate postoperative period.

The study designs that were included were randomised controlled trials (RCTs), retrospective and prospective cohort studies and case control studies.

### Eligibility criteria, search strategy, and data extraction

AMED, BNI, CINAHL, EMBASE, HBE, HMIC, Medline, PsycINFO and PubMed, Cochrane register of controlled trials (CCTR), Cochrane database of systematic reviews (CDSR) CINAHL and Google scholar were searched for studies that looked at vaginal drains after hysterectomy, between January and April 2018, using the search terms “vaginal”, “drain” and “hysterectomy”. A manual search of reference lists of all known and included studies was conducted to identify studies not captured by electronic searches. No language restrictions were applied. Papers that were not in English were translated by colleagues who could read the language as well as Google Translate and there were no studies which duplicated data. The title and abstracts were screened by two independent reviewers (SJ and PK). Full articles of all citations that were likely to meet the predefined selection criteria were obtained. Data was extracted independently by two authors (MK and PK) and recorded on a data collection form. Any discrepancies were settled by discussion with the senior author (SJ).

### Study selection

Randomised controlled trials and observational studies which compared outcomes in women with and without a vaginal drain after hysterectomy were included. Where data were incomplete, including those in conference abstracts, the authors were contacted by email and if no response was received after 2 weeks, a further email was sent.

### Methodological quality assessment

The Cochrane Collaboration tool for assessing risk of bias [10] was used to evaluate the methodological quality of the included studies. For assessing bias, the tool provides seven items: random sequence generation (Selection Bias), allocation concealment (Selection Bias), blinding of participants and personnel (Performance Bias), blinding of outcome assessment (Detection Bias), incomplete outcome data (Attrition Bias), selective reporting (Reporting Bias) and Other Bias. Each item was categorized as low

risk of bias, ‘unclear’ (either lack of information or uncertainty over the potential for bias), and high risk of bias.

### Data synthesis and analysis

The meta-analysis was performed using Review Manager 5.3 (RevMan). Heterogeneity was assessed by examining the characteristics of the included studies. The outcomes analysed included development of vault haematoma, length of hospital stay, antibiotics usage and febrile morbidity in the immediate postoperative period.

## Results

**Study selection** (Fig. 1): Our search strategy revealed 278 studies and an additional 3 studies were identified through reference lists. Of these studies, 258 abstracts were excluded and 23 full text articles were assessed for eligibility. Thirteen studies were further excluded: three because the drain did not exit through the vagina, two looked at different outcomes (shoulder tip pain and wound discharge), three were review articles and five did not have appropriately compared groups of women, i.e., women undergoing hysterectomy with a vaginal drain compared to a similar group without a drain. Ten studies [10–20] involving 1778 women, 811 with a drain and 967 without the drain, were included in the meta-analysis and are summarized in Fig. 1 and Table 1. All routes of hysterectomy except radical hysterectomy were included in this study (Table 2).

**Study Characteristics** (Table 1): There was considerable heterogeneity of the studies with respect to preoperative antibiotics, route of hysterectomy, type of drain used, duration that the drain was left in and fixation of the drain while in situ. Swartz et al [19] and Kjer et al [12] have not used preoperative antibiotics, Roh et al [17] have not mentioned if antibiotics were used in the two groups while the rest of the studies have used them. The routes of hysterectomy varied in each study and included women who underwent abdominal, vaginal and single port access laparoscopic

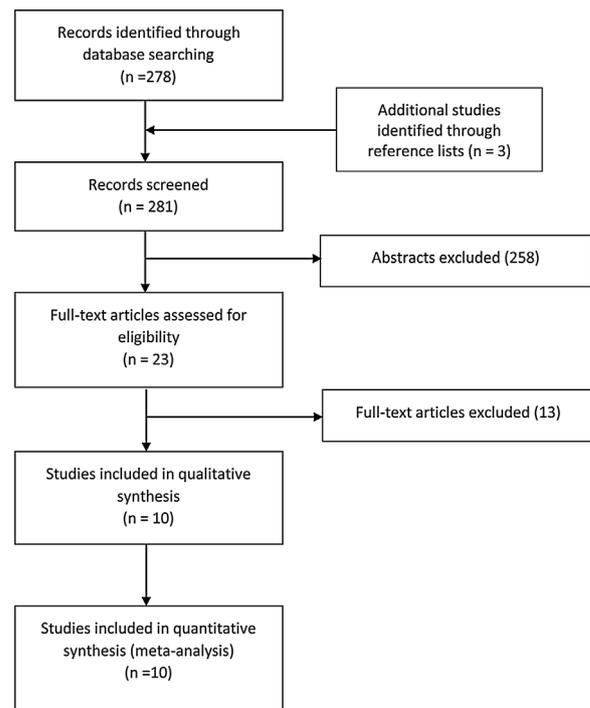


Fig. 1. Flow chart of study search.

**Table 1**  
Characteristics of included studies.

Paper	Year	Country	Study design	Study period	Sample size	Type of hysterectomy	Type of drain	Duration of drain	Follow up period
Dua [11]	2011	United Kingdom	Randomised Controlled Trial	2005 – 2010	272 (135 with drain and 137 with no drain)	Vaginal hysterectomy in postmenopausal women	Size 16 Robinson's	Based on surgeon	3 months
Kjer [12]	1977	Denmark	Randomised Controlled Trial	1975 – 1976	100 (50 each)	Abdominal hysterectomy	T suction drainage	Unclear	Unclear
Krishnaswamy [13]	2018	United Kingdom	Retrospective cohort	2011 – 2016	103 (52 with drain and 51 without)	Vaginal hysterectomy	Size 18 Foley's catheter	2nd postoperative day	Varied. Clinical notes and telephone follow up
Laila [14]	2016	Bangladesh	Randomised Controlled Trial	2015 – 2015	60 (30 each)	Vaginal hysterectomy	Not mentioned	Unclear	Until discharge and then clinical notes
Lee [15]	2017	South Korea	Retrospective cohort	2010 – 2014	359 (124 with drain, 235 without drain)	Single port access laparoscopic assisted vaginal hysterectomy	Jackson Pratt closed suction drain	48 hours	30 days after surgery
Poulsen [16]	1984	Denmark	Randomised Controlled Trial	1980 – 1981	100 (50 with drain, 50 without a drain)	Abdominal hysterectomy	T suction drainage	72 hours	Unclear
Roh [17]	2012	South Korea	Case control	2010 – 2012	183 (68 with drains, 115 without drains))	Single port access laparoscopic assisted vaginal hysterectomy	Jackson Pratt closed suction drain	48 hours	Unclear
Scotto [18]	1985	Italy	Randomised Controlled Trial	1981 – 1982	102 (52 with drain and 50 without)	Vaginal and abdominal hysterectomy	Size 16 T suction drainage	72 hours	Unclear
Swartz [19]	1975	USA	Case control	Not mentioned	300 (150 each)	Vaginal and abdominal hysterectomy	Size 24 T suction drainage	48 to 72 hours	Unclear
Swartz [20]	1976	USA	Randomised Controlled Trial	1974 – 1975	199 (100 with drain and 99 without a drain)	Vaginal and abdominal hysterectomy	T suction drainage	48 hours	Unclear

**Table 2**  
Type of hysterectomy, the number of studies looking at each type of hysterectomy and number of patients in each paper- total, with a drain and without a drain.

Type of hysterectomy	Number of studies	Total number of patients	Patients with a drain	Patients without a drain
Vaginal [11,13,14,18–20]	6	660	328	332
Abdominal [12,16,18–20]	5	576	291	285
Single port access laparoscopic assisted vaginal hysterectomy [15,17]	2	542	192	350

assisted vaginal hysterectomy [15,17]. Five studies used T suction drainage [12,16,18–20], Dua et al [11] used Robinson's drain, Krishnaswamy et al [13] used a Foley catheter as a drain, Roh et al [17] and Lee et al [15] used Jackson Pratt closed suction drain while Laila et al [14] did not mention which drain they used. On average, the drain seemed to stay in between 48–72 h (Table 1). The drains in three studies were fixed with a stitch [12,15,17] while those in 4 studies were not fixed [11,13,18–20]. The other studies did not mention if the drain was fixed or not.

**Risk of bias:** The risk of bias assessments is summarized in Table 3 and Fig. 2. One study was deemed to be at low risk of bias in relation to the risk of bias with respect to random sequence generation, allocation, blinding patients, incomplete outcome data, selective reporting and other bias [11]. Selection bias was either high or unclear in most studies as the method of selection of patient groups was either surgeon dependent or appeared unclear [12,13,15,17–19]. Blinding patients (Performance Bias) was either not done or was unclear in all studies except Dua et al [11].

**Table 3**  
Risk of bias assessment.

Reference	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Dua [11]	low	low	low	high	low	low	low
Kjer [12]	unclear	unclear	unclear	high	unclear	low	Unclear
Krishnaswamy [13]	high	high	high	high	low	low	low
Laila [14]	low	low	unclear	high	low	low	low
Lee [15]	high	high	high	high	low	low	low
Poulsen [16]	low	low	unclear	high	Unclear	low	low
Roh [17]	unclear	unclear	unclear	high	Unclear	low	low
Scotto [18]	unclear	unclear	unclear	high	Unclear	low	Low
Swartz [19]	high	high	high	high	Unclear	low	Unclear
Swartz [20]	low	low	unclear	high	Unclear	low	low

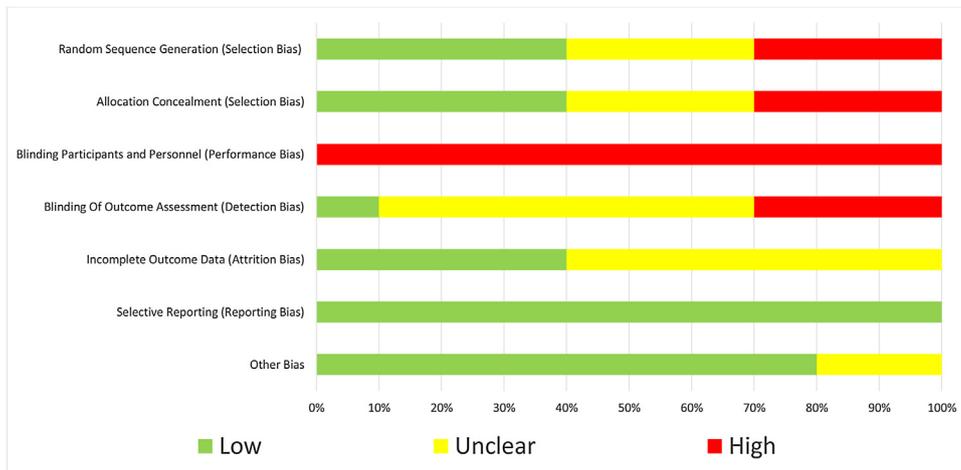


Fig. 2. Risk of bias graph.

‘Blinding of participants and personnel’ is generally not possible when interventions result in either in the presence of a vaginal drain or not. Attrition Bias was not clearly addressed in the studies by Kjer et al, Poulson et al, Roh et al, Scotto et al, Swartz et al and Swartz et al [12,16–20]. None of the studies appeared to report selectively and the risk of other bias appeared unclear in only two studies [12,19].

Synthesis of results

Meta-analysis was undertaken where there were more than 3 studies assessing the outcome.

**Vault Haematoma (Fig. 3):** There were more women with vault haematomas in the group without a drain when compared to the group with the drain (22 vs 5 cases). (OR=0.22; 95% CI 0.08 to 0.57; p=0.002). This analysis was performed on 5 studies with the drain being inserted in 234 women and not being inserted in 231 women [12–14,16,18].

**Febrile Morbidity (Fig. 4):** All ten studies in this review looked at febrile morbidity with 687 women having had the drain inserted and compared with 732 women who did not [11–20]. The insertion of a drain almost halved the odds of having an episode of high temperature post operatively with 84 episodes occurring in the women with the drain and 145 in the women without (OR=0.54; 95% CI 0.40 to 0.73; p= <0.0001). The temperature that was used to indicate febrile morbidity varied with most studies using 38 °C as the cut off for identification. Lee, Dua and Roh et al used 37.5 °C while Laila et al did not mention the value they used [11,14,15,17]. None of the studies looked at rates of incision and drainage for symptomatic cuff abscess.

**Hospital stay (Fig. 5):** This analysis was performed on four studies mentioning a mean and standard deviation involving 363 women with a drain which was compared with 473 women without a drain [11,13,15,18]. The study by Scotto et al analysed this in two groups, abdominal and vaginal hysterectomy and this has,

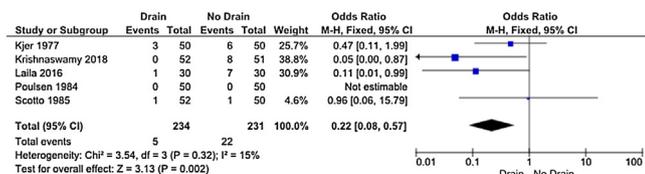


Fig. 3. Forest plot shows reduction in rates of vault haematoma following insertion of a vaginal drain.

hence, been used separately in the review [18]. The studies by Laila, Poulson, Roh and Kjer et al, though mentioned the length of stay in the hospital as a mean or a range, this could not be used in the analysis due to insufficient data for analysis [12,14,16,17]. The mean difference in length of stay was found comparable in both groups and was 0.12 with the 95% confidence interval being -0.14 to 0.38 and the p value was 0.35.

**Use of postoperative antibiotics (Fig. 6):** Four studies looked at women who needed postoperative antibiotics for febrile morbidity involving 278 women with a drain which was compared with 386 women without a drain [13,15,16,18]. Three of the studies (Polson et al, Scotto et al and Krishnaswamy et al) specified the use of antibiotics for pelvic infection while one (Lee et al) did not (13,15,16,18). There was a non-significant reduction in the number of women being administered post-operative antibiotics with an odds ratio of 0.80, 95% confidence interval of 0.46–1.42 and the p value being 0.45.

Discussion

Principal findings

Ten studies were included in this review involving 1778 patients. The data from this systematic review suggests that the use of a vaginal drain after hysterectomy could reduce the incidence of vault haematoma and febrile morbidity. There might be some evidence of benefit for reduction in usage of antibiotics. There was no difference in the length of hospital stay.

There is currently no known specially designed vaginal drain for the drainage of more viscous fluids such as blood and this can result in haematoma formation with its inherent complications following a hysterectomy. The drains that have been used in the studies included in this systematic review were a large bore Foley catheter, Robinson’s drain, T tube suction drain and a Jackson Pratt closed suction drain. However, these drains are not ideal as the eyelet for drainage is either small or they are not self-retaining which means that they may fall out when the patient ambulates following surgery. This also means that the drain may be less effective if it falls out or may need a stitch to keep the drain in place. Removal of the stitch after surgery would increase postoperative morbidity in that it might be painful and require stronger pain relief or further anaesthesia which could delay recovery.

Strengths and weaknesses of the study

To our knowledge this is the first systematic review and meta-analysis to compare the use of vaginal drains versus no drain after

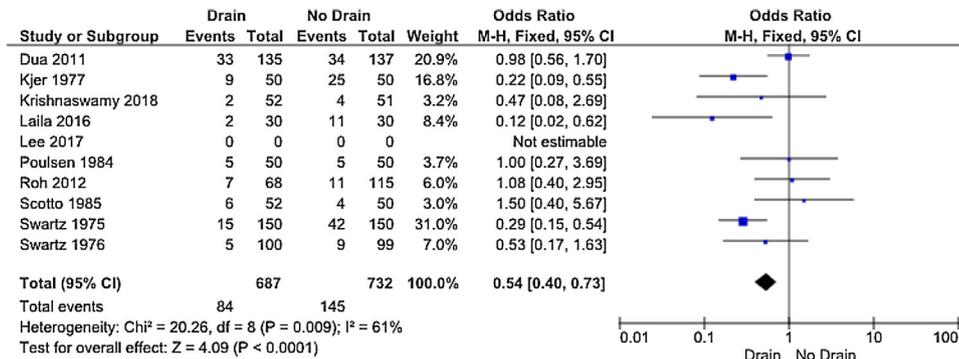


Fig. 4. Forest plot shows reduction in rates of febrile morbidity following insertion of a vaginal drain.

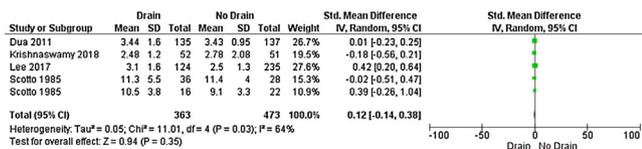


Fig. 5. Forest plot shows no change in length of postoperative hospital stay following insertion of a vaginal drain.

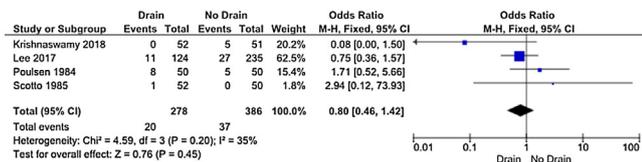


Fig. 6. Forest plot shows non-significant reduction in rates of increased antibiotic usage following insertion of a vaginal drain.

hysterectomy. The findings of this comprehensive review provide the best available evidence till date. The main limitation is the quality of the included studies which included six small sized randomised controlled trials (RCTs), two retrospective cohort studies and two case control studies. Due to the studies having small sample sizes, all the studies were analysed together and it is acknowledged that the small population sizes and inherent biases due to study design weakens the strength of conclusions drawn from the review, including those drawn from the RCTs. There was considerable heterogeneity of the studies with respect to preoperative antibiotics, route of hysterectomy, type of drain and the duration the drain was left in situ. These factors reduce the strength of the results and requires caution in the interpretation of the results due to the risk of bias.

*Strengths and Weaknesses related to other studies*

There are 6 randomised controlled trials, two retrospective cohort studies and two case control studies included in this paper. The randomised controlled trial by Dua et al in 2012 [11] showed no benefit from inserting a drain after vaginal hysterectomy. This study had several limitations. Drains were inserted for all women in the study group and most of whom were postmenopausal (>85%) where there might have been a lesser clinical need compared to premenopausal women as these women are likely to have had small, atrophic uteri, with lesser risks of vault haematoma formation. Moreover, those women who were clinically indicated to have a drain inserted were excluded from the study thereby defeating the purpose of the study altogether. All drains were removed before the patient mobilised and there was

no standardised time for the removal of the drain as this was up to the operating surgeon. Vault haematoma detection was based on postoperative pyrexia during the early postoperative period, but there was no adequate follow up. As vault haematoma presents several days after surgery and sometimes as late as 7–14 postoperatively, these women may have been missed or treated by their general practitioner with antibiotics.

This systematic review indicates that there is a need for larger studies with high quality RCT evidence with modern peri-operative management for the use of vaginal drains in women undergoing hysterectomies before further conclusions regarding the efficacy of using vaginal drains can be made.

*Future research*

This review and meta-analysis suggest that there could be merit in the use of using a vaginal drain following hysterectomy. Future research could pioneer the development of a vaginal drain specifically designed for use following a hysterectomy. The ideal drain for this purpose would have a larger eyelet as well as self-retaining properties to be of maximum efficiency. The authors are currently investigating the feasibility of developing a vaginal drain which fulfils these specifications.

**Brief summary**

The use of a vaginal drain after a hysterectomy could reduce postoperative morbidity associated with pelvic haematoma formation.

**Contribution to authorship**

- PK: Project development, Data collection and analysis, Manuscript write up
- SJ: Project conception and development, Data Analysis, Manuscript write up
- MK: Data Collection and Analysis

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None Relevant to this publication

**Ethics approval**

Not Applicable  
As this was a systematic review, formal ethical approval was not required.

## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ejogrb.2019.04.020>.

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