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Surgery for women with apical vaginal prolapse (Review)

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[Intervention Review]

Surgery for women with apical vaginal prolapse

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ABSTRACT

Background

Apical vaginal prolapse is a descent of the uterus or vaginal vault (post-hysterectomy). Various surgical treatments are available and there are no guidelines to recommend which is the best.

Objectives

To evaluate the safety and efficacy of any surgical intervention compared to another intervention for the management of apical vaginal prolapse.

Search methods

We searched the Cochrane Incontinence Group's Specialised Register of controlled trials, which contains trials identified from the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, ClinicalTrials.gov, WHO ICTRP and handsearching of journals and conference proceedings (searched July 2015) and ClinicalTrials.gov (searched January 2016).

Selection criteria

We included randomised controlled trials (RCTs).

Data collection and analysis

We used Cochrane methods. Our primary outcomes were awareness of prolapse, repeat surgery and recurrent prolapse (any site).

Main results

We included 30 RCTs (3414 women) comparing surgical procedures for apical vaginal prolapse. Evidence quality ranged from low to moderate. Limitations included imprecision, poor methodological reporting and inconsistency.

Vaginal procedures versus sacral colpopexy (six RCTs, n = 583; one to four-year review).

Awareness of prolapse was more common after vaginal procedures (risk ratio (RR) 2.11, 95% confidence interval (CI) 1.06 to 4.21, 3 RCTs, n = 277, I^2 = 0%, moderate-quality evidence). If 7% of women are aware of prolapse after sacral colpopexy, 14% (7% to 27%) are likely to be aware after vaginal procedures.

Repeat surgery for prolapse was more common after vaginal procedures (RR 2.28, 95% CI 1.20 to 4.32; 4 RCTs, n = 383, I^2 = 0%, moderate-quality evidence). The confidence interval suggests that if 4% of women require repeat prolapse surgery after sacral colpopexy, between 5% and 18% would require it after vaginal procedures.

We found no conclusive evidence that vaginal procedures increase*repeat surgery for stress urinary incontinence (SUI)* (RR 1.87, 95% CI 0.72 to 4.86; 4 RCTs, n = 395; I^2 = 0%, moderate-quality evidence). If 3% of women require repeat surgery for SUI after sacral colpopexy, between 2% and 16% are likely to do so after vaginal procedures.

Recurrent prolapse is probably more common after vaginal procedures (RR 1.89, 95% CI 1.33 to 2.70; 4 RCTs, n = 390; I^2 = 41%, moderate-quality evidence). If 23% of women have recurrent prolapse after sacral colpopexy, about 41% (31% to 63%) are likely to do so after vaginal procedures.

The effect of vaginal procedures on *bladder injury* was uncertain (RR 0.57, 95% CI 0.14 to 2.36; 5 RCTs, n = 511; I^2 = 0%, moderate-quality evidence).

SUI was more common after vaginal procedures (RR 1.86, 95% CI 1.17 to 2.94; 3 RCTs, n = 263; I^2 = 0%, moderate-quality evidence).

Dyspareunia was also more common after vaginal procedures (RR 2.53, 95% CI 1.17 to 5.50; 3 RCTs, n = 106, I^2 = 43%, low-quality evidence).

Vaginal surgery with mesh versus without mesh (6 RCTs, n = 598, 1-3 year review).

Awareness of prolapse - There may be little or no difference between the groups for this outcome (RR 1.08 95% CI 0.35 to 3.30 1 RCT n = 54, low quality evidence). The confidence interval was wide suggesting that if 18% of women are aware of prolapse after surgery without mesh, between 6% and 59% will be aware of prolapse after surgery with mesh.

Repeat surgery for prolapse - There may be little or no difference between the groups for this outcome (RR 0.69, 95% CI 0.30 to 1.60; 5 RCTs, n = 497; I^2 = 9%, low-quality evidence). If 4% of women require repeat surgery for prolapse after surgery without mesh, 1% to 7% are likely to do so after surgery with mesh.

We found no conclusive evidence that surgery with mesh increases r*epeat surgery for SUI* (RR 4.91, 95% CI 0.86 to 27.94; 2 RCTs, n = 220; I^2 = 0%, low-quality evidence). The confidence interval was wide suggesting that if 2% of women require repeat surgery for SUI after vaginal colpopexy without mesh, 2% to 53% are likely to do so after surgery with mesh.

We found no clear evidence that surgery with mesh decreases r*ecurrent prolapse* (RR 0.36, 95% CI 0.09 to 1.40; 3 RCTs n = 269; I^2 = 91%, low-quality evidence). The confidence interval was very wide and there was serious inconsistency between the studies.

Other outcomes

There is probably little or no difference between the groups in rates of SUI (*de novo*) (RR 1.37, 95% CI 0.94 to 1.99; 4 RCTs, n = 295; I^2 = 0%, moderate-quality evidence) or dyspareunia (RR 1.21, 95% CI 0.55 to 2.66; 5 RCTs, n = 501; I^2 = 0% moderate-quality evidence). We are uncertain whether there is any difference for *bladder injury* (RR 3.00, 95% CI 0.91 to 9.89; 4 RCTs, n = 445; I^2 = 0%; very low-quality evidence).

Vaginal hysterectomy versus alternatives for uterine prolapse (six studies, n = 667)

No clear conclusions could be reached from the available evidence, though one RCT found that awareness of prolapse was less likely after hysterectomy than after abdominal sacrohysteropexy (RR 0.38, 955 CI 0.15 to 0.98, n = 84, moderate-quality evidence).

Other comparisons

There was no evidence of a difference for any of our primary review outcomes between different types of vaginal native tissue repair (two RCTs), comparisons of graft materials for vaginal support (two RCTs), different routes for sacral colpopexy (four RCTs), or between sacral colpopexy with and without continence surgery (four RCTs).

Authors' conclusions

Sacral colpopexy is associated with lower risk of awareness of prolapse, recurrent prolapse on examination, repeat surgery for prolapse, postoperative SUI and dyspareunia than a variety of vaginal interventions.

The limited evidence does not support use of transvaginal mesh compared to native tissue repair for apical vaginal prolapse. Most of the evaluated transvaginal meshes are no longer available and new lighter meshes currently lack evidence of safety

The evidence was inconclusive when comparing access routes for sacral colpopexy.

No clear conclusion can be reached from the available data comparing uterine preserving surgery versus vaginal hysterectomy for uterine prolapse.

PLAIN LANGUAGE SUMMARY

Surgical management of pelvic organ prolapse in women

Review question

Which surgical interventions for apical vaginal prolapse have the best outcomes?

Background

Apical vaginal prolapse is a descent of the uterus or (after hysterectomy) the upper vagina (vault). Various surgical treatments are available and there are no guidelines to recommend which is the best.

Study characteristics

Thirty randomised controlled trials evaluated 3414 women who underwent surgery for apical vaginal prolapse. The most common comparisons were between vaginal surgery and sacral colpopexy (an abdominal procedure suspending the upper vagina to the sacrum with a graft) (six RCTs), vaginal surgery with mesh versus without (six RCTs), vaginal hysterectomy versus alternatives (six RCTs), and different types or routes of sacral colpopexy (eight RCTs). The evidence is current to July 2015.

Key results

Compared to various vaginal repairs, sacral colpopexy was associated with lower rates of awareness of prolapse, repeat surgery for prolapse, prolapse on examination, urinary stress incontinence (SUI) and painful intercourse. If 7% of women are aware of prolapse after sacral colpopexy, 14% (7% to 27%) are likely to be aware after vaginal procedures. If 4% of women require repeat prolapse surgery after sacral colpopexy, between 5% and 18% would require it after vaginal procedures.

We found no conclusive evidence that vaginal procedures increase the need for repeat surgery for SUI. If 3% of women require repeat surgery for SUI after sacral colpopexy, between 2% and 16% are likely to do so after vaginal procedures.

The limited evidence does not support the use of transvaginal mesh compared to native tissue repairs. The evidence was imprecise, but suggests that if 18% of women are aware of prolapse after surgery without mesh, between 6% and 59% will be aware after surgery with mesh. If 4% of women require repeat surgery for prolapse after surgery without mesh, 1% to 7% are likely to do so after surgery with mesh. We found no clear evidence that surgery with mesh decreases recurrent prolapse. Most of the evaluated transvaginal meshes are no longer available and new lighter meshes lack evidence of safety.

The evidence was inconclusive in comparisons of uterine preserving surgery versus vaginal hysterectomy, and different access routes for sacral colpopexy.

Quality of the evidence

Evidence quality ranged from very low to moderate. Limitations included imprecision, poor reporting of study methods and inconsistency.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Vaginal procedure versus sacral colpopexy for the repair of apical prolapse.

Population: Women with apical compartment pelvic organ prolapse
Setting: Inpatient
Intervention: Vaginal procedures
Comparison: Sacral colpopexy

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)
	Assumed risk	Corresponding risk			
	Sacral colpopexy	Vaginal surgery			
Awareness of prolapse (2 years)	**65 per 1000**	**137 per 1000** (69 to 274)	**RR 2.11** (1.06 to 4.21)	277 (3 studies)	⊕⊕⊕◯ **moderate**[1]
Repeat surgery for prolapse (2 to 4 years)	**41 per 1000**	**93 per 1000** (49 to 177)	**RR 2.28** (1.20 to 4.32)	383 (4 studies)	⊕⊕⊕◯ **moderate**[1]
Repeat surgery for stress urinary incontinence (2 years)	32 per 1000	61 per 1000 (23 to 157)	RR 1.87 (0.72 to 4.86)	395 (4 studies)	⊕⊕⊕◯ **moderate**[1]
Recurrent prolapse on examination (1 to 2 years)	**232 per 1000**	**438 per 1000** (309 to 626)	**RR 1.89** (1.33 to 2.70)	390 (4 studies)	⊕⊕⊕◯ **moderate**[2]
Bladder injury	**16 per 1000**	**9 per 1000** (2 to 39)	RR 0.57 (0.14 to 2.36)	511 (5 studies)	⊕⊕⊕◯ **moderate**[1]
Stress urinary incontinence (2 years)	**139 per 1000**	**259 per 1000** (163 to 409)	**RR 1.86** (1.17 to 2.94)	263 (3 studies)	⊕⊕⊕◯ **moderate** [2]

Dyspareunia (2 years)	**91 per 1000**	**230 per 1000** (106 to 501)	**RR 2.53** (1.17 to 5.50)	106 (3 studies)	⊕⊕◯◯ **low**[1,2]

*The basis for the **assumed risk** is the median control group risk across studies. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval; **RR:** Risk ratio;

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Imprecision: wide confidence intervals and or low event rates suggesting imprecision: downgraded one level
[2] Unclear management of detection bias in 3 of 4 studies and outcome dependent upon reviewer assessment: down graded one level for serious risk of bias

BACKGROUND

Description of the condition

Pelvic organ prolapse is common and is seen on examination in 40% to 60% of parous women (Handa 2004; Hendrix 2002). The annual aggregated rate of associated surgery in the USA is in the range of 10 to 30 per 10,000 women (Brubaker 2002). While anterior vaginal prolapse is the most common site of prolapse, loss of apical support is usually present in women with prolapse that extends beyond the hymen Brubaker 2009. There is growing recognition that adequate support for the vaginal apex is an essential component of a durable surgical repair for women with advanced prolapse Brubaker 2009. Because of the significant contribution of the apex to vaginal support, anterior and posterior vaginal repairs may fail unless the apex is adequately supported Hsu 2008. Surgical correction of the apex has several good options with relatively high success rates. Apical suspension procedures can broadly be separated into those performed transvaginally and those performed abdominally. Abdominal procedures can be performed via laparotomy or using conventional laparoscopic or robotically assisted-laparoscopic techniques. Although precise estimates are not available, most studies suggest that the vaginal approach is most common with 80 to 90% of procedures being performed through this route. The individual woman's surgical history and goals, as well as her individual risks for surgical complications, prolapse recurrence and de novo symptoms affect surgical planning and choice of procedure for apical pelvic organ prolapse (POP).

Pelvic organ prolapse is the descent of one or more of the pelvic organs (uterus, vagina, bladder or bowel). The different types of prolapse include:

1. apical vaginal prolapse i.e. uterus, vaginal vault (after hysterectomy when the top of the vagina drops down);
2. anterior vaginal wall prolapse i.e. cystocele (bladder descends), urethrocele (urethra descends), paravaginal defect (pelvic fascia defect);
3. posterior vaginal wall prolapse i.e. enterocele (small bowel descends), rectocele (rectum descends), perineal deficiency.

A woman can present with prolapse of one or more of these sites. Women with prolapse commonly have a variety of pelvic floor symptoms only some of which are directly related to the prolapse. Generalised symptoms of prolapse include pelvic heaviness; bulge, lump or protrusion coming down from the vagina; a dragging sensation in the vagina; or backache. Symptoms of bladder, bowel or sexual dysfunction are frequently present. For example, women may need to reduce the prolapse by using their fingers to push the prolapse up to aid urinary voiding or defecation. These symptoms may be directly related to the prolapsed organ, for example poor urinary stream when a cystocele is present or obstructed defecation when a rectocele is present. They may also be independent of the prolapse, for example symptoms of overactive bladder when a cystocele is present.

These symptoms require careful evaluation prior to surgical correction of prolapse to ensure the women understands what can and cannot be expected post-intervention.

Description of the intervention

Treatment of prolapse depends on the severity of the prolapse, its symptoms, the woman's general health, and the surgeon's preference and capabilities. Options available for treatment are conservative, mechanical or surgical interventions.

Generally, conservative or mechanical treatments are considered for women with a mild degree of prolapse, those who wish to have more children, the frail or those women unwilling to undergo surgery. Conservative and mechanical interventions have been considered in separate Cochrane reviews (Bugge 2013 Hagen 2011). There was no good evidence to guide management in either of these reviews.

Previously the Cochrane review on the surgical management of pelvic organ prolapse evaluated all aspects of prolapse surgery and in this update the review has been split into six separate reviews. This review evaluates the surgeries for apical prolapse and further detail regarding other reviews is stated in Differences between protocol and review.

Surgery is aimed at re-suspending the upper vagina which may include the uterus or in post-hysterectomy women, the vaginal vault. Suspension of the upper vagina can be achieved via the vagina or the abdominal approach. The vaginal approach can include native suspensions to the uterosacral or sacrospinous ligament or mesh suspensions usually also to the sacrospinous ligament. The abdominal approach can involve suspension of the vaginal apex to the sacrum (sacral colpopexy) or uterosacral ligaments. Abdominal suspension of the uterus to the sacrum is a sacral hysteropexy and to the uterosacral ligament is a suture hysteropexy. Abdominal surgery can be performed through an open incision or keyhole incisions via the laparoscope or robotically.

The current review considers all surgical procedures for women with apical vaginal prolapse.

How the intervention might work

A combination of the above-mentioned procedures and other continence and prolapse operations may be employed in the surgical correction of apical vaginal prolapse as frequently more than one type of prolapse occurs. The choice of operation depends on a number of factors, which include the nature, site and severity of the prolapse; whether there are additional symptoms affecting urinary, bowel or sexual function; the general health of the woman; the wish to preserve the uterus and the surgeon's preference and capability.

To aid the assessment of the success of surgery, clear pre and post-operative site-specific vaginal grading and details of the operative

intervention should be recorded in the reports.

Why it is important to do this review

The wide variety of surgical treatments available for prolapse indicates the lack of consensus as to the optimal treatment for apical vaginal prolapse. No guidelines exist to direct the surgeon and the women as to the preferred surgical intervention. Provided that sufficient numbers of trials of adequate quality have been conducted, the most reliable evidence is likely to come from the consideration of randomised controlled trials, and this is the basis for the review. The aim is to help identify optimal practice and to highlight where there is a need for further research.

OBJECTIVES

To evaluate the safety and efficacy of any surgical intervention as compared to another intervention for the management of apical vaginal prolapse.

METHODS

Criteria for considering studies for this review

Types of studies

We included published and unpublished randomised controlled trials (RCTs) in which any surgery for apical vaginal prolapse was compared with any other surgery for apical vaginal prolapse. We excluded quasi-randomised studies (e.g. studies with evidence of inadequate sequence generation such as alternate days, patient numbers) as they are associated with a high risk of bias. As this is a systematic review of surgical interventions, cross-over studies were excluded as the design was not valid in this context.
Trials were required to have at least six months' follow-up and at least 20 women in each arm in order to be eligible for the review.

Types of participants

Eligible studies included adult women seeking treatment for symptomatic apical vaginal prolapse, either primary or recurrent.
Types of apical vaginal prolapse include:

1. uterine prolapse;
2. vault prolapse (post-hysterectomy);
3. unspecified vaginal prolapse (uterine and/or vault prolapse).

Types of interventions

Eligible studies compared different types of surgery for apical vaginal prolapse, including the following.
Differences in route:

1. transvaginal;
2. abdominal;
3. open, laparoscopic or robotic.

Differences in type of repair:

1. with or without mesh;
2. types of native tissue repair;
3. whether uterus is spared.

Differences in extent of surgery:

1. hysterectomy versus uterine-preserving;
2. with and without continence surgery.

Types of outcome measures

Primary outcomes

1. Awareness of prolapse: any affirmative response to questions relating to awareness of prolapse or vaginal bulge, or any affirmative response to question three of Pelvic floor distress inventory (PFDI-20) "Do you usually have a bulge or something falling out that you can see or feel in the vaginal area?"
2. Repeat surgery:
2.1 repeat surgery for prolapse;
2.2 repeat surgery for stress urinary incontinence.
3. Any recurrent prolapse Defined as any stage 2 or greater vaginal prolapse (Pelvic Organ Prolapse Quantification (POPQ): prolapse - 1 cm above the hymen or below).

Secondary outcomes

4. Adverse events: outcomes to be reported include but are not limited to:
4.1 death (related to surgery);
4.2 mesh exposure;
*4.3 i*njury to bladder (cystotomy);
4.4 injury to bowel (enterotomy);
4.5 repeat surgery for mesh exposure.
5. Prolapse outcomes:
5.1 objective failure;
5.1.1 stage 2 or greater anterior compartment prolapse (point Ba at or beyond 1 cm inside the introitus);
5.1.2 stage 2 or greater apical compartment prolapse: (point C at or beyond 1 cm inside the introitus);
5.1.3 stage 2 or greater posterior vaginal compartment prolapse (Point Bp at or beyond 1 cm inside the introitus);
5.1.4 Pelvic Organ Prolapse Quantification (POPQ) system scores: POPQ scores describe nine measurements of the vagina to quantify and describe vaginal prolapse. For simplicity we report four of these basic measurements.

1. Point Ba on POPQ measurement (range -3 to +10 cm). Point Ba is approximately mid-point of the anterior vaginal wall.

2. Point Bp on POPQ measurements (range -3 to +10 cm). Point Bp is approximately mid-point of posterior vaginal wall.

3. Point C on POPQ measurements range from -10 cm to non determined limit). Point C describes the vaginal apex (upper vagina).

4. Total vaginal length (TVL) in cm range (0 to 14 cm): TVL is length from the vaginal entrance to apex (cervix or vaginal cuff).

6. Bladder function:
6.1 stress urinary incontinence;
6.2 de novo stress urinary incontinence;
6.3 surgery for stress urinary incontinence;
6.4 de novo bladder overactivity or urge incontinence;
6.5 urinary voiding dysfunction.

7. Bowel function:
7.1 de novo fecal incontinence;
7.2 de novo obstructed defecation;
7.3 constipation.

8. Sexual function:
8.1 dyspareunia;
8.2 de novo dyspareunia;
8.3 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ) (PISQ-12; range zero to 48, the higher the score the better the sexual function).

9. Quality of life and satisfaction (Continuous data):
9.1 Patient Global Impression of Improvment (PG1-1) questionnaire: data presented as seven-point Likert scale and responses of "much" or "very much" better considered affirmative and presented as dichotomous outcome;
9.2 Prolapse Quality of Life questionnaire (PQOL): range from zero to100, the higher the score the greater the dysfunction;
9.3 Pelvic Floor Distress Inventory (PFDI-20): range zero to 300, the higher the score the greater the dysfunction;
9.4 Pelvic Floor Impact Questionnaire (PFIQ-7): range zero to 300, the higher the score the greater the dysfunction.

10. Measures associated with surgery:
10.1 operating time (minutes);
10.2 length of hospital stay;
10.3 blood transfusion.

Search methods for identification of studies

We did not impose any language or other limits on any of the searches which are detailed below.

Electronic searches

This review drew on the search strategy developed for the Cochrane Incontinence Group. Relevant trials were identified from the Group's Specialised Register of controlled trials which is described, along with the Review Group search strategy, under the Group's module in the Cochrane Library. The Register contains trials identified from the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, MEDLINE in process, ClinicalTrials.gov, WHO ICTRP and handsearching of journals and conference proceedings.

The Incontinence Group Specialised Register was searched on 6 July 2015 using the Group's own keyword system; the search terms used are given in Appendix 1.

In addition, we searched ClinicalTrials.gov in January 2016.

Searching other resources

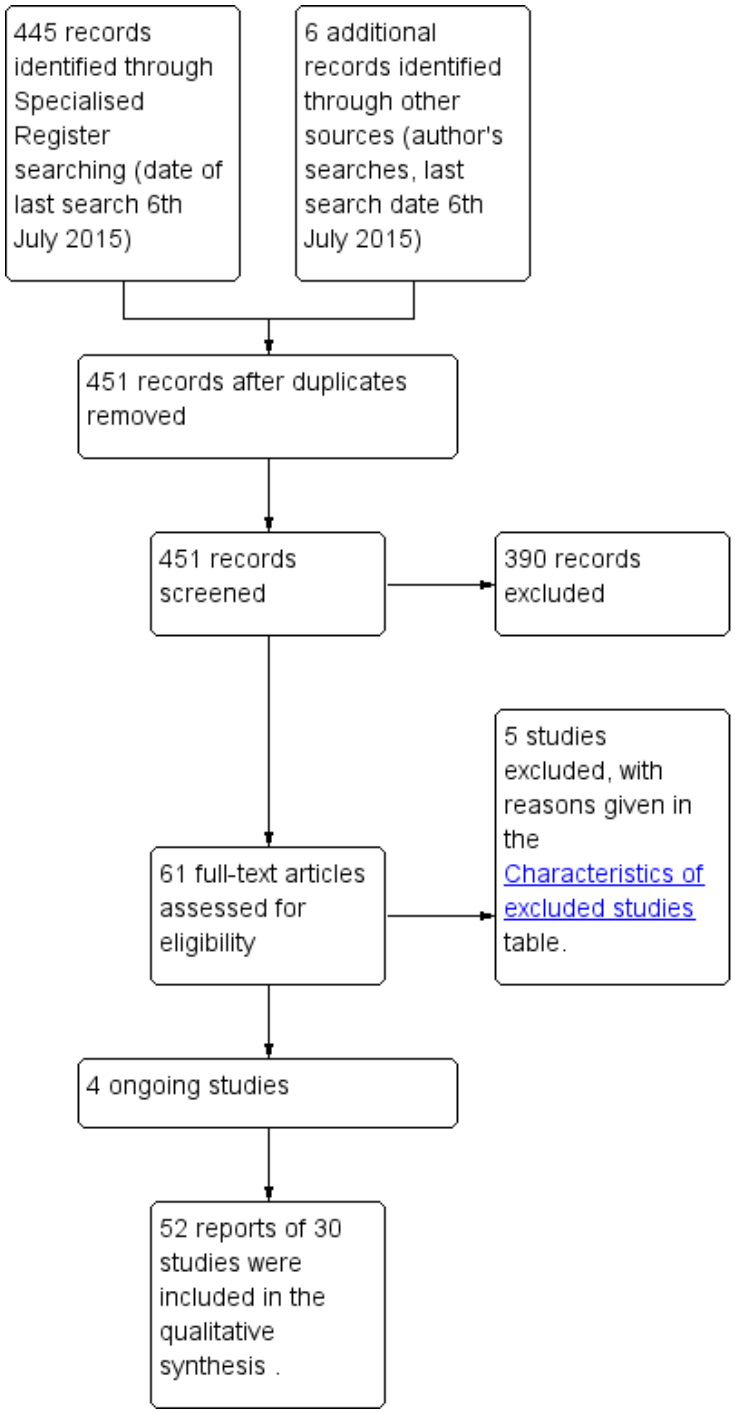
We handsearched conference proceedings for the International Urogynecology Society (IUGA) and International Continence Society (ICS) for podium presentations 2012 to June 2015. We searched the reference lists of relevant articles, and contacted researchers in the field.

Data collection and analysis

Selection of studies

Two review authors assessed the titles and, if available, abstracts of all possibly eligible studies for compliance with the inclusion criteria for the review. Full-text reports of each study likely to be eligible were then independently assessed by at least two review authors. Excluded studies are listed with the reasons for their exclusion in the table Characteristics of excluded studies. The selection process can be referred to in the PRISMA flow chart (Figure 1).

Figure 1. PRISMA study flow diagram.



Data extraction and management

Data extraction was undertaken independently by at least two review authors and comparisons made to ensure accuracy. Discrepancies were resolved by discussion or by referral to a third party. Data extracted included study characteristics and outcome data. Where studies had multiple publications, we collated the multiple reports of the same study, so that each study rather than each report is the unit of interest in the review, and we gave these studies a single study ID with multiple references.

Where trial data were not reported adequately, we attempted to acquire the necessary information from the trialist.

Assessment of risk of bias in included studies

Two review authors independently assessed the included studies for risk of bias using the Cochrane 'Risk of bias' assessment tool (Higgins 2011) to assess: selection (random sequence generation and allocation concealment); performance (blinding of participants and personnel); detection (blinding of outcome assessors); attrition (incomplete outcome data); reporting (selective reporting); and other bias. Disagreements were resolved by discussion or by a third review author. We describe all judgements fully and present the conclusions in the 'Risk of bias' tables, which were incorporated into the interpretation of review findings by means of sensitivity analyses (see below).

Measures of treatment effect

For dichotomous data we used the numbers of events in the control and intervention groups of each study to calculate Mantel-Haenszel risk ratios (RRs). For continuous data, if all studies reported exactly the same outcomes we calculated the mean difference (MDs) between treatment groups. If similar outcomes were reported on different scales, we planned to calculate the standardised mean difference (SMD). We presented 95% confidence intervals for all outcomes. We compared the magnitude and direction of effect reported by studies with how they are presented in the review, taking account of legitimate differences. We would have interpreted the SMD as follows: an effect size of 0.2 is a small effect, an effect size of 0.5 is a medium effect, and an effect size of 0.8 is a large effect (Cohen 1988).

Unit of analysis issues

All analyses were per woman randomised.

Dealing with missing data

We analysed the data on an intention-to-treat basis (once randomised to an intervention the participants are analysed in that intervention and analysis includes all randomised participants) as far as possible, and attempts were made to obtain missing data from the original trialists. Where these were unobtainable we analysed only the available data.

Assessment of heterogeneity

We considered whether the clinical and methodological characteristics of the included studies were sufficiently similar for meta-analysis to provide a clinically meaningful summary. We assessed statistical heterogeneity by the measure of the I^2. An I^2 measurement greater than 50% was taken to indicate substantial heterogeneity (Higgins 2011), and a random-effects calculation was undertaken to express greater uncertainly by widening the confidence intervals.

Assessment of reporting biases

In view of the difficulty of detecting and correcting for publication bias and other reporting biases, we aimed to minimise their potential impact by ensuring a comprehensive search for eligible studies and by being alert for duplication of data. Had there been 10 or more studies in an analysis, we planned to use a funnel plot to explore the possibility of small-study effects(a tendency for estimates of the intervention effect to be more beneficial in smaller studies).

Data synthesis

Where studies were sufficiently similar, we combined the data using a fixed-effect model in the following comparisons.

1. Vaginal procedure versus sacral colpopexy
2. Vaginal surgery with mesh versus without mesh
3. Vaginal surgery: comparison of one native tissue repair versus another
4. Vaginal hysterectomy versus alternative surgery for uterine prolapse
    i) vaginal hysterectomy versus abdominal hysterectomy
    ii) vaginal hysterectomy versus vaginal uterus-preserving surgery
    iii) vaginal hysterectomy versus abdominal uterus-preserving surgery
5. Sacral colpopexy with mesh versus without
6. Sacral colpopexy: laparoscopic versus other
    i) laparoscopic versus open
    ii) laparoscopic versus robotic

7. Sacral colpopexy with continence surgery versus without

An increase in the odds of a particular outcome, which may be beneficial (for example. patient's global impression of improvement) or detrimental (for example, re-operation for prolapse), is displayed graphically in the meta-analyses to the right of the centre-line, and a decrease in the odds of an outcome to the left of the centre-line.

We did not intend to pool data unless the intervention arm was clinically homogeneous.

Subgroup analysis and investigation of heterogeneity

No subgroup analysis was planned.

If we detected substantial heterogeneity, we explored possible explanations in sensitivity analyses. We took any statistical heterogeneity into account when interpreting the results, especially if there was any variation in the direction of effect.

Sensitivity analysis

We conducted sensitivity analyses for the primary outcomes to determine whether the conclusions were robust to arbitrary decisions made regarding the eligibility and analysis. These analyses included consideration of whether the review conclusions would have differed if:

1. a random-effects model had been adopted;
2. the summary effect measure had been odds ratio (OR) rather than risk ratio (RR).

Overall quality of the body of evidence: 'Summary of findings' tables

We prepared 'Summary of findings' tables using GRADEPRO software, using Cochrane methods. Two review authors working independently evaluated the overall quality of the body of evidence for the main review outcomes (awareness of prolapse, repeat surgery for prolapse or stress incontinence, recurrent prolapse on examination, bladder injury, stress urinary incontinence and dyspareunia) with regard to the main review comparisons (vaginal procedures versus sacral colpopexy and vaginal surgery with versus without mesh). We used GRADE criteria (study limitations (i.e. risk of bias), consistency of effect, imprecision, indirectness and publication bias). Judgements about evidence quality (high, moderate or low) were justified, documented, and incorporated into reporting of results for each outcome.

RESULTS

Description of studies

Results of the search

Four hundred and fifty-one abstracts were screened and 390 records were excluded. Sixty-one full text articles were screened and 52 publications associated with 30 studies were included (Anger 2014; Barber 2014; Benson 1996; Braun 2007; Brubaker 2008; Costantini 2007; Costantini 2008; Costantini 2013; Culligan 2005; Culligan 2013; da Silviera 2015; Detollenaere 2015; de Tayrac 2008, Dietz 2010; Halaska 2012; Iglesia 2010; Jeng 2005, Lim 2012; Lo 1998; Maher 2004; Maher 2011; Meschia 2004a; Natale 2010; Freeman 2013; Paraiso 2011; Rahmanou 2015; Rondini 2015; Roovers 2004; Svabik 2014; Trabuco 2014). Five studies were excluded and four studies are ongoing. No studies are awaiting classification.

Full details of the included trials are given in the 'Characteristics of included studies' table.

The flow of literature through the assessment process is shown in the PRISMA flowchart (Figure 1).

Included studies

Study design and setting

Thirty trials were included and were conducted in eight countries (Australia, Chile, Czeck Republic, England, Holland, Italy, Taiwan and the USA). All trials were parallel design.

Participants

A total of 3414 women were randomised in the 30 included trials. All trials reported age and parity. The mean age of participants was between 60 and 70 years in all trials except in Anger 2014; Barber 2014; Rondini 2015; Roovers 2004, where the mean age was between 55 to 60 years. Median parity was less than three in all trials except Rondini 2015 with a mean parity of 3.8.

Interventions

1. Six trials (Benson 1996; Lim 2012, Lo 1998; Maher 2004; Maher 2011; Rondini 2015) compared a vaginal-based apical prolapse repair with sacral colpopexy for apical prolapse and randomised 583 women, of which 83% were post-hysterectomy. Post-hysterectomy prolapse-only patients were included in Maher 2004; Maher 2011 and the remainder included both uterine and post-hysterectomy prolapse. All trials included those with stage 2 or greater apical prolapse and abdominal intervention in all trials was an open sacral colpopexy except for Maher 2011 were laparoscopic access to the abdomen was utilised and Lim 2012 were either a laparoscopic or open approach was performed. The vaginal colpopexy was to the sacrospinous ligament in three trials (Benson 1996 bilateral; Lo 1998; Maher 2004), uterosacral ligament (Lim 2012; Rondini 2015), and with transvaginal polypropylene mesh (Lim 2012; Maher 2011).

2 Six trials (da Silviera 2015; de Tayrac 2008; Halaska 2012; Iglesia 2010; Meschia 2004a; Svabik 2014) compared vaginal apical procedures with mesh versus vaginal apical procedures without mesh in 598 women. In all studies a sacrospinous colpopexy was performed in the native tissue arm (n = 297) and the mesh (n = 301)

was polypropylene. THe polypropylene mesh was a monofilament weave in four studies (da Silviera 2015; Halaska 2012; Iglesia 2010; Svabik 2014) and multi-filament in two studies (de Tayrac 2008, Meschia 2004a). Two studies (Halaska 2012; Svabik 2014) included only those with post-hysterectomy prolapse, while the remainder included those with apical prolapse (uterine and vault).
3 Two additional trials were identified (Barber 2014; Natale 2010) including 545 women. Both studies are quite different in respect to interventions and baseline interventions and are not suitable for group analysis. Barber 2014 reported a multi-centre trial comparing uterosacral (n = 188) and sacrospinous colpopexy (n = 186) for apical (uterine or vault) prolapse with two-year review. All patients had symptomatic prolapse, and prolapse equal or beyond -1 cm from the hymen and stress urinary incontinence. A separate analysis compared treatment with and without a program of behavioural therapy and pelvic floor muscle training (BPMT) and the reader is directed to a a separate review under preparation Perioperative interventions at prolapse surgery review for further details of this comparison. Natale 2010 compared two vaginal apical suspending procedures, high levator myorrhaphy (HLM) (n = 116) and uterosacral colpopexy (USLS) (n = 113), in patients with stage 2 or more uterine prolapse. All women underwent vaginal hysterectomy and anterior repair with concomitant mono-filament polypropylene mesh in over 90% of women
4. Six trials reported on uterine prolapse (Braun 2007; Detollenaere 2015; Dietz 2010; Jeng 2005, Rahmanou 2015; Roovers 2004) evaluating 663 women; with three comparing vaginal hysterectomy versus alternatives for uterine prolapse, including vaginal sacrospinous hysteropexy (uterine preserving) intervention (Detollenaere 2015; Dietz 2010; Jeng 2005); abdominal sacrohysteropexy (Rahmanou 2015; Roovers 2004), and abdominal hysterectomy (Braun 2007).
5. Two trials with 204 women compared different graft materials utilised to suspend the vagina from the sacrum at sacral colpopexy. Culligan 2005 compared polypropylene mesh (Trelex Boston,) with cadaveric fascia lata (Tutoplast, Mentor) and more recently Culligan 2013 polypropylene mesh (Pelvitex, Bard) with acellular collagen matrix porcine dermis (Pelvisoft, Bard).
6. Four trials compared access routes for sacral colpopexy. Sacral colpopexy can be performed with an abdominal incision (ASC), laparoscopically (LSC) or robotically (RSC) and two trials with 120 women (Costantini 2013; Freeman 2013) compared ASC and LSC and Anger 2014 and Paraiso 2011 with 157 women compared LSC and RSC.
7. Four trials evaluated the efficacy of performing continence surgery at the time of sacrocolpopexy including 544 women (Brubaker 2008; Costantini 2007; Costantini 2008; Trabuco 2014). Three evaluated with and without colposuspension (Brubaker 2008; Costantini 2007; Costantini 2008) and Trabuco 2014 compared colposuspension with mid-urethral sling at the time of sacrocolpopexy. In Brubaker 2008 and Costantini 2007, the women had prolapse and were continent and in Costantini 2008 and Trabuco 2014, prolapse and urinary stress incontinence (SUI) were the inclusion criteria.

Follow-up

Fifteen trials reported median/mean follow-up of less than one year (Anger 2014; Costantini 2013; Culligan 2013; da Silviera 2015; Detollenaere 2015; Dietz 2010; Freeman 2013; Halaska 2012; Jeng 2005; Lim 2012; Natale 2010; Paraiso 2011; Rahmanou 2015; Svabik 2014; Trabuco 2014).
Two-year results were reported in six studies (Barber 2014; Benson 1996; Braun 2007; Lo 1998; Maher 2004; Maher 2011).
Three to four-year outcomes were reported in three trials (Costantini 2008; Iglesia 2010; Rondini 2015), and four trials reported outcomes at greater than five years (Brubaker 2008, Costantini 2007, Culligan 2005, Roovers 2004).

Outcomes

Twenty-four studies reported data in a form suitable for analysis on at least one of the primary outcomes.

1. Nine reported awareness of prolapse (Barber 2014; Benson 1996; Brubaker 2008; Culligan 2005; Detollenaere 2015; Iglesia 2010; Maher 2004; Maher 2011; Roovers 2004).
2. Twenty-one reported re-operation for prolapse (Barber 2014; Benson 1996; Braun 2007; Brubaker 2008; Costantini 2007; Costantini 2008; Culligan 2005; Culligan 2013; da Silviera 2015; de Tayrac 2008; Detollenaere 2015; Dietz 2010; Freeman 2013; Halaska 2012; Iglesia 2010; Maher 2004; Maher 2011; Rahmanou 2015; Rondini 2015; Roovers 2004; Svabik 2014).
3. Fourteen reported prolapse on examination at any site (Braun 2007; Brubaker 2008; Culligan 2005; Culligan 2013; Detollenaere 2015; Freeman 2013; Halaska 2012; Iglesia 2010; Lim 2012; Lo 1998; Maher 2004; Maher 2011; Paraiso 2011; Svabik 2014).

Six trials did not report any primary outcome but all reported at least one secondary outcome (Anger 2014; Costantini 2013; Jeng 2005; Meschia 2004a, Natale 2010; Trabuco 2014).

Excluded studies

Overall five studies were excluded from the review (Altman 2013; Balci 2011; Chao 2012; Heinonen 2011 Juneja 2010). Full details are given in the 'Characteristics of excluded studies' table.

Risk of bias in included studies

Allocation

Random sequence generation and allocation concealment

Seventeen trials adequately described the allocation process and confirmed that secure concealment of the randomisation process was used, for example allocation by a remote person or sealed envelopes (Anger 2014; Barber 2014; Benson 1996; Brubaker 2008;

Culligan 2005; Culligan 2013, Detollenaere 2015 Dietz 2010; Iglesia 2010; Lim 2012, Lo 1998, Maher 2004; Maher 2011; Meschia 2004a Paraiso 2011 Rondini 2015; Roovers 2004). However, in one of these trials, four women received the opposite treatment to their randomised allocation (mesh instead of fascia) and were subsequently analysed in the mesh group thus compromising the randomisation process; an intention-to-treat analysis was not used (Culligan 2005). Svabik 2014 described computer-generated randomisation based on hospital numbers.

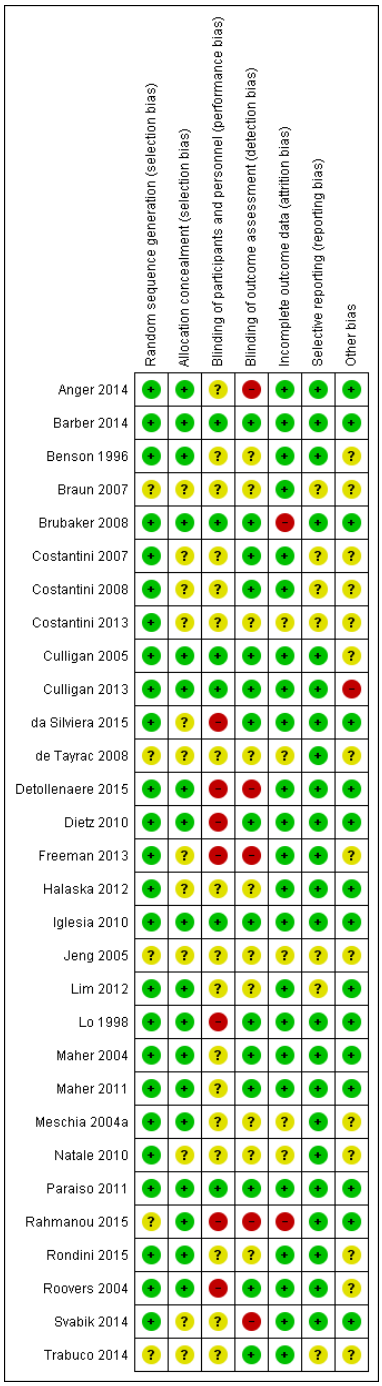
Of the remainder, 11 trials stated that they used computer-generated number lists but it was unclear whether the allocation was concealed before assignment (Braun 2007; Costantini 2007; de Tayrac 2008; Freeman 2013; Halaska 2012; Lo 1998; Natale 2010; Paraiso 2011; Svabik 2014).

Twenty-five trials were rated as at low risk of bias related to sequence generation and five as at unclear risk. Eighteen trials were rated as low risk of bias related to allocation concealment and 12 as at unclear risk.

Blinding

Women and surgeons could not be blinded to the procedure when different surgical routes were compared (Benson 1996; Braun 2007; da Silviera 2015; Maher 2004; Maher 2011; Rahmanou 2015; Roovers 2004; Svabik 2014). Blinding of patients and the postoperative reviewer were performed in six trials (Barber 2014; Brubaker 2008; Culligan 2005; Culligan 2013; Iglesia 2010; Paraiso 2011). Outcome assessments were conducted by non-surgeons in 13 trials (Anger 2014; Barber 2014; Benson 1996; Costantini 2008; Culligan 2005; Culligan 2013; Iglesia 2010; Maher 2004; Maher 2011; Paraiso 2011; Roovers 2004; Svabik 2014; Trabuco 2014). These findings are summarised in Figure 2.

Figure 2. 'Risk of bias' summary: review authors' judgements about each risk of bias item for each included study.



Six trials were at low risk of performance bias, 17 an unclear risk and 7 at high risk of bias in this domain. Fifteen were at low risk of detection bias, 10 at an unclear risk and five were at high risk of detection bias.

Incomplete outcome data

Loss to follow-up ranged from zero (Braun 2007; Costantini 2008; Detollenaere 2015, to less than 10% in eight trials (Anger 2014; Benson 1996; Culligan 2013; Dietz 2010; Halaska 2012; Maher 2004; Maher 2011; Svabik 2014) At one year Rahmanou 2015 reported 37% attrition rate and generally as review time increased attrition rate also climbed. At five years Culligan 2005 reported a 46% loss to follow-up that increased to 62% at the seven-year evaluation of the Care study (Nygaard 2013). Roovers 2004 had a 27% attrition rate and Costantini 2007 a 6% attrition rate at eight years. Attrition rate not stated in Costantini 2013.

Twenty-three studies were rated as at low risk of attrition bias, two studies were rated as at high risk of attrition bias and five as at unclear risk.

Selective reporting

Twenty-three trials were at low risk and seven at unclear risk of reporting bias. Data relating to a number of outcomes were not available in a suitable format to be included in a meta-analysis, as mean and standard deviations were not reported when describing the central tendency and dispersion of data.

Other potential sources of bias

In 12 trials, data were analysed on an intention-to-treat basis (Barber 2014, Brubaker 2008; Culligan 2013; Detollenaere 2015; Dietz 2010, Iglesia 2010; Jeng 2005; Maher 2004; Maher 2011; Paraiso 2011;Rondini 2015 Roovers 2004).

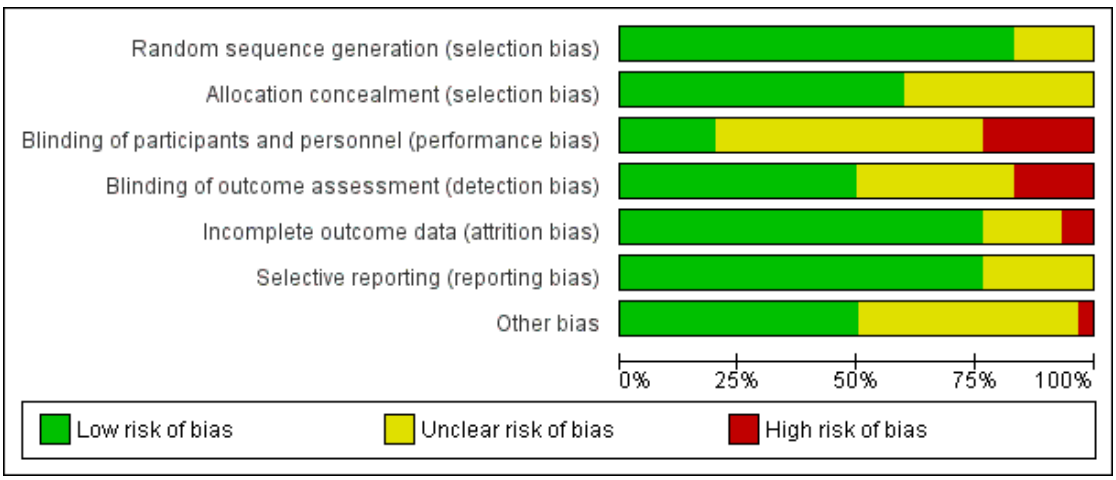
Baseline descriptive characteristics were reported in all trials and were equally distributed except for: Meschia 2004a were women in the vaginal sacrospinous colpopexy arm were significantly older. Barber 2014 compared sacrospinous and uterosacral colpopexy and in the uterosacral group there was lower body mass index (BMI), higher parity and less prolapse as compared to sacrospinous colpopexy group. In Detollenaere 2015, in the vaginal hysterectomy group, more posterior repairs were performed than in the sacrohysteropexy group.

Preoperative prolapse status was reported in all trials but equal distribution and severity of prolapse between groups was not specifically reported in Benson 1996; Meschia 2004a, or Freeman 2013.

Thirteen trials were at low risk of bias related to financial conflict of interest with risk being unclear in 16 trials and high in one.

These findings are summarised in Figure 2 and Figure 3.

Figure 3. 'Risk of bias' graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.



Effects of interventions

See: **Summary of findings for the main comparison** Vaginal procedure versus sacral colpopexy; **Summary of findings 2** Vaginal surgery with mesh versus without mesh

1 Vaginal procedure versus sacral colpopexy

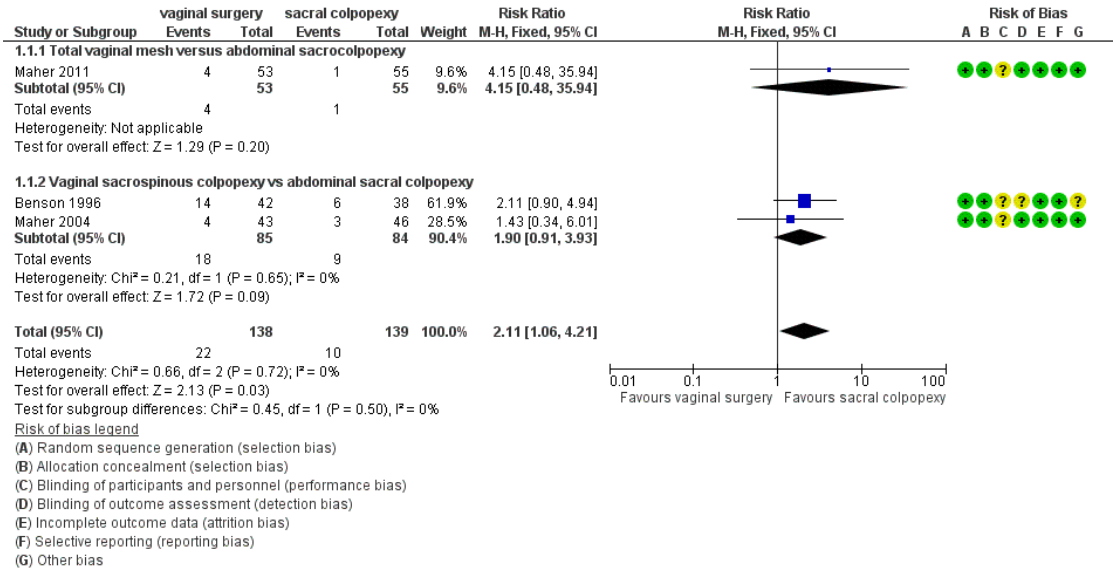
Six trials (583 women) reported on this comparison (Benson 1996; Lim 2012; Lo 1998; Maher 2004; Maher 2011; Rondini 2015). The trials compared vaginal procedures with laparoscopic or open colpopexy.

PRIMARY OUTCOMES

1.1 Awareness of prolapse

Awareness of prolapse was more common after vaginal procedures than after sacral colpopexy (risk ratio (RR) 2.11, 95% confidence interval (CI) 1.06 to 4.21; 3 RCTs, n = 277; I^2 = 0% moderate-quality evidence, Analysis 1.1; Figure 4). If 7% of women are aware of prolapse after sacral colpopexy, 14% (7% to 27%) are likely to be aware after vaginal procedures.

Figure 4. Forest plot of comparison: 1 Vaginal procedure versus sacral colpopexy, outcome: 1.1 Awareness of prolapse (2 years).

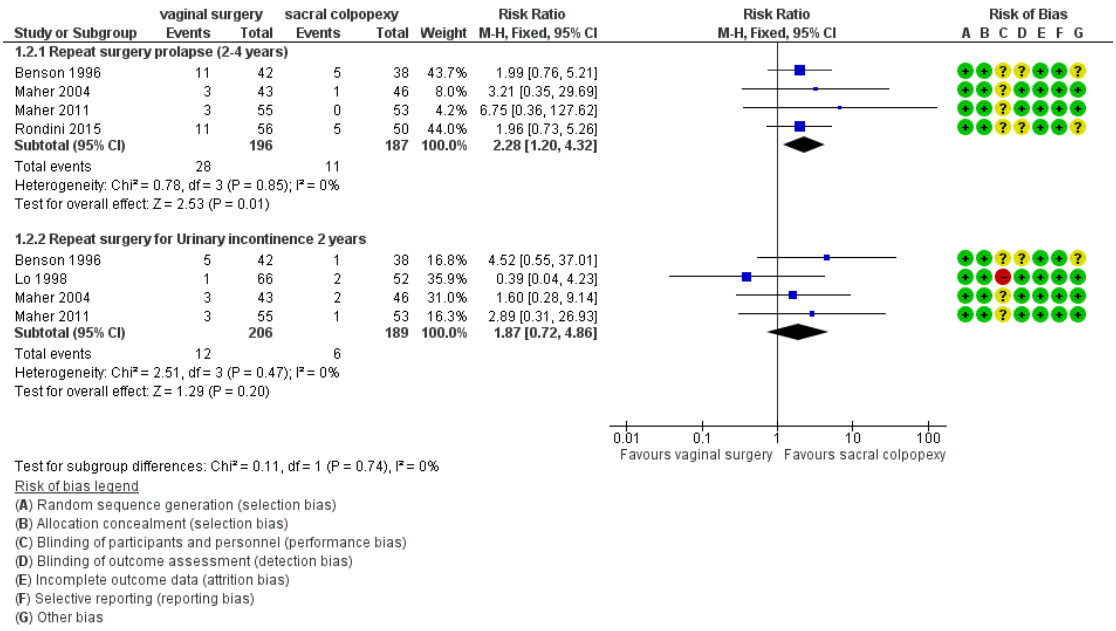


1.2 Repeat surgery

1.2.1 Repeat surgery for prolapse

Repeat surgery for prolapse was more common after vaginal procedures than sacral colpopexy at two- to four-year follow-up (RR 2.28, 95% CI 1.20 to 4.32; 4 RCTs, n = 383; I^2 = 0% moderate-quality evidence, Analysis 1.2; Figure 5). The confidence interval suggests that if 4% of women require repeat prolapse surgery after sacral colpopexy, between 5% and 18% would require it after vaginal procedures.

Figure 5. Forest plot of comparison: 1 Vaginal procedure versus sacral colpopexy, outcome: 1.2 Repeat surgery (2-4 years).



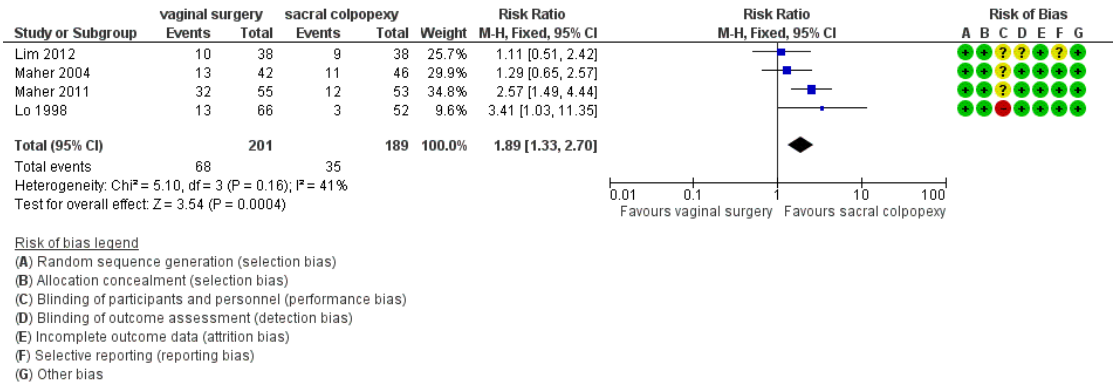
1.2.2 Repeat surgery for stress incontinence (SUI)

We found no conclusive evidence that vaginal procedures increase repeat surgery for SUI (RR 1.87, 95% CI 0.72 to 4.86; 4 RCTs, n = 395; I^2 = 0%, moderate-quality evidence). If 3% of women require repeat surgery for SUI after sacral colpopexy, between 2% and 16% are likely to do so after vaginal procedures. (Analysis 1.2; Figure 5)

1.3 Any recurrent prolapse

After one to two years follow-up, recurrent prolapse on examination (those with stage 2 or greater prolapse at any site) is probably more common after vaginal procedures (RR 1.89, 95% CI 1.33 to 2.70; 4 RCTs, n = 390; I^2 = 41%, moderate-quality evidence). If 23% of women have recurrent prolapse after sacral colpopexy, about 41% (31% to 63%) are likely to do so after vaginal procedures. (Analysis 1.3, Figure 6)

Figure 6. Forest plot of comparison: 1 Vaginal procedure versus sacral colpopexy, outcome: 1.3 Any recurrent prolapse (1-2 years).



SECONDARY OUTCOMES

1.4 Adverse events

1.4.1 Death related to surgery

No data were reported for this outcome.

1.4.2 Mesh exposure

There was no evidence of a difference between the groups; vaginal procedure 4% (9/291) versus sacral colpopexy 3% (8/283) for mesh exposure (RR 1.13; 95% CI 0.47 to 2.69, 6 RCTs, n = 574; I^2 = 28%, Analysis 1.4).

1.4.3 Bladder injury

The effect of vaginal procedures on bladder injury was uncertain, due to imprecision associated with low event rates: vaginal procedure 0.7% (2/267) versus sacral colpopexy 1.8% (4/244): (RR 0.57, 95% CI 0.14 to 2.36; 5 RCTs, n = 511; I^2 = 0%, Analysis 1.5.1; moderate-quality evidence). If bladder injury occurred in 2% of women after sacral colpopexy, then up to 4% would have bladder injury following vaginal procedures.

1.4.4 Bowel injury

There was no evidence of a difference between the groups: vaginal procedure 0.6% (1/163) versus sacral colpopexy 1.4% (2/143) for bowel injury (RR 0.63, 95% CI 0.12 to 3.23; 3 RCTs, n = 306; I^2 = 0%, Analysis 1.5.2). Caution should be taken when interpreting these results due to the low event rates.

1.4.5 Repeat surgery for mesh exposure

There was no evidence of a difference between vaginal procedures and sacral colpopexy for repeat surgery for mesh exposure at one- to four-year follow-up (RR 1.14; 95% CI 0.35 to 3.64; I^2 = 48% 5 RCTs, n = 497. Analysis 1.2.3).

1.5 Objective failure, by site

1.5.1 Objective failure of anterior compartment

Anterior compartment prolapse was more likely after vaginal procedures than after sacral colpopexy (RR 4.02, 95% CI 1.71 to 9.49; 2 RCTs, n = 199; I^2 = 22%, Analysis 1.7)

1.5.2 Objective failure of apical compartment

Apical prolapse was more likely after vaginal procedures than after sacral colpopexy (RR 8.15, 95% CI 2.71 to 24.49; 3 RCTs, n= 275; I^2 = 0%, Analysis 1.7).

1.5.3 Objective failure of posterior vaginal compartment

Posterior compartment prolapse was more likely after vaginal procedures than after sacral colpopexy (RR 3.43, 95% CI 1.10 to 10.66; 2 RCTs, n=199; I^2 = 0%, Analysis 1.7).

1.5.4 Pelvic organ prolapse quantification (POPQ) scores

1. Point Ba was less supported in the vaginal procedure group than the sacral colpopexy group (mean difference (MD) 0.80 cm, 95% CI 0.41 to 1.19; 1 RCT, n = 108, Analysis 1.8).
2. Point Bp was less supported in the vaginal procedure group as compared to sacral colpopexy (MD 0.77 cm, 95% CI 0.38 to 1.16; 1 RCT, n = 108, Analysis 1.8).
3. Point C was less supported in the vaginal procedure group compared to sacral colpopexy (MD 0.50 cm, 95% CI 0.11 to 0.88; 1 RCT, n = 108, Analysis 1.8).
4. Total vaginal length was less in the vaginal procedure group compared to sacral colpopexy (MD -0.89 cm, 95%CI -1.29 to -0.50; 1 RCT, n = 108, Analysis 1.8).

1.6 Bladder function

1.6.1 Stress urinary incontinence (SUI)

Postoperative SUI is probably more common following the vaginal procedures (RR 1.86, 95% CI 1.17 to 2.94; 3 RCTs, n = 263; I^2 = 0% moderate-quality evidence, Analysis 1.9). These data suggest that if SUI occurs in 14% of women after sacral colpopexy, then 16% to 40% will develop SUI after vaginal procedures.

1.6.2 de novo stress urinary incontinence (SUI)

No data were reported for this outcome.

1.6.3 de novo urge incontinence

There was no evidence of a difference between the vaginal procedure and sacral colpopexy groups for de novo urge incontinence (RR 1.61, 95% CI 0.68 to 3.81; 1 RCT, n = 62, Analysis 1.10). Caution should be taken in interpreting these results due to small sample size, low event rates and wide confidence intervals.

1.6.4 Urinary voiding dysfunction

There was no evidence of a difference between the vaginal procedure and sacral colpopexy groups for de novo urinary voiding dysfunction (RR 1.03, 95% CI 0.07 to 15.82, 1 RCT, n = 75, Analysis 1.11). Caution should be taken in interpreting these results due to small sample size, low event rates and wide confidence intervals.

1.7 Bowel function

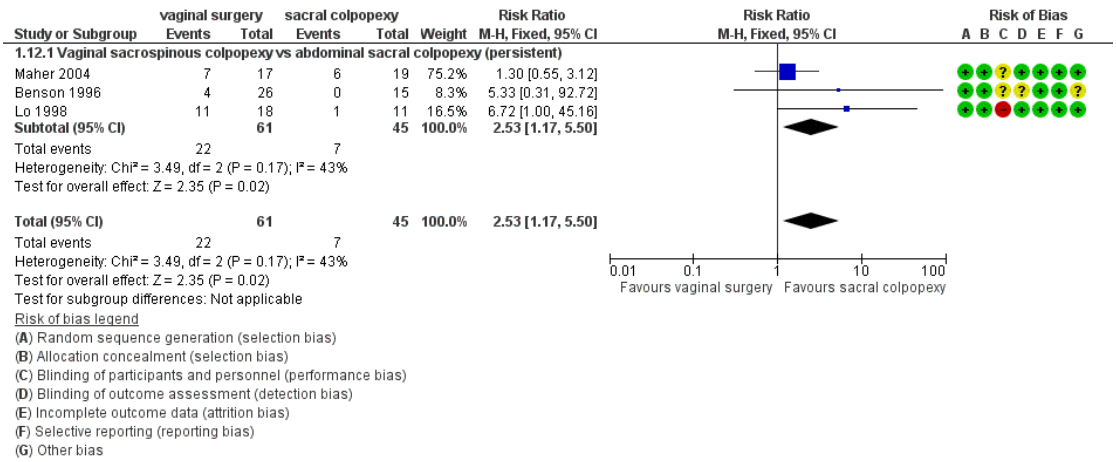
No data were reported for any of the bowel function outcomes (de novo fecal incontinence, de novo obstructed defecation, constipation).

1.8 Sexual function

1.8.1 Dyspareunia

Dyspareunia rates may be higher after the vaginal procedures than after sacral colpopexy (RR 2.53, 95% CI 1.17 to 5.50; 3 RCTs, n = 106, I^2 = 43%, Analysis 1.12; Figure 7, low-quality evidence). These data suggest that if 9% of women have dyspareunia after sacral colpopexy then 11% to 50% will be affected after vaginal procedures.

Figure 7. Forest plot of comparison: 1 Vaginal procedure versus sacral colpopexy, outcome: 1.12 Dyspareunia.



1.8.2 de novo dyspareunia

No data were reported for this outcome

1.8.3 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ)

There was no evidence of a difference between the groups in PISQ scores (MD -1.20, 95% CI -4.35 to 1.95; 1 RCT, n = 110, Analysis 1.13).

1.9 Quality of life and satisfaction measures

1.9.1 No data were reported for the Patient Global Impression of Improvement (PGI-1) questionnaire.
1.9.2 A single study Rondini 2015 reported no evidence of a difference between the vaginal procedure and the sacral colpopexy group for the Prolapse quality of Life Questionnaire (PQoL) (MD 22.70, 95% CI -7.53 to 52.93, 1 RCT, n = 110, Analysis 1.14).
1.9.3 A small advantage was seen in the sacral colpopexy group compared with the vaginal procedure group in the Pelvic Floor Distress Inventory (PFDI-20) (MD 7.90 95% CI 0.70 to 15.10; 1 RCT, n = 110, Analysis 1.14).
1.9.4 No data were reported for the Pelvic Floor Impact Questionnaire (PFIQ-7).

1.10 Measures associated with surgery

1.10.1 Operating time

Vaginal procedures may be associated with a shorter operating time than sacral colpopexy (MD -21.49 minutes, 95% CI; -28.00 to -14.98, 4 RCTs, n = 403, I^2 = 0%, low-quality evidence, Analysis 1.15).

1.10.2 Length of hospital stay

Sacral colpopexy was associated with a shorter length of stay compared with vaginal procedures (MD 0.63 days, 95% CI 0.44 to 1.03; 4 RCTs n = 403; I^2 = 84%). When a random-effects model was used, the association was no longer evident and there was no evidence of a difference between the vaginal procedure and sacral colpopexy groups for length of hospital stay (MD 0.19 days random-effects 95% CI -0.50 to 0.89, 4 RCTs, n = 403, I^2 = 84%, Analysis 1.16).

1.10.3 Blood transfusion rate

There may be no difference between the groups: vaginal procedure 0% (0/97) compared to sacral colpopexy 3% (3/91) for the need for blood transfusions (RR 0.26, 95% CI 0.04 to 1.57; 3 RCTs, n = 277; I^2 = 0%, Analysis 1.17).
Findings are summarised in Summary of findings for the main comparison.

2 Vaginal surgery with mesh versus without mesh

Six trials da Silviera 2015; de Tayrac 2008; Halaska 2012; Iglesia 2010; Meschia 2004a; Svabik 2014 randomised 598 women.

In all studies a sacrospinous colpopexy was performed in the native tissue arm (n = 297) and the mesh (n = 301) was polypropylene. A polypropylene mesh was a monofilament weave in four studies (da Silviera 2015; Halaska 2012; Iglesia 2010; Svabik 2014), and multi-filament in two studies (de Tayrac 2008, Meschia 2004a). Two studies (Halaska 2012; Svabik 2014) included only those with post-hysterectomy prolapse while the remainder included those with apical prolapse (uterine and vault).

PRIMARY OUTCOMES

2.1 Awareness of prolapse

There may be little or no difference between the groups for this outcome (RR 1.08 95% CI 0.35 to 3.30 1 RCT n = 54, low-quality evidence). The confidence interval was wide suggesting that if 18% of women are aware of prolapse after surgery without mesh, between 6% and 59% will be aware of prolapse after surgery with mesh (Analysis 2.1).

2.2 Repeat surgery

2.2.1 Repeat surgery for prolapse

There may be little or no difference between the groups for this outcome (RR 0.69, 95% CI 0.30 to 1.60; 5 RCTs, n = 497; I^2 = 9%, low-quality evidence). If 4% of women require repeat surgery for prolapse after surgery without mesh, 1% to 7% are likely to do so after surgery with mesh (Analysis 2.2).

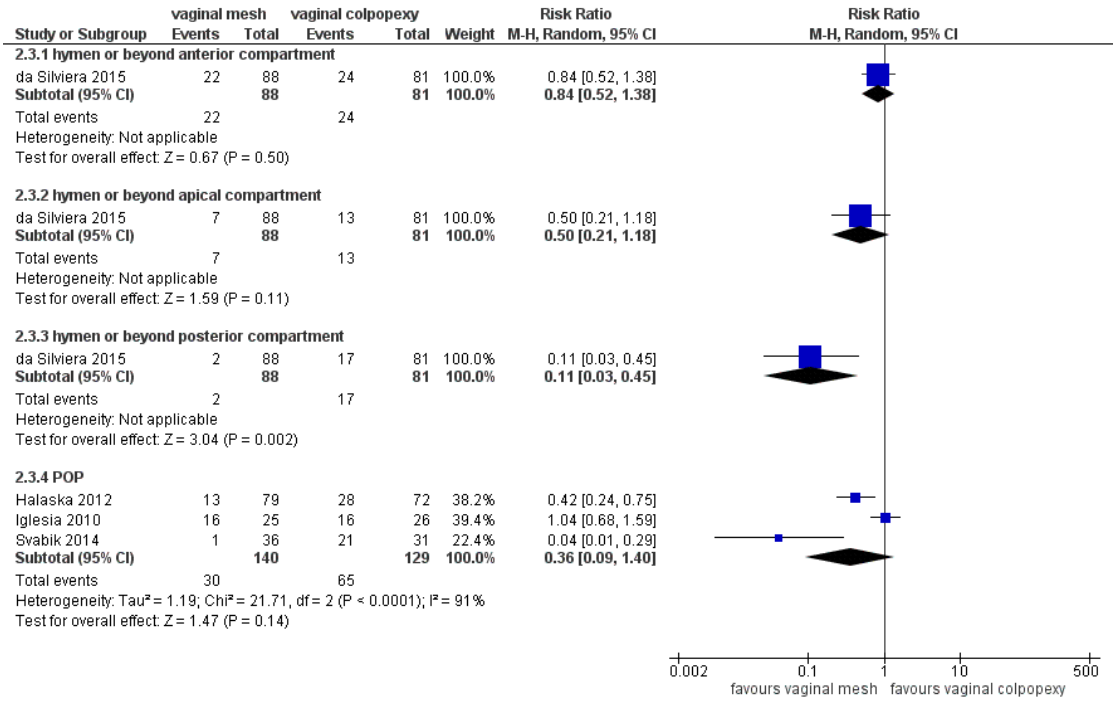
2.2.2 Repeat surgery for stress urinary incontinence

We found no conclusive evidence that surgery with mesh increases r*epeat* surgery for SUI (RR 4.91, 95% CI 0.86 to 27.94; 2 RCTs, n = 220; I^2 = 0%, low-quality evidence, Analysis 2.2.2). The confidence interval was wide suggesting that if 2% of women require repeat surgery for SUI after vaginal colpopexy without mesh, 2% to 53% are likely to do so after surgery with mesh. Caution should be used in interpreting the results due to serious imprecision with wide confidence intervals, small sample size and low event rates.

2.3 Any recurrent prolapse

We found no clear evidence that surgery with mesh decreases recurrent prolapse at one to three years (RR 0.36, 95% CI 0.09 to 1.40; 3 RCTs n = 269; I^2 = 91%, low-quality evidence). However, caution should be used in interpreting the results as the confidence interval was very wide and there was serious inconsistency between the studies. (Analysis 2.3; Figure 8)

Figure 8. Forest plot of comparison: 2 Vaginal surgery with mesh versus without mesh, outcome: 2.3 Recurrent prolapse on examination (1-3 years).



SECONDARY OUTCOMES

2.4 Adverse events

2.4.1 Death related to surgery

No data were reported for this outcome.

2.4.2 Mesh exposure

Only total data for mesh exposure (18%; 42/235) were reported and this was not separated by intervention group (Table 1).

2.4.3 Bladder injury

We are uncertain whether there is any difference between the groups: vaginal surgery with mesh 4% (8/205) versus vaginal surgery without mesh 1% (2/195) (RR 3.00, 95% CI 0.91 to 9.89; 4 RCTs, n = 445; I^2 = 0% very low-quality evidence).These data suggest that if cystotomy occurs in 1% of women during vaginal surgery without mesh, then 1% to 12% would have cystotomy during vaginal surgery with mesh (Analysis 2.4).

2.4.4 Bowel injury

There was no evidence of a difference between groups (RR 3.00, 95% CI 0.12 to 72.65; 3 RCTs, n = 389; I^2 = 0%).Two of the trials (n = 213) reported no events in either group (Analysis 2.4). Caution is advised in interpreting these data due the limited number of trials with evidence of imprecision shown by wide confidence intervals and low event rates.

2.4.5 Repeat surgery for mesh exposure

Only total data for repeat operation for mesh exposure (9.5%; 22/235) were reported and these were not separated by intervention group (Table 2).

2.5 Objective failure by site

2.5.1 Objective failure of anterior compartment

Recurrent anterior wall prolapse (stage 2 or greater): there was no evidence of a difference between groups: vaginal surgery with mesh 18.5% (10/54) versus vaginal surgery without mesh (native tissue) 30% (17/57) (RR 0.61, 95% CI 0.31 to 1.20; 2 RCTs, n = 111; I^2 = 47%; Analysis 2.5). For recurrent anterior vaginal prolapse beyond the hymen, there was no evidence of a difference between the groups (RR 0.84, 95% CI 0.52 to 1.38; 1 RCT, n = 169; Analysis 2.3).

2.5.2 Objective failure of apical compartment

Recurrent apical prolapse (stage 2 or greater): there was no evidence of a difference between groups: vaginal surgery with mesh 4% (2/54) versus vaginal surgery without mesh (vaginal colpopexy) 0% (0/57) (RR 3.20, 95% CI 0.34 to 29.82; 2 RCTs, n = 111; I^2 = 0%; Analysis 2.5). For recurrent apical vaginal prolapse beyond the hymen, there was no evidence of a difference between the groups (RR 0.50, 95% CI 0.21 to 1.18; 1 RCT, n = 169; Analysis 2.3).

2.5.3 Objective failure of posterior vaginal compartment

Recurrent posterior vaginal prolapse (stage 2 or greater): there was no evidence of a difference between groups: vaginal surgery with mesh 8.7% (5/57) versus vaginal surgery without mesh (vaginal colpopexy) 10.5% (6/57) (RR 0.85, 95% CI 0.29 to 2.45; 2 RCTs, n = 114; I^2 = 0%; Analysis 2.5)

Recurrent posterior vaginal prolapse beyond the hymen appeared to be lower after vaginal surgery with mesh 2% (2/82) than with vaginal surgery without mesh 21% (17/81) (RR 0.11, 95% CI 0.03 to 0.45; 1 RCT, n = 169; Analysis 2.3).

2.5.4 Pelvic organ prolapse quantification (POPQ) scores

At one year POPQ assessment was reported in two trials (da Silviera 2015; Svabik 2014).

1. Point Ba - was less supported in the vaginal surgery with mesh group than the vaginal surgery without mesh group (MD -1.71, 95% CI -2.88 to -0.55; 2 RCTs n = 239; Analysis 2.6).
2. Point Bp - was less supported in the vaginal surgery with mesh group than the vaginal surgery without mesh group (MD -0.59, 95% CI -1.07 to -0.12; 2 RCTs, n = 239; Analysis 2.6).
3. Point C - There was no evidence of a difference between vaginal surgery with mesh and vaginal surgery without mesh groups (MD -1.93, 95% CI -3.99 to 0.13; 2 RCTs n = 239; Analysis 2.6).
4. Total vaginal length - No data were reported for this outcome.

2.6 Bladder function

2.6.1 Stress urinary incontinence

No data were reported for this outcome.

2.6.2 *De novo* stress urinary incontinence

There is probably little or no difference between the groups in rates of de novo stress urinary incontinence (RR 1.37, 95% CI 0.94 to 1.99; 4 RCTs, n = 295; I^2 = 0%, moderate-quality evidence; Analysis 2.7). These data suggest that if de novo stress urinary incontinence occurs in 22% of women after vaginal surgery without mesh surgery, then 21% to 44% will develop stress urinary incontinence after vaginal surgery with mesh.

2.6.3 *De novo* urge incontinence

There was no evidence of a difference found for *de novo* urge incontinence between the groups: vaginal surgery with mesh 10% (18/183) versus vaginal surgery without mesh 7% (12/179) (RR 1.42, 0.72 to 2.82; 4 RCTs, n = 362; I^2 = 10%, Analysis 2.8).

2.6.4 Urinary voiding dysfunction

There was no evidence of a difference in postoperative voiding dysfunction: vaginal surgery with mesh 17% (9/54) versus vaginal surgery without mesh 28% (16/57) (RR 0.59, 95% CI 0.29 to 1.24; 2 RCTs, n = 111; Analysis 2.9).

2.7 Bowel function

No data were reported for any of the bowel function outcomes pre-specified in this review (*de novo* faecal incontinence, *de novo* obstructed defecation, constipation).

2.8 Sexual function

2.8.1 Dyspareunia

There is probably little or no difference between the groups in rates of dyspareunia: vaginal surgery with mesh 5% (13/257) versus vaginal surgery without mesh 4% (10/243) (RR 1.21, 95% CI 0.55 to 2.66; 5 RCTs, n = 501; I^2 = 0%, moderate quality evidence Analysis 2.10). These data suggest that if dyspareunia occurs in 3% of women after vaginal surgery without mesh, then between 2% and 9% will have dyspareunia after vaginal surgery with mesh. One study (Halaska 2012), of 151 women, reported no evidence of a difference between the vaginal surgery with mesh (6/79) and the vaginal surgery without mesh (sacral colpopexy) (3/72) groups for vaginal pain (RR 1.82, 95%CI 0.47 to 7.02; 1 RCT, n = 151).

2.8.2 *De novo* dyspareunia

No data were reported for this outcome.

2.8.3 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ)

There was no evidence of a difference between the groups for the PISQ (MD -1.72, 95% CI -3.57 to 0.14; 3 RCTs, n = 180; I^2 = 7%; Analysis 2.11)

2.9 Quality of life and satisfaction

2.9.1 Patient Global Impression of Improvement (PGI-1) - There was no evidence of a difference between vaginal surgery with mesh and vaginal surgery without mesh for women who reported an improvement of 'much better' or 'very much better' (RR 1.75, 95% CI 0.37 to 8.24; 1 RCT, n = 51, Analysis 2.12).
2.9.2 Prolapse Quality of Life Questionnaire (PQOL) - Surgery with vaginal mesh was associated with a reduced quality of life compared with surgery without mesh (RR 5.70, 95% CI 1.53 to 9.87; 1 RCT, n = 167, Analysis 2.13).
2.9.3 Pelvic Floor Distress Inventory (PFDI-20) - No trials reported data for this questionnaire.
2.9.4 Pelvic Floor Impact Questionnaire (PFIQ-7) - No trials reported data for this questionnaire.

2.10 Measures associated with surgery

2.10.1 Operating time
There was no evidence of a difference between vaginal surgery with mesh or vaginal surgery without mesh (sacral colpopexy) groups (MD -3.27, 95% CI -14.96 to 8.43; 3 RCTs, n = 294; I^2 = 54%; Analysis 2.14).
2.10.2 Length of hospital stay
No data were reported for this outcome.
2.10.3 Blood transfusion rate
There was no evidence of a difference between the vaginal surgery with mesh 2% (2/127) and vaginal surgery without mesh 2% (2/122) (RR 0.96, 95%CI 0.17 to 5.46; 2 RCTs, n = 249; I^2 = 0%, Analysis 2.15).
Findings are summarised in Summary of findings 2.

3 Vaginal surgery: comparison of one native tissue repair versus another

Two trials are reviewed (Barber 2014; Natale 2010). Natale 2010, compared uterosacral colpopexy and high levator myorrhaphy for uterine prolapse and Barber 2014 compared uterosacral colpopexy and sacrospinous colpopexy for apical vaginal (uterine and vault) prolapse.

PRIMARY OUTCOMES

3.1 Awareness of prolapse

There may be no difference between uterosacral and sacrospinous colpopexy in rates of awareness of prolapse (RR 0.91, 95% CI 0.58 to 1.43; 1 RCT, n = 303; Analysis 3.1; low-quality evidence). This suggests that if 6% of women were aware of prolapse after sacrospinous hysteropexy then between 2% to 17% would be aware of prolapse after uterosacral colpopexy.

3.2 Repeat surgery

3.2.1 Repeat surgery for prolapse

There may be no difference between uterosacral and sacrospinous colpopexy for repeat surgery for prolapse (RR 1.20, 95% CI 0.33 to 4.40; 1 RCT, n = 316; Analysis 3.2). This suggests that if 6% of women had repeat surgery for prolapse after sacrospinous hysteropexy then between 1% to 55% would have repeat surgery for prolapse after uterosacral colpopexy.

3.2.2 Repeat surgery for stress incontinence

No data were reported for repeat surgery for stress incontinence.

3.3 Any recurrent prolapse

No data were reported for this outcome.

SECONDARY OUTCOMES

3.4 Adverse events

3.4.1 Death (related to surgery)

No data were reported for this outcome.

3.4.2 Mesh exposure

No data were reported for this outcome.

3.4.3 Bladder injury

There was no evidence of a difference between the uterosacral and sacrospinous colpopexy groups (RR 8.67, 95% CI 0.47 to 159.64; 1 RCT, n = 316; Analysis 3.3). Intra-operative ureteric injury was more frequent at uterosacral colpopexy than with other vaginal procedures (RR 15.91, 95% CI 2.13 to 118.51; 2 RCTs, n = 544; I^2 = 0%, Analysis 3.3). There was no evidence of a difference between uterosacral colpopexy and other vaginal procedures for ureteric injury postoperatively (RR 2.89, 95% CI 0.12 to 70.38; 2 RCTs, n = 544; I^2 = 0% Analysis 3.3). Caution is advised in interpreting these data due the limited number of trials with evidence of imprecision shown by wide confidence intervals and low event rates.

3.4.4 Bowel Injury

There was no evidence of a difference between uterosacral and sacrospinous colpopexy (RR 0.32, 95% CI 0.01 to 7.82; 1 RCT, n = 316; Analysis 3.3). Caution is advised in interpreting these data due the data being available from a single trial with evidence of imprecision shown by wide confidence intervals and low event rates.

3.4.5 Repeat surgery for mesh exposure

No data were reported for this outcome.

3.5 Objective failure by site

3.5.1 Objective failure of anterior compartment

There was no evidence of a difference between uterosacral colpopexy and other vaginal procedures for this outcome (RR 1.15, 95% CI 0.85 to 1.57; 2 RCTs, n = 537; I^2 = 0%, Analysis 3.4).

3.5.2 Objective failure of apical compartment

There was no evidence of a difference between uterosacral colpopexy and other vaginal procedures for this outcome (RR 0.80, 95% CI 0.38 to 1.67; 2 RCTs, n = 536; I^2 = 0%, Analysis 3.4).

3.5.3 Objective failure of posterior vaginal compartment

There was no evidence of a difference between the uterosacral colpopexy and other vaginal procedures for this outcome (RR 1.14, 95% CI 0.63 to 2.06; 2 RCTs, n = 537; I^2 = 0%, Analysis 3.4).

3.5.4 Pelvic Organ Prolapse Quantification (POPQ) score

1. Point Ba - There was no evidence of a difference between uterosacral colpopexy and other vaginal procedures (MD -0.10, 95% CI -0.39 to 0.19; 1 RCT, n = 374).
2. Point Bp -There was no evidence of a difference between uterosacral colpopexy and other vaginal procedures (MD 0.00, 95% CI -0.04 to 0.04; 1 RCT, n = 374).
3. Point C - No data were reported for this outcome.
4. Total vaginal length - No data were reported for this outcome.

3.6 Bladder function

3.6.1 Stress urinary incontinence

No data were reported for this outcome.

3.6.2 De novo stress urinary incontinence

There was no evidence of a difference between uterosacral colpopexy and high levator myorrhaphy (RR 1.60, 95% CI 0.64 to 3.98; 1 RCT, n = 228 Analysis 3.6)

3.6.3 Urinary urge incontinence

There was no evidence of a difference between uterosacral colpopexy and high levator myorrhaphy (RR 3.50, 95% CI 0.76 to 16.14; 1 RCT, n = 116; Analysis 3.7)

3.6.4 Urinary voiding dysfunction

No data were reported for this outcome.

3.7 Bowel function

No data were reported for any of the pre-specified outcomes for bowel function (de novo fecal incontinence, de novo obstructed defecation, constipation).

3.8 Sexual function

3.8.1 Dyspareunia

There may be no difference between uterosacral colpopexy and high levator myorrhaphy for this outcome (RR 1.19, 95% CI 0.73 to 1.95; 1 RCT, n = 228; Analysis 3.8). This suggests that if 20% of women had dyspareunia after sacrospinous hysteropexy then between 14.6% to 39% would have dyspareunia after uterosacral colpopexy.

3.8.2 De novo dyspareunia

There may be no difference between uterosacral colpopexy and high levator myorrhaphy for this outcome (RR 1.31, 95% CI 0.50 to 3.39; 1 RCT, n = 228; Analysis 3.8)

3.8.3 Pelvic organ prolapse/urinary incontinence sexual questionnaire (PISQ)

No data were reported for this outcome.

3.9 Quality of life and satisfaction

There were no data in suitable format for analysis for this outcome.

3.10 Measures associated with surgery

3.10.1 Operating time

No data were reported for this outcome.

3.10.2 Length of hospital stay

No data were reported for this outcome.

3.10.3 Blood transfusion

There may be no difference between uterosacral and sacrospinous colpopexy for this outcome (RR 1.67, 95% CI 0.50 to 5.60; 1 RCT, n = 315; Analysis 3.9).

4 Vaginal hysterectomy versus alternative surgery for uterine prolapse

Vaginal hysterectomy versus abdominal hysterectomy was compared in one trial Braun 2007.

Vaginal hysterectomy with vault support versus vaginal sacrospinous hysteropexy (uterine preserving) was reported in three trials Detollenaere 2015; Dietz 2010; Jeng 2005. Data from the Jeng 2005 trial was not included in analysis as no anatomical or peri-operative data were supplied.

Vaginal hysterectomy with vault support versus abdominal sacrohysteropexy (uterine preserving) was reported in two trials (Rahmanou 2015; Roovers 2004). Roovers 2004 used an open approach and Rahmanou 2015 a laparoscopic approached was employed.

PRIMARY OUTCOMES

4.1 Awareness of prolapse:

1. No data were reported comparing vaginal and abdominal hysterectomy.
2. There may be no difference between vaginal hysterectomy and vaginal sacrospinous hysteropexy for this outcome (RR 0.98, 95% CI 0.33 to 2.94; 1 RCT, n = 208; low-quality evidence; Analysis 4.1). These data suggest that if 6% of women were aware of prolapse after sacrospinous hysteropexy, then 2% to 17% would be aware of prolapse after vaginal hysterectomy with vault support.
3. Women who have vaginal hysterectomy may have lower rates of awareness of prolapse than those who have sacrohysteropexy (RR 0.38, 95% CI 0.15 to 0.98;1 RCT, n = 84, low-quality evidence; Analysis 4.1). These data suggest that if 31% of women were aware of prolapse after sacrohysteropexy, then 5% to 30% would be aware of prolapse after vaginal hysterectomy with vault support.

4.2 Repeat surgery

4.2.1 Repeat surgery for prolapse

1. We are uncertain whether there is a difference between vaginal and abdominal hysterectomy for repeat surgery for prolapse (RR 2.88, 95% CI 0.12 to 67.29; 1 RCT, n = 47, very low-quality evidence, Analysis 4.2.1)
2. There may be no difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy for repeat surgery for prolapse (RR 1.31, 95% CI 0.19 to 8.91; 2 RCTs, n= 270; I^2 = 51% low-quality evidence Analysis 4.2). These data suggest that if 6.2% require repeat prolapse surgery after sacrospinous hysteropexy, between 1.2% to 55.2% would require prolapse surgery after vaginal hysterectomy with vault support.
3. There may be no difference between vaginal hysterectomy with vault support and abdominal sacrohysteropexy for repeat surgery for prolapse (RR 0.68, 95% CI 0.36 to 1.31; 2 RCTs, n = 182, I^2 = 0%, low-quality evidence, Analysis 4.2). These data suggest that if 21% of women require repeat prolapse surgery after abdominal sacrohysteropexy, then 7% to 28% would require prolapse surgery after vaginal hysterectomy with vault support.

4.2.2 Repeat surgery for stress incontinence

1. No data were reported on the need for repeat surgery for urinary incontinence for the comparison of vaginal versus abdominal hysterectomy.
2. We are uncertain whether there is a difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy with respect to the need for repeat surgery for urinary incontinence (RR 4.00, 95% CI 0.45 to 35.18, 1 RCT, n = 204, very low-quality evidence, Analysis 4.8).
3. No data were reported on the need for repeat surgery for urinary incontinence in the comparison of vaginal hysterectomy with vault support versus abdominal sacrohysteropexy.

4.3 Any recurrent prolapse

1. We are uncertain whether there is a difference between vaginal and abdominal hysterectomy for any recurrent prolapse (RR 4.80, 95% CI 0.24 to 94.90; 1 RCT, n = 47, very low-quality evidence, Analysis 4.3).
2. There may be no difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy for any recurrent prolapse (RR 0.90, 95% CI 0.67 to 1.21; 1 RCT, n = 204, low-quality evidence) These data suggest that if 49% of women had any recurrent prolapse on examination after sacrospinous hysteropexy, then 33% to 59% would have any prolapse on examination after vaginal hysterectomy with apical support.
3. No data were reported for any recurrent prolapse for the comparison of vaginal hysterectomy with vault support versus abdominal sacrohysteropexy.

SECONDARY OUTCOMES

4.4 Adverse events

4.4.1 Death (related to surgery)

No data were reported for this outcome.

4.4.2 Mesh exposure

1. We are uncertain whether there is a difference in the rate of mesh exposure between vaginal and abdominal hysterectomy (RR 0.32, 95% CI 0.01 to 7.48, 1 RCT, n = 47, Analysis 4.6).
2. We are uncertain whether there is a difference in the rate of mesh exposure between vaginal hysterectomy with vault support and abdominal sacrohysteropexy. (RR 0.20, 95% CI 0.01 to 4.04, 1 RCT, n = 82, Analysis 4.6).

4.4.3 Bladder injury

1. No data were reported on bladder injury for the comparison of vaginal versus abdominal hysterectomy.
2. There were no events of bladder injury reported in a single trial of 65 women comparing vaginal hysterectomy with vault support versus vaginal sacrospinous hysteropexy (Analysis 4.4).
3. No data were reported on bladder injury for the comparison of vaginal hysterectomy with vault support versus abdominal sacrohysteropexy.

4.4.4 Bowel injury

1. No data were reported for bowel injury for the comparison of vaginal versus abdominal hysterectomy.
2. There were no events of bowel injury reported in a single trial of 66 women comparing vaginal hysterectomy with vault support versus vaginal sacrospinous hysteropexy (Analysis 4.5).
3. We are uncertain whether there is a difference in the rate of bowel injury between vaginal hysterectomy with vault support and abdominal sacrohysteropexy (RR 3.00, 95% CI 0.13 to 71.56; 1 RCT, n = 82 Analysis 4.5).

4.4.5 Repeat surgery for mesh exposure

1. No data were reported on the need for repeat surgery for mesh exposure for the comparison of vaginal and abdominal hysterectomy.
2. No data were reported on the need for repeat surgery for mesh exposure for the comparison of vaginal hysterectomy with vault support versus vaginal sacrospinous hysteropexy.
3. We are uncertain whether there is a difference in the need for repeat operation for mesh exposure between vaginal hysterectomy with vault support versus abdominal sacrohysteropexy (RR 0.20, 95% CI 0.01 to 4.04, 1 RCT, n = 82; Analysis 4.6).

4.5 Objective failure, by site

4.5.1 Objective failure of anterior vaginal compartment

1. There were no data reported for this outcome for the comparison of vaginal versus abdominal hysterectomy.
2. For recurrent anterior wall prolapse (stage 2 or greater), there may be no difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy (RR 0.95, 95% CI 0.53 to 1.70; 2 RCTs, n = 265; I^2 = 78%; Analysis 4.9).
3. We are uncertain whether there is a difference between vaginal hysterectomy with vault support and abdominal sacrohysteropexy for this outcome (RR 1.04, 95% CI 0.60 to 1.82; 1 RCT, n = 83; Analysis 4.9).

4.5.2 Objective failure of apical compartment

1. There were no data comparing vaginal and abdominal hysterectomy for this outcome.
2. There was no evidence of a difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy (RR 0.80, 95% CI 0.04 to 17.59; 2 RCTs, n = 267; I^2 = 83% Analysis 4.10).

3. We are uncertain whether there is a difference between vaginal hysterectomy and sacrohysteropexy (RR 1.00, 95% CI 0.15 to 6.76; 1 RCT, n = 82; Analysis 4.10).

4.5.3 Objective failure of posterior vaginal compartment

1. There were no data comparing vaginal and abdominal hysterectomy for this outcome.
2. When vaginal hysterectomy was compared with sacrospinous hysteropexy, recurrent posterior wall prolapse (stage 2 or greater) was more likely in the hysterectomy group (18%: 23/130) than in the sacrospinous hysteropexy group (7%: 10/135) (RR 2.43, 95% CI 1.22 to 4.87; 2 RCTs, n = 265; I^2 = 16%, Analysis 4.11).
3. We are uncertain whether there is a difference between vaginal hysterectomy with vault support and abdominal sacrohysteropexy (RR 3.07, 95% CI 0.66 to 14.35; 1 RCT, n = 83; Analysis 4.11).

4.5.4 Pelvic organ prolapse quantification (POPQ) scores

1. Point Ba
   i) There were no data comparing vaginal and abdominal hysterectomy for this outcome.
   ii) There was no evidence of a difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy (MD 0.40; 95% CI -0.48 to 1.28, 1 RCT, n = 57; Analysis 4.12).
   iii) There may be no difference between vaginal hysterectomy with vault support and abdominal sacrohysteropexy (MD -0.30; 95% CI -0.65 to 0.05, 1 RCT, n = 208; Analysis 4.12).
2. Point Bp
   i) There were no data comparing vaginal and abdominal hysterectomy for this outcome.
   ii) We are uncertain whether there is a difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy (MD 0.20; 95% CI -0.45 to 0.85; 1 RCT, n = 57; Analysis 4.13).
   iii) There may be no difference between vaginal hysterectomy with vault support and abdominal sacrohysteropexy (MD 0.10, 95% CI -0.14 to 0.34; 1 RCT, n = 208; Analysis 4.13).
3. Point C
   i) There were no data comparing vaginal and abdominal hysterectomy for this outcome.
   ii) There were no data comparing vaginal hysterectomy with vault support versus vaginal sacrospinous hysteropexy for this outcome.
   iii) There may be a difference between vaginal hysterectomy and sacrohysteropexy in favour of sacrohysteropexy (MD 0.80; 95% CI 0.27 to 1.33; 1 RCT, n = 208; Analysis 4.14).
4. Total vaginal length
   i) There were no data comparing vaginal and abdominal hysterectomy for this outcome.
   ii) Vaginal hysterectomy with vault support may be associated with a reduced total vaginal length compared with vaginal sacrospinous hysteropexy (MD -0.98, 95% CI -1.86 to -0.11; 2 RCTs, n = 265; I^2 = 80%; random-effects model).
   iii) There were no data comparing vaginal hysterectomy with vault support versus abdominal sacrohysteropexy.

4.6 Bladder function

4.6.1 Stress urinary incontinence

No data were reported for this outcome.

4.6.2 de novo stress urinary incontinence

No data were reported for this outcome.

4.6.3 de novo urge incontinence

No data were reported for this outcome.

4.6.4 urinary voiding dysfunction

No data were reported for this outcome.

4.7 Bowel function

4.7.1 de novo faecal incontinence

No data were reported for this outcome.

4.7.2 de novo obstructed defecation

No data were reported for this outcome.

4.7.3 constipation

No data were reported for this outcome.

4.8 Sexual function

4.8.1 Dyspareunia

1. No data were reported comparing vaginal versus abdominal hysterectomy.
2. We are uncertain whether there is a difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy (RR 1.03, 95% CI 0.27 to 3.96; 1 RCT, n = 158; Analysis 4.16). This suggests that if 5% of women experienced dyspareunia after sacrospinous hysteropexy then between 1% to 20% would experience dyspareunia after vaginal hysterectomy.
3. No data were reported comparing vaginal hysterectomy with vault support versus abdominal sacrohysteropexy.

4.8.2 de novo dyspareunia

No data were reported for this outcome.

4.8.3 Prolapse and Incontinence Sexual questionnaire (PISQ)

1. No data were reported comparing vaginal and abdominal hysterectomy.
2. There may be no difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy (MD 0.00, 95% CI -1.23 to 1.23; 1 RCT, n = 208; Analysis 4.17).
3. No data were reported comparing vaginal hysterectomy and sacrohysteropexy.

4.9 Quality of life and satisfaction

No data were reported for this outcome in the included studies or data were not in a suitable format for analysis. Detollenaere 2015 provided mean and range data for Urogenital Distress Inventory (UDI), Defecatory distress inventory (DDI), Incontinence impact questionnaire (IIQ) and Short Form-36 9SF-36) and demonstrated no evidence of a difference between the groups. Dietz 2010 also provided data on UDI and IIQ and demonstrated no differences between the groups.

4.10 Measures associated with surgery

4.10.1 Operating time (minutes)

1. No data were reported comparing vaginal and abdominal hysterectomy.
2. Operating time may be longer for vaginal hysterectomy with vault support compared to vaginal sacrospinous hysteropexy (MD 13.00 minutes, 95% CI 8.26 to 17.74; 1 RCT, n = 207; Analysis 4.18).
3. Operating time may be longer for vaginal hysterectomy with vault support versus abdominal sacrohysteropexy (MD 10.00 minutes, 95% CI 8.20 to 11.80; 1 RCT, n = 83; Analysis 4.18).

4.10.2 Length of hospital stay (days)

1. No data were reported comparing vaginal and abdominal hysterectomy.
2. There may be no difference between vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy (MD 0.00, 95% CI -0.27 to 0.27; 1 RCT, n = 207; Analysis 4.19).
3. There may be no difference between vaginal hysterectomy with vault support and abdominal sacrohysteropexy (MD -0.10, 95% CI -0.21 to 0.01; 1 RCT, n = 83; Analysis 4.19).

4.10.3 Blood transfusion

1. No data were reported comparing vaginal and abdominal hysterectomy.
2. No data were reported comparing vaginal hysterectomy with vault support and vaginal sacrospinous hysteropexy.
3. We are uncertain whether there is a difference between vaginal hysterectomy with vault support and abdominal sacrohysteropexy for the need for a blood transfusion (RR 2.00, 95% CI 0.19 to 21.21; 1 RCT, n = 82 Analysis 4.20).

5.0 Sacral colpopexy with mesh versus without

Two trials with 204 women compared different graft materials utilised to suspend the vagina from the sacrum at sacral colpopexy. Culligan 2005 compared polypropylene mesh (Trelex Boston) with cadaveric fascia lata (Tutoplast, Mentor), and more recently Culligan 2013 polypropylene mesh (Pelvitex, Bard) with acellular collagen matrix porcine dermis (Pelvisoft, Bard). Both cadaveric fascia and porcine dermis are classified as biological grafts

PRIMARY OUTCOMES

5.1 Awareness of prolapse

We are uncertain whether there is any difference between sacral colpopexy with mesh (polypropylene mesh) compared with sacral colpopexy without mesh (biological graft) (RR 0.33, 95% CI 0.04 to 3.02; 1 RCT, n= 58; very low-quality evidence Analysis 5.1). These data suggest that if 10% of women were aware of prolapse after sacral colpopexy without mesh, then 0% to 31% would be aware of prolapse after sacral colpopexy with mesh. Caution should

be taken in interpreting the results due to wide confidence intervals, small sample size and low event rates suggestive of imprecision.

5.2 Repeat surgery

5.2.1 Repeat surgery for prolapse

There may be no difference between sacral colpopexy with mesh (polypropylene mesh) compared with sacral colpopexy without mesh (biological graft) (RR 1.00, 95% CI 0.07 to 15.24; 2 RCTs, n = 173; I^2 = 0% low-quality evidence, Analysis 5.2. The trial by Culligan 2013 reported no events in either the intervention or the control group. The data suggest that if 2% of women required repeat prolapse surgery after sacral colpopexy without mesh (biological graft), then 0% to 26% would require repeat prolapse surgery after sacral colpopexy with mesh.

5.2.2 Repeat surgery for stress urinary incontinence (SUI)

There was no evidence of a difference between sacral colpopexy with mesh and without for repeat surgery for SUI (RR 3.00, 95% CI 0.13 to 70.74; 1 RCT, n = 58; Analysis 5.3).

5.2.3 Repeat surgery for prolapse, stress urinary incontinence, or mesh exposure (composite outcome)

No data were reported for this outcome.

5.3 Any recurrent prolapse

There may be no difference between the sacral colpopexy with mesh and without mesh (RR 0.49, 99% CI 0.20 to 1.25; 2 RCTs, n = 173; I^2 = 48%, low-quality evidence Analysis 5.4). These data suggest that if 25% of women have any recurrent prolapse after sacral colpopexy without mesh (biological graft), then 6% to 25% would have recurrent prolapse on examination after sacral colpopexy with mesh.

SECONDARY OUTCOMES

5.4 Adverse effects

5.4.1 Death (related to surgery)

No data were reported for this outcome.

5.4.2 Mesh exposure

There may be no difference between sacral colpopexy with mesh (polypropylene mesh) or without mesh (biological graft) (RR 2.35, 95% CI 0.36 to 15.40; 2 RCTs, n = 173; I^2 = 0% Analysis 5.5). Caution should be taken in interpreting the results due to wide confidence intervals, small sample size and low event rates suggestive of imprecision.

5.4.3 Bladder injury

There may be no difference between sacral colpopexy with mesh (polypropylene mesh) or without mesh (biological graft) for this outcome (RR 2.51, 95% CI 0.10 to 60.13; 2 RCTs, n = 224; I^2 = 0% low-quality evidence Analysis 5.6). The Culligan 2013 trial reported no events in either the intervention or the control group. Caution should be taken in interpreting the results due to wide confidence intervals, small sample size and low event rates suggestive of imprecision.

5.4.4 Bowel injury

No events reported in a single study (0/113) Analysis 5.7.

5.4.5 Repeat surgery for mesh exposure

There may be no difference between sacral colpopexy with mesh (polypropylene mesh) or without mesh (biological graft) (RR 2.00, 95% CI 0.19 to 20.86; 2 RCTs, n = 173; I^2 = 0%, Analysis 5.8) Caution should be taken in interpreting the results due to wide confidence intervals, small sample size and low event rates suggestive of imprecision.

5.5 Objective failure by site

5.5.1 Objective failure of anterior vaginal compartment

No data were available.

5.5.2 Objective failure of apical compartment

No data were available.

5.5.3 Objective failure of posterior vaginal compartment

No data were available.

5.5.4 Pelvic organ prolapse quantification scores

1. Point Ba: we are uncertain whether there is a difference between sacral colpopexy with mesh (polypropylene mesh) or without mesh (biological graft) (MD 0.80, 95% CI 0.20 to 1.40, 1 RCT, n = 58; Analysis 5.10).
2. Point Bp: we are uncertain whether there is a difference between sacral colpopexy with mesh (polypropylene mesh) or without mesh (biological graft) (MD -0.20, 95% CI -0.51 to 0.11, 1 RCT, n = 58, Analysis 5.10).
3. Point C: we are uncertain whether there is a difference between sacral colpopexy with mesh (polypropylene mesh) or without mesh (biological graft) (MD 0.31, 95% CI -0.41 to 1.03, 1 RCT, n = 58, Analysis 5.10). No events of recurrent apical prolapse were reported between polypropylene mesh in one trial (0/103) and biological graft (0/101).
4. Total vaginal length: we are uncertain whether there is a difference between sacral colpopexy with mesh (polypropylene mesh) or without mesh (biological graft) (MD -0.10 , 95% CI -0.69 to 0.49, 1 RCT, n = 58; Analysis 5.10).

5.6 Bladder function

5.6.1 stress urinary incontinence

No data were reported for this outcome.

5.7 Quality of life

There may be no difference between the groups for quality of life measured by the pelvic floor impact questionnaire (PFIQ-7) (MD -7.00, 95% CI -29.48 to 15.48; 1 RCT, n = 115; I^2 = 0%) or the pelvic floor distress inventory (PFDI-20) (MD -6.00, 95% CI -25.75 to 13.75; 1 RCT, n = 115; I^2 = 0%, Analysis 5.13).

5.8 Measures associated with surgery

Operating time
There may be no difference between the groups in operating time (MD -6.00, 95% CI -31.51 to 19.51; 1 RCT, n = 100; I^2 = 0%) Analysis 5.14

6.0 Sacral colpopexy: laparoscopic versus other

Sacral colpopexy can be performed with an abdominal incision (ASC), laparoscopically (LSC) or robotically (RSC). Two trials (Costantini 2013; Freeman 2013) compared ASC and LSC and two (Anger 2014; Paraiso 2011) compared LSC and RSC.

PRIMARY OUTCOMES

6.1 Awareness of prolapse

No data were reported for this outcome.

6.2 Repeat surgery for prolapse

1. 6.2.1 There may be no difference between laparoscopic and abdominal (open) sacral colpopexy for this outcome (RR 1.04, 95% CI 0.16 to 6.80; 1 RCT, n = 47; low-quality evidence; Analysis 6.1). The data suggest that if 8% of women require repeat prolapse surgery after abdominal (open) approach, then 1% to 56% would require repeat prolapse surgery after laparoscopic sacral colpopexy. No data were reported for laparoscopic versus robotic sacral colpopexy.
2. 6.2.2 Surgery for stress incontinence - No data were reported for this outcome.
3. 6.2.3 Surgery for prolapse, stress urinary incontinence, or mesh exposure (composite outcome) - no data were reported for this outcome.

6.3 Any recurrent prolapse

We are uncertain whether there is any difference between laparoscopic and other interventions for sacral colpopexy (abdominal and robotic) for this outcome (RR 0.87; 95%CI 0.25 to 3.06; 2 RCTs, n = 96; very low-quality evidence; Analysis 6.2). These data suggest that if 9% of women have any recurrent prolapse on examination after open or robotic interventions for sacral colpopexy, between 2% and 27% would have recurrent prolapse on examination following laparoscopic sacral colpopexy.

SECONDARY OUTCOMES

6.4 Adverse effects

6.4.1 Death (related to surgery)

No data were reported for this outcome.

6.4.2 Mesh exposure

We are uncertain whether there is any difference between laparoscopic and other interventions for sacral colpopexy for this outcome (RR 0.22, 95% CI 0.01 to 4.40; 3 RCTs, n = 186; I^2 = 0%, Analysis 6.3). No events of mesh exposure were reported in laparoscopic versus abdominal (open) sacral colpopexy (Freeman 2013). Caution is advised in interpreting the results due to wide

confidence intervals, small sample size and low event rates that suggest imprecision.

6.4.3 Bladder injury

We are uncertain whether there is any difference between laparoscopic and abdominal or robotic interventions for sacral colpopexy for this outcome (RR 1.75, 95% CI 0.43 to 7.14, 3 RCTs, n = 199; I^2 = 0%; Analysis 6.4). Caution is advised in interpreting the results due to wide confidence intervals, small sample size and low event rates that suggest imprecision. The data suggest that if 2% of women had bladder injury following abdominal or robotic interventions then between 1% to 14% would have a bladder injury following a laparoscopic intervention.

6.4.4 Bowel injury

There was no evidence of a difference between laparoscopic and other interventions (abdominal or robotic) for sacral colpopexy (RR 0.36, 95% CI 0.04 to 3.32; 2 RCTs, n = 108; I^2 = 0%; Analysis 6.5).

6.4.5 Repeat surgery for mesh exposure

No data were reported for this outcome. Caution is advised in interpreting the results due to wide confidence intervals, small sample size and low event rates that suggest imprecision.

6.5 Objective failure, by site

6.5.1 Objective failure of anterior vaginal compartment

No data were available.

6.5.2 Objective failure of apical compartment

No data were available.

6.5.3 Objective failure of posterior vaginal compartment

No data were available.

6.5.4 Pelvic organ prolapse quantification scores

1. Point Ba - Data from one trial found no evidence of a difference for this outcome between laparoscopic and robotic interventions for sacral colpopexy (MD 0.05; 95% CI -0.31 to 0.41; 1 RCT, n = 78; Analysis 6.6).
2. Point BP was more supported in the laparoscopic sacral colpopexy group than open or robotic interventions (MD -0.40, 95% CI -0.76 to -0.05; 2 RCTs, n = 125; I^2 = 0%; Analysis 6.7).
3. Point C - There was no evidence of a difference between laparoscopic and open or abdominal interventions for sacral colpopexy (MD 0.15, 95% CI -0.52 to 0.83; 3 RCTs, n = 197; I^2 = 0%; Analysis 6.8).
4. Total vaginal length - No data were reported for this outcome.

6.6 Bladder function

6.6.1 Stress urinary incontinence

We are uncertain whether there is a difference between a laparoscopic versus a robotic intervention for this outcome (RR 1.63 95% CI 0.29, 9.18, 1 RCT, n = 73; Analysis 6.9; moderate-quality evidence).

6.6.2 de novo stress urinary incontinence

No data were reported for this outcome.

6.6.3 de novo urge incontinence

No data were reported for this outcome.

6.6.4 urinary voiding dysfunction

No data were reported for this outcome.

6.7 Bowel function

6.7.1 de novo faecal incontinence

No data were reported for this outcome.

6.7.2 de novo obstructed defecation

No data were reported for this outcome.

6.7.3 constipation

No data were reported for this outcome.

6.8 Sexual function

6.8.1 Dyspareunia

No data were reported for this outcome.

6.8.2 de novo dyspareunia

No data were reported for this outcome.

6.8.3 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ)

No data were reported for this outcome.

6.9 Quality of life and satisfaction

6.9.1 Patient Global Impression of Improvement questionnaire

No data were reported for this outcome.

6.9.2 Prolapse quality of life (PQoL)

We are uncertain whether there is a difference in scores between a laparoscopic and an open intervention for sacral colpopexy (MD 0.70, 95% CI -19.14 to 20.54; 1 RCT, n = 47; Analysis 6.10).

6.9.3 Pelvic floor impact questionnaire (PFIQ-7)

We are uncertain whether there is a difference in scores between a laparoscopic and a robotic intervention for sacral colpopexy (MD 21.00, 95% CI -46.76 to 88.76; 1 RCT, n = 78; Analysis 6.10).

6.9.4 Pelvic floor distress inventory (PFDI-20)

We are uncertain whether there is a difference in scores between a laparoscopic and a robotic intervention for sacral colpopexy (MD 21.00, 95% CI -46.76 to 88.76; 1 RCT, n = 78; Analysis 6.10).

6.10 Measures associated with surgery

6.10.1 Operating time

We are uncertain whether there is a difference in operating time between laparoscopic and open or robotic interventions for sacral colpopexy (MD -12.30 minutes, 95%CI -52.65 to 28.05; 4 RCTs, n = 265; I^2 = 92%; Analysis 6.11). In order to try and explain the high heterogeneity we looked at the comparison groups. The operating time was longer in the laparoscopic group compared to the abdominal (open) intervention group (MD 19.93, 95% CI 2.42 to 37.45; 2 RCTs, n = 120; studies = 2; I^2 = 17%; Analysis 6.11). The operating time was less in the laparoscopic group compared to the robotic group (random-effects MD -45.27, 95% CI -85.45 to -5.09; 2 RCTs; n = 145, I^2 = 85%; Analysis 6.11). Caution is required when interpreting the results due to the heterogeneity and small sample size.

6.10.2 Length of hospital stay

Laparoscopic surgery was associated with a decreased length of hospital stay compared with open or robotic interventions for sacral colpopexy (random-effects MD -0.99 days, 95% CI -1.85 to -0.14; 3 RCTS, n = 194; I^2 = 87%; Analysis 6.12). We tried to explain the heterogeneity by looking at the treatment subgroups. Laparoscopic sacral colpopexy was associated with a decreased length of hospital stay compared with an open interventions (random-effects model MD -1.35, 95% CI -2.12 to -0.57; 2 RCTs, n = 126; I^2 = 67%; Analysis 6.12). There was no evidence of a difference between groups when the laparoscopic intervention was compared with a robotic intervention (MD -0.39, 95% CI -0.81 to 0.03; 1 RCT, n = 68; Analysis 6.12).

6.10.3 Blood transfusion

The Anger 2014 trial reported no events following either laparoscopic or robotic sacral colpopexy (Analysis 6.13).

7. Sacral colpopexy with continence surgery versus without

Four trials evaluated the efficacy of performing continence surgery at the same time of sacral colpopexy (Brubaker 2008; Costantini 2007; Costantini 2008; Trabuco 2014). Three trials compared surgery with and without colposuspension (Brubaker 2008; Costantini 2007; Costantini 2008) and Trabuco 2014 compared colposuspension with mid-urethral sling at time of sacral colpopexy. In Brubaker 2008 and Costantini 2007, the women had prolapse and were continent and in the Costantini 2008 and Trabuco 2014 trials, prolapse and SUI were the inclusion criteria.

Two trials (Brubaker 2008; Costantini 2007) provided long-term outcome data: Nygaard 2013 reported seven-year results for the Brubaker 2008 trial and Costantini 2011 reported eight-year outcomes for the Costantini 2007 trial .

PRIMARY OUTCOMES

7.1 Awareness of prolapse (seven years)

There may be no difference between sacral colpopexy with colposuspension 37% (27/73) as compared to 31% (22/71) sacral colpopexy without colposuspension (RR 1.19, 95% CI 0.75 to 1.89; 1 RCT, n = 144; Analysis 7.1). No data were reported for sacral colpopexy with colposuspension versus sacral colpopexy with mid-urethral sling.

7.2 Repeat surgery (two to eight years)

7.2.1 Repeat surgery for prolapse (pessary or surgery)

There may be no difference between sacral colpopexy with and sacral colpopexy without colposuspension (RR 0.71, 95% CI 0.24 to 2.15; 3 RCTs, n = 256; I^2 = 0%; Analysis 7.2). Two of the trials (Costantini 2007; Costantini 2008) reported no events in either group. No data were reported for this outcome for sacral colpopexy with colposuspension versus sacral colpopexy with mid-urethral sling.

7.2.2 Repeat surgery for stress incontinence (seven years)

There may be no difference between sacral colpopexy with and sacral colpopexy without colposuspension (RR 1.42, 95% CI 0.47 to 4.30; 1 RCT, n = 183; Analysis 7.3). No data were available for sacral colpopexy with colposuspension versus sacral colpopexy with mid-urethral sling.

7.3 Any recurrent prolapse (stage 2 or more: seven-year review)

There may be no difference between sacral colpopexy with colposuspension and sacral colpopexy without colposuspension (RR 1.20, 95% CI 0.69 to 2.10; 1 RCT, n = 70; Analysis 7.4). No data were reported for sacral colpopexy with colposuspension versus sacral colpopexy with mid-urethral sling.

SECONDARY OUTCOMES

7.4 Adverse effects

7.4.1 Death (related to surgery)

No data were reported for this outcome.

7.4.2 Mesh exposure

No data were reported for this outcome.

7.4.3 Bladder injury

No data were reported for this outcome.

7.4.4 Bowel injury

No data were reported for this outcome.

7.4.5 Repeat surgery for mesh exposure

No data were reported for this outcome.

7.5 Objective failure by site

7.5.1 Objective failure of anterior vaginal compartment

No data were available.

7.5.2 Objective failure of apical compartment

No data were available.

7.5.3 Objective failure of posterior vaginal compartment

No data were available.

7.5.4 Pelvic organ prolapse quantification scores

1. Point Ba (two-year) - Point Ba was better supported in sacral colpopexy with colposuspension compared to sacral colpopexy without colposuspension (MD -0.40, 95% CI -0.62 to -0.18; 1 RCT, n = 322; Analysis 7.5).
2. Point Bp (two-year) - Point Bp had less support in the sacral colpopexy with colposuspension as compared to sacral colpopexy without colposuspension (MD 0.30, 95% CI 0.11 to 0.49; 1 RCT, n = 322; Analysis 7.6).
3. Point C (two-year) -there was no evidence of a difference for sacral colpopexy with or without colposuspension (MD 0.20, 95% CI -0.11 to 0.51; 1 RCT, n = 322; Analysis 7.7).
4. Total vaginal length - no data were reported for this outcome.

7.6 Bladder function

7.6.1 Stress urinary incontinence (four to seven years)

There may be no difference between sacral colpopexy with and without colposuspension: (random-effects RR 1.13, 95% CI 0.63 to 2.04; 3 RCTs, n = 295; I^2 = 70% Analysis 7.8). No data were reported for sacral colpopexy with colposuspension versus sacral colpopexy with mid-urethral sling.

7.6.2 De novo stress urinary incontinence

No data were reported for this outcome.

7.6.3 De novo bladder overactivity or urge incontinence

No data were reported for this outcome.

7.6.4 Urinary voiding dysfunction

No data were reported for this outcome.

7.7 Bowel function

7.7.1 De novo faecal incontinence

No data were reported for this outcome.

7.7.2 De novo obstructed defecation

No data were reported for this outcome.

7.7.3 Constipation

No data were reported for this outcome.

7.8 Sexual function

7.8.1 dyspareunia

No data were reported for this outcome.

7.8.2 de novo dyspareunia

No data were reported for this outcome.

7.8.3 Prolapse and Incontinence Sexual Questionnaire

No data were reported for this outcome.

7.9 Quality of life and satisfaction measured by questionnaire

7.9.1 Patient Global Impression of Improvement questionnaire

No data were reported for this outcome.

7.9.2 Prolapse quality of life (PQoL)

No data were reported for this outcome.

7.9.3 Pelvic floor impact questionnaire (PFIQ-7)

No data were reported for this outcome.

7.9.4 Pelvic floor distress inventory (PFDI-20)

No data were reported for this outcome.

7.10 Measures associated with surgery

7.10.1 Operating time

Sacral colpopexy with colposuspension was associated with a longer operating time than sacral colpopexy without colposuspension (MD 20.00 minutes; 95% CI 7.44 to 32.56; 1 RCT; n = 322; Analysis 7.9).

7.10.2 Length of hospital stay

No data were reported for this outcome.

7.10.3 Blood transfusion

We are uncertain whether there is a difference between sacral colpopexy with and sacral colpopexy without colposuspension for this outcome (RR 0.94, 95% CI 0.20 to 4.33; 1 RCT, n = 66; Analysis 7.10). No data were reported for sacral colpopexy with colposuspension versus sacral colpopexy with mid-urethral sling.

Other analyses

We were unable to conduct our planned assessment of reporting bias or our planned sensitivity analyses, as there were insufficient studies in any one comparison to permit meaningful analysis.

ADDITIONAL SUMMARY OF FINDINGS *[Explanation]*

Vaginal mesh compared with no vaginal mesh for women with apical vaginal prolapse

Patient or population: Women with apical vaginal prolapse
Setting: Inpatient
Intervention: Vaginal mesh
Comparison: No vaginal mesh (vaginal colpopexy)

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)
	Assumed risk	Corresponding risk			
	Vaginal colpopexy	Vaginal mesh			
Awareness of prolapse (3 years)	**179 per 1000**	**193 per 1000** (63 to 589)	**RR 1.08** (0.35 to 3.30)	54 (1 study)	⊕◯◯◯ **low**[4]
Repeat surgery for prolapse (1 to 3 years)	**42 per 1000**	**29 per 1000** (13 to 67)	**RR 0.69** (0.3 to 1.60)	497 (5 studies)	⊕◯◯◯ **low**[1,2]
Repeat surgery for stress urinary incontinence (2 years)	19 per 1000	94 per 1000 (17 to 536)	RR 4.91 (0.86 to 27.94)	220 (2 studies)	⊕◯◯◯ **low**[4]
Recurrent prolapse on examination (1-3 years)	**615 per 1000**	**222 per 1000** (55 to 862)	**0.36** (0.09 to 1.40)	269 (3 studies)	⊕◯◯◯ **low**[2,3]
Bladder injury	**13 per 1000**	**38 per 1000** (11 to 124)	**RR 3.00** (0.91 to 9.89)	445 (4 studies)	⊕◯◯◯ **very low**[1,2]
Stress urinary incontinence (de novo 1 to 3 years)	**219 per 1000**	**300 per 1000** (206 to 436)	**RR 1.37** (0.94 to 1.99)	295 (4 studies)	⊕⊕⊕◯ **moderate**[2]
Dyspareunia (1 to 3 years)	**31 per 1000**	**39 per 1000** (18 to 86)	**RR 1.21** (0.55 to 2.66)	501 (5 studies)	⊕⊕⊕◯ **moderate**[2]

*The basis for the **assumed risk** is the median control group risk across studies. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval; **RR:** Risk ratio;

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Imprecision: wide confidence intervals crossing the line of no effect; small sample size and low event rates: downgraded one level
[2]Risk of bias: Allocation concealment poorly reported in majority of studies: downgraded one level
[3] Inconsistency: Very high statistical heterogeneity: I^2 91%, downgraded one level
[4] Imprecision: wide confidence intervals crossing the line of no effect; very small sample size and very low event rates: downgraded two levels

DISCUSSION

Summary of main results

There is an increasing volume of data available on trials relating to apical (uterine and vault or post-hysterectomy) prolapse.

Vaginal procedure versus sacral colpopexy

Sacral colpopexy is associated with lower risk of awareness of prolapse, any recurrent prolapse on examination, repeat surgery for prolapse, postoperative stress urinary incontinence (SUI) and dyspareunia than a variety of vaginal interventions (vaginal sacrospinous colpopexy, uterosacral colpopexy and transvaginal mesh) for apical prolapse with a longer operating time being the only disadvantage (Summary of findings for the main comparison). While these trials demonstrate significant advantages of sacral colpopexy over vaginal-based interventions for apical prolapse the reader should be aware of the following points. Firstly, although data were available for bowel outcomes they were too few to provide sufficiently precise estimates to identify or rule out clinically important differences. Secondly, these data relate primarily to post-hysterectomy apical prolapse and finally, that not all women will be suitable for sacral colpopexy but may be suitable to undergo vaginal-based interventions.

Route of sacral colpopexy

Four trials compared access route of sacral colpopexy and importantly, in short- term results demonstrated equal anatomical outcomes between the open, laparoscopic and robotic approaches to sacral colpopexy The laparoscopic approach was associated with a longer operating time and reduced blood loss as compared to the open approach with similar admission time. When comparing the laparoscopic and robotic approaches the laparoscopic approach was associated with reduced operating times with no other differences detected.

Vaginal surgery with mesh versus without mesh

Six randomised controlled trials (RCTs) compared vaginal native tissue repairs with transvaginal polypropylene mesh for apical prolapse and demonstrated no significant differences between the groups except that the rate of mesh exposure after transvaginal mesh was 18% and surgery for mesh exposure was required in 9.5%. No patients in the six trials that evaluated transvaginal mesh underwent surgery for any other reason than the management of mesh exposure. No trials performed a cost-analysis.

Vaginal hysterectomy versus uterine preserving surgery

No clear conclusion can be reached from the available data on the efficacy or otherwise of uterine preserving surgery versus vaginal hysterectomy for uterine prolapse as there was significant disparity between interventions and outcome data supplied by the five trials (Detollenaere 2015; Dietz 2010; Jeng 2005, Rahmanou 2015; Roovers 2004). When comparing vaginal hysterectomy and sacrospinous hysteropexy the early anatomic data appears equal between the two groups (Detollenaere 2015; Dietz 2010) and perioperative outcomes including decreased operating time, blood loss and recovery time were seen in the hysteropexy group in one trial (Dietz 2010). Two trials compared vaginal hysterectomy with abdominal uterine suspending surgeries. Roovers 2004 reported at eight-year review a reduced awareness of prolapse in the vaginal hysterectomy group as compared to abdominal sacrohysteropexy. No difference was detected in apical compartment prolapse or re-operation for prolapse between the groups.

Choice of graft at sacral colpopexy

Finally, two trials compared polypropylene mesh with alternative graft materials at sacral colpopexy. The polypropylene had superior anatomical outcomes when compared with cadaveric fascia at the five-year review. However at one-year review no difference in outcomes was seen when compared with acellular porcine dermis at one year. Further evaluation of different graft materials at the time of sacral colpopexy is required.

These findings raise an interesting dilemma for clinicians when counselling women regarding choice of surgical intervention. These data are supportive of sacral colpopexy as the procedure of choice for post-hysterectomy prolapse in those suitable for the intervention. The laparoscopic access has small peri-operative advantages over both the open and robotic approach based on limited data. However, uterine prolapse is much more common than vault prolapse and as many clinicians are reluctant to perform hysterectomy at the time of sacral colpopexy due to higher rates of mesh exposure following sacral colpopexy with hysterectomy as apposed to sacral colpopexy performed post-hysterectomy (Gutman 2013), the management of uterine prolapse remains a challenging problem. The data comparing traditional vaginal hysterectomy with vault suspending procedures to either vaginal sacrospinous hysteropexy or abdominal sacrohysteropexy are relatively limited, however, vaginal hysterectomy is generally a longer intervention. Significant further well-conducted trials are required for the management of uterine prolapse.

In those not suitable for sacral colpopexy and in those with uterine prolapse, we were unable to detect an advantage to utilising transvaginal mesh as compared to vaginal colpopexy, and the transvaginal mesh was associated with a one in 10 risk of a subsequent surgical intervention for the management of mesh exposure. All the transvaginal mesh kits that have been evaluated in this review have been voluntarily removed from the market following transvaginal mesh alert issued by the American Food and Drug Administration (FDA 2011). The principal concern raised by the FDA related to vaginal pain and dyspareunia that accounted for 36% of adverse events reported to the FDA . These concerns have not been realised in this analysis with the rate of dyspareunia and sexual function scores on the validated Pelvic organ prolapse/urinary Incontinence Sexual Questionnaire (PISQ) being the same between native tissue and transvaginal mesh interventions. There were no reports of mesh being removed in any of these trials except for the management of mesh exposure.

Newer lighter weight transvaginal mesh kits are currently available for the surgical management of apical vaginal prolapse, however to date, these have not been reviewed under the auspices of a ran-

domised controlled trial. Further rigorous evaluation of transvaginal mesh procedures compared with native tissue vaginal surgery and sacral colpopexy are required specifically in the management of uterine prolapse. Further evaluation of newer graft material at time of sacral colpopexy are required as is long-term outcome data on the route of sacral colpopexy.

Overall completeness and applicability of evidence

Although 30 trials are available for review on apical prolapse, due to very significant heterogeneity in study methodology and interventions undertaken, further trials are required in most areas of apical prolapse with the exception of sacrospinous colpopexy versus transvaginal mesh.

All trials reported in the last four years included a consort flow diagram and all trials reported some form of objective assessment of apical vaginal support, however site-specific outcomes are available in 18 trials Anger 2014; Barber 2014; Benson 1996; Brubaker 2008; Culligan 2005; Culligan 2013; da Silviera 2015; de Tayrac 2008; Detollenaere 2015; Dietz 2010; Iglesia 2010; Maher 2004; Maher 2011; Meschia 2004a; Natale 2010; Rahmanou 2015; Rondini 2015; Svabik 2014.

Two trials (Anger 2014; Detollenaere 2015), reported median follow-up of less than one year. Two-year results were reported in six studies (Barber 2014; Benson 1996; Braun 2007; Lo 1998; Maher 2004; Maher 2011); three-year outcomes in three studies (Costantini 2007; Iglesia 2010; Rondini 2015), and three trials reported outcomes at greater than five years (Brubaker 2008, Culligan 2005, Roovers 2004). A number of trials remain reported only as abstracts (Braun 2007; Costantini 2013; Detollenaere 2015; Lim 2012; Trabuco 2014).

Thirteen trials adequately described the randomisation process and confirmed that secure concealment of the randomisation process was used, for example allocation by a remote person or sealed envelopes (Anger 2014; Barber 2014; Benson 1996; Brubaker 2008; Costantini 2008; Culligan 2005; Culligan 2013, Dietz 2010; Iglesia 2010; Maher 2004; Maher 2011; Rondini 2015; Roovers 2004). Blinding of participants and assessors is impossible when different routes of access were utilised including vagina versus abdominal or open versus laparoscopic access for abdominal procedures. Blinding of patients and the postoperative assessor were performed in five trials (Barber 2014; Brubaker 2008; Culligan 2005; Iglesia 2010; Paraiso 2011).

Generally, the reporting of the impact of surgery on bladder and sexual function is improving, however significant variation exists in the trialist's choice of outcome measures. Validated pelvic floor quality of life outcomes are generally included in recent trials and reported with data suitable for meta-analysis (mean and standard deviation) Anger 2014; Barber 2014; Brubaker 2008; Culligan 2005; Culligan 2013; da Silviera 2015; Detollenaere 2015; Dietz 2010; Freeman 2013; Halaska 2012; Iglesia 2010; Maher 2011; Natale 2010; Rahmanou 2015; Rondini 2015; Roovers 2004; Svabik 2014

Trials on all aspects on uterine prolapse are urgently required including different routes of hysterectomy and uterine preservation and comparisons between uterine preservation and hysterectomy. Furthermore, trials comparing all aspects of sacral colpopexy including different access routes, grafts utilised and role of concomitant surgery, including interventions for continence, posterior compartment prolapse and rectal prolapse. Cost outcomes were reported in five trials (Anger 2014; Benson 1996; Maher 2004; Maher 2011; Paraiso 2011), although significant variation exists in the cost-analysis reported.

Quality of the evidence

The quality of the reporting is generally improving with the randomisation process being well-reported and reporting of flow diagrams, allocation concealment and methods of blinding of participants and reviewers also improving. Most recent trials are including validated pelvic questionnaires, however there is significant variation in the questionnaires utilised, which limit the ability for meta-analysis. All trials should include a cost-analysis.

The quality of evidence was largely moderate (dyspareunia was low) for comparisons of vaginal interventions versus sacral colpopexy (Summary of findings for the main comparison).

The quality of evidence ranged from very low to moderate for comparisons of vaginal interventions with and without mesh Summary of findings 2).

The quality of evidence ranged from low to moderate for comparisons of one vaginal native tissue repair versus another native tissue repair.

The quality of the evidence ranged from low to very low for comparisons of vaginal hysterectomy versus alternatives, mesh or biological graft at sacral colpopexy, laparoscopic access at sacral colpopexy versus open or robotic access and sacral colpopexy with versus without continence surgery.

The main reasons for downgrading the quality of the evidence were imprecision, inconsistency and lack of information to be able to judge 'Risk of bias' domains.

Potential biases in the review process

The author of the review was also first author in two of the 30 trials included in the review. Any possible bias is mitigated in the methodology process as two review authors assessed each trial and checked each data entry. Systematic searches of the literature for published and unpublished trials was rigorous and we do not believe that any publications have been omitted.

Agreements and disagreements with other studies or reviews

Two recent reviews Barber 2013; Siddiqui 2015 evaluated topics relating to apical compartment prolapse that are included in our review. Barber evaluated all levels of evidence and reported similar outcomes to our review when evaluating sacral colpopexy and vaginal-based procedures. The review did not evaluate different graft and access techniques that are included in this review.
A second systematic review Siddiqui 2015 evaluated sacral colpopexy and native tissue vaginal repairs, which was an important aspect of our review. The Siddiqui 2015 review was quite different methodologically compared to our review with both randomised and non randomised published trials included for primary outcomes (anatomical outcomes, re-operation rate) with meta-analysis only performed if outcome data were reported in three or more trials. Adverse events data were retrieved from non-comparative studies. The authors concluded similarly to ourselves that improved anatomic outcomes were obtained in sacral colpopexy as compared to vaginal native tissue repairs. They were not able to detect any other differences between the groups in other primary outcomes, which is not unexpected as meta-analysis was not performed unless three or more trials included outcome data. They also determined from non-comparative studies that complications including ileus or small bowel obstruction and thromboembolic events were more frequent following the sacral colpopexy intervention as compared to native tissue groups.

AUTHORS' CONCLUSIONS

Implications for practice

Sacral colpopexy is associated with a lower risk of awareness of prolapse, any recurrent prolapse on examination, repeat surgery for prolapse, postoperative stress urinary incontinence (SUI) and dyspareunia than a variety of vaginal interventions (vaginal sacrospinous colpopexy, uterosacral colpopexy and transvaginal mesh) for apical prolapse with a longer operating time being the only disadvantage (Summary of findings for the main comparison). However, the reader should also be aware that most of these data related to post-hysterectomy prolapse and that in some cases due to medical and or surgical co-morbidities the vaginal approach maybe more appropriate. The data were not conclusive on the preferred route of sacral colpopexy.

The native tissue vaginal repairs had similar rates of awareness of prolapse, any recurrent prolapse on examination, repeat surgery for prolapse, dyspareunia and SUI when compared to transvaginal mesh procedures for apical vaginal prolapse. However the transvaginal mesh was associated with higher rates of cystotomy, and significant rates of mesh exposure and surgery for mesh exposure. Most of the evaluated transvaginal apical mesh products have been removed from the market and the newer lighter mesh products have not been evaluated in a randomised controlled trial (RCT). The implication for clinical practice is that while the newer mesh products may be as anatomically beneficial with a lower complication rate than their preceding mesh products, this has not been rigorously evaluated and these products should be used cautiously until level one comparative data become available.

The evidence was not conclusive when comparing different access routes for sacral colpopexy.

No clear conclusion can be reached from the available data on the efficacy or otherwise of uterine preserving surgery versus vaginal hysterectomy for uterine prolapse.

Implications for research

Significant further research is required in all areas of apical prolapse. The surgical management of women with uterine prolapse needs urgent attention including but not limited to:

1. vaginal hysterectomy and apical suspension versus abdominal (minimally invasive, subtotal) hysterectomy and apical suspension;
2. vaginal hysteropexy versus abdominal hysteropexy;
3. vaginal hysterectomy with apical suspension versus vaginal hysteropexy.

Newer lightweight single incision polypropylene mesh kits should be compared with native tissue repairs and also sacral colpopexy.

Further evaluation of appropriate graft and access route is also required.

Future research should include a range of outcomes including, but not limited to, subjective and objective data, validated pelvic floor questionnaires evaluating bladder, bowel and sexual function, and quality of life assessments, patient satisfaction, peri-operative outcomes, re-operations, complications and cost.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Anger 2014

Methods	Multi-centre (2 sites, USA) RCT, parallel design.
Participants	Inclusion criteria - women undergoing sacral colpopexy with symptomatic prolapse POPq stage 2 with apical descent at least halfway down the vagina and able to consent and complete 12-month review Exclusion criteria: pregnancy in last 12 months or planned pregnancy,
Interventions	Sacral colpopexy 2 separate pieces synthetic mesh with Goretex permanent sutures LSC 4 ports RSC 5 ports Surgeon preference on type of mesh and wether the peritoneum was reperitonealised concomitant hysterectomy (58%), posterior repair (6) and retropubic mid-urethral slings (60%) 84 consented, 78 randomised LSC 38, 6 months 35 RSC 40, 6 months 38
Outcomes	Primary outcome cost between groups (hospital and physician cost, robot cost and maintenance - cost estimated from average purchase price, number of years service, procedures performed and resale value) Secondary outcome postoperative pain, POPq measurements,adverse events (Dindo classification) and QOL (short form health survey, EuroQol-5D, PGI-I, PFDI, PFII, PISQ Quality adjusted life years calculated from EuroQOL-5D at baseline, 2 and 6 weeks Convalescence and Recovery Evaluation (CARE), an activity assessment, and Likert pain scale postoperatively day 1, 2 and 6 weeks No difference in demographics and concomitant surgery 1. POPq outcomes Ba, Bp C 6 months 2. continence surgery 3. SUI 4. perioperative outcomes, operating time (minutes), blood loss 5. Quality of life: PFDI (0-300) PFIQ (0-400) 6. complications, bladder injury, transfusion, mesh exposure 7. pain score at 1 week (0-10) 8. cost (US dollars)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated blocked for sites and hysterectomy

Anger 2014 (*Continued*)

Allocation concealment (selection bias)	Low risk	Web page with secure login to access
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinded for 6 weeks postoperative
Blinding of outcome assessment (detection bias) All outcomes	High risk	Assessors unblinded due to nature of intervention
Incomplete outcome data (attrition bias) All outcomes	Low risk	35/38 LSC at 6 months 38/40 RSC
Selective reporting (reporting bias)	Low risk	While no primary outcomes reported, main outcomes relevant to comparison of access are reported
Other bias	Low risk	No COI authors

Barber 2014

Methods	Multi-centre (9 sites, USA) RCT, parallel design.
Participants	1996 evaluated, 409 included Inclusion criteria - > 18 years undergoing vaginal surgery for Stage 2-4 prolapse (vaginal or uterine descent 1 cm proximal to the hymen or beyond) with a) complaints of vaginal bulge symptoms; b) SUI symptoms; and c) objective demonstration of stress incontinence by office or urodynamic testing in the previous 12 months BPMT randomised 186, completed review 24 months 152 Usual care randomised 188, completed 24 months n = 164 USLS randomised 188 , completed 24 months n = 157 SSF randomised 186, completed review 24 months n = 159
Interventions	BPMT randomised preoperatively and stratified by site USLS versus SSF randomised in OT, stratified by surgeon and hysterectomy 1. with perioperative behavioural therapy with pelvic floor muscle training (BPMT) or usual care n = 188 BPMT received an individualised program that included one visit 2-4 weeks prior to surgery, and four postoperative visits (2, 4-6, 8, and 12 weeks after surgery). Pelvic floor muscle training, individualised progressive pelvic floor muscle exercise, and education on behavioural strategies to reduce urinary and colorectal symptoms were performed at each visit. Self-reported adherence to BPMT was assessed at 6, 12, and 24 months. All BPMT 2. sacrospinous colpopexy (SSF) or uterosacral colpopexy (USLS) All underwent TVT SUI All with uterine prolapse vaginal hysterectomy SSF unilateral Michagan 4 wall technique 9 2 x permanent sutures and 2 x delayed absorbable: USLS Shull technique 2 permanent and 2 absorbable sutures

	Concomitant surgery surgeon's discretion No grafts utilised
Outcomes	Outcomes (uterosacral versus sacrospinous) 6,12, 24 months: 1. awareness of prolapse (symptoms vaginal bulge from affirmative response questions PFDI) 2. re-operation prolapse 3. apical, anterior and posterior compartment prolapse (hymen and beyond) 4. POPq points Ba, Bp 5. bladder injury, ureteric injury detected in OT, ureteric injury detected postoperatively, bowel injury 6. complications: transfusion, intervention for neurological pain
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated stratified by surgeon and hysterectomy, computer-generated block design centrally
Allocation concealment (selection bias)	Low risk	Separate closed opaque envelopes each trial
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants blinded to surgery
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessors blinded to assignment to surgery and behavioural treatment
Incomplete outcome data (attrition bias) All outcomes	Low risk	Accounted for all data: intention-to-treat analysis: USLS 157/188, SSF 159/186 no BPMT 152/186 BPMT164/188
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Low risk	Funded by The Eunice Kennedy Shriver National Institute of Child Health and Human Development some authors reported COI none of which was directly related to study. Preoperative comparison groups same except > vaginal deliveries ULS than SSF. BMI < ULS (mean 28.7 SD 5.2) than SSF 29.0 (SD 5.7) > posterior compartment descent SSF 0.8 ± 2.9 ULS 0.2 ± 2.5

Benson 1996

Methods	Single-centre RCT for uterine or vault prolapse
Participants	101 randomised 13 withdrawals (10 did not want surgery, 3 in group A wanted vaginal surgery) 88 analysed 8 lost to follow-up Inclusion criteria: cervix to or beyond hymen, vaginal vault inversion > 50% length and anterior wall to or beyond introitus Exclusion criteria: uterus > 12 weeks, adnexal mass, short vagina, central cystocele, > 2 abdominal surgeries, obesity, prior inflammatory bowel or pelvic disease
Interventions	Group A (40): abdominal group: sacral colpopexy (mesh not specified), paravaginal repair, Halban, posterior vaginal wall repair with colposuspension or sling for SUI, non standardised continence surgery Group B (48): vaginal group: bilateral sacrospinous colpopexy, vaginal paravaginal repair, McCall culdoplasty, needle suspension or sling; permanent sutures
Outcomes	Optimal: asymptomatic vaginal apex > levator plate: no vaginal tissue beyond the hymen A: 22/38, B: 12/42 Satisfactory: asymptomatic for prolapse and prolapse improved from preoperative: Symptomatic: prolapse apex descent > 50% of its length or vaginal tissue beyond hymen Outcomes: 1. re-operation for prolapse 2. re-operation SUI 3. prolapse on examination (any stage 2 or beyond) 4. injuries: bladder, bowel 5. SUI 6. dyspareunia 7. transfusion 8. hospital stay (days) 9. cost (US dollars)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomisation table held by non-surgeon
Allocation concealment (selection bias)	Low risk	The surgeon received the randomisation assignment from the non-surgeon. Co-author who had sole access to the randomisation table after the workup
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No data

Benson 1996 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No data
Incomplete outcome data (attrition bias) All outcomes	Low risk	80/88 (90%): completed 2.5 year review
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Unclear risk	No data

Braun 2007

Methods	Single-centre, parallel design, RCT comparing abdominal and vaginal approaches for surgically treating central compartment prolapse
Participants	Inclusion criteria: POP-Q Stage 3-4 prolapse Exclusion criteria: not specified Randomised: 47 Analysed: 47
Interventions	Group A (23): TAH ± BSO + abdominal (open) sacral colpopexy Group B (24): vaginal hysterectomy + anterior & posterior colporrhaphy + Mayo McCall stitch Materials used: Group A: vypro mesh (combined absorbable - non-absorbable); prolene (non-absorbable) sutures to both sacrum and vagina Group B: delayed absorbable (PDS) sutures
Outcomes	1. Repeat prolapse surgery 2. Prolapse on examination (stage 2 or beyond) 3. Mesh exposure Prolapse assessment: POP-Q
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not stated
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated

Braun 2007 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	47/47at 33-month review
Selective reporting (reporting bias)	Unclear risk	Moderate outcome data reported, however as mean and SD not reported some outcome data were not able to be included (abstract only)
Other bias	Unclear risk	Not stated

Brubaker 2008

Methods	RCT, parallel design. Multi-centre study in USA (7 sites)
Participants	322 women. CONSORT statement Inclusion criteria: POP-Q stage 2-4 prolapse (Aa must be -1 or worse) and stress continence based on responses of 'never' or 'rarely' to 6 of the 9 SUI questions of MESA. Despite these criteria, preoperatively 19.2% participants had SUI defined by PFDI, 10% had bothersome SUI (PFDI questionnaire) and 39% had a positive stress test, with or without prolapse reduction prior to intervention. From table 2 of the 3-month data it appears these participants were equally distributed between the groups. Exclusion criteria: Immobile urethrovesical junction, pregnancy, anticipated move away after surgery Groups were comparable at baseline on age, race, ethnic group, marital status, education, parity, method of delivery, distribution of women with positive stress test, OAB, prior hysterectomy continence and prolapse surgery Surgeons were unaware of urodynamic findings including urodynamic stress incontinence or occult stress incontinence with or without the prolapse reduced
Interventions	Group A (157): abdominal sacral colpopexy with Burch colposuspension Group B (165): abdominal sacral colpopexy without Burch colposuspension (control group) Compliance: women treated according to randomised groups: group A, 154/157; group B, 164/165. concomitant surgery paravaginal repair group A 31/157 20% group B 34/165 20.6%, hysterectomy group A 29%: group B 28% standardised surgery for colposuspension: not standardised paravaginal repair or sacral colpopexy (17% biological grafts, 43% Mersilene and 39% polypropylene and minimal use of PFTE (Gore-tex) (6%) While surgery was standardised for colposuspension neither the paravaginal repair nor sacral colpopexy was standardised with variation in use of suture type and graft materials: 17% biological grafts, 43% Mersilene 39% polypropylene 6% Gore-tex. No data on further performed surgeries were provided in the publication

Brubaker 2008 (*Continued*)

Outcomes	**Reports at 3 months, 2 year and 7 years** 1. Awareness of Prolapse (7 years) 2. Prolapse on examination any site (7 years) 3. Repeat prolapse surgery or pessary (7 years) 4. Surgery SUI (7 years) 5. SUI (7 years) 6. POPq Q points C, Bp, Ba (2 years) 7. Operating time 8. Blood loss
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Low risk	Sealed envelopes opened at time of surgery after anaesthetic was administered
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Blinded patients
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinded patients
Incomplete outcome data (attrition bias) All outcomes	High risk	At 2 years 302 of 322 completed some part of the review Sc - urethropexy randomised 165, 7 years 44 examined, 60 interviews SC + urethropexy; randomised 157, 7 years 46 examined, 66 interviews
Selective reporting (reporting bias)	Low risk	Main outcome data included
Other bias	Low risk	Funded competitive research grants,

Costantini 2007

Methods	Single-centre RCT
Participants	66 women Inclusion criteria: continent women (women with negative stress test before and after prolapse reduction, no preoperative symptoms of UI, negative symptom questionnaire

Costantini 2007 (*Continued*)

	and no leakage during urodynamics) with 'severe' uterovaginal and vault prolapse (not clearly defined) Exclusion criteria: N/S 66 randomised 66 analysed
Interventions	Group A (32): sacral colpopexy (open) Group B (34): sacral colpopexy + Burch (open) concomitant surgeries: abdominal hysterectomy
Outcomes	Review 2 and 8 years 1. Repeat surgery prolapse (8 years) 2. Repeat surgery SUI (8 years) 3. Transfusion
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinded assessors
Incomplete outcome data (attrition bias) All outcomes	Low risk	66/66 at 1 year
Selective reporting (reporting bias)	Unclear risk	Moderate outcome data only
Other bias	Unclear risk	No conflict of interest statement or funding statement

Costantini 2008

Methods	Single site RCT, parallel design
Participants	Inclusion criteria: women age 18-75 years, POP > Stage 2 (BW and POPQ), UI defined by ICS Exclusion criteria: uterine fibroids, uterine/cervical malignancy, active PID, allergy to synthetic graft/suture materials, pregnancy/lactation, significant illnesses, inability to

	provide informed consent or comply with study protocol 47 randomised A 23; B 24 No loss to follow-up Distribution of POP between groups not clear: 24 uterovaginal, 13 vault, 8 cystocele and 2 cystocele and rectocele
Interventions	Group A (23): sacral colpopexy 17, sacral hysteropexy 6, no colposuspension Group B (24): sacral colpopexy + Burch 14, sacral hysteropexy + Burch 10 Preoperatively incontinence defined by urodynamics: 13 USI, 30 mixed, 4 occult (incontinence with coughing or Valsalva manoeuvre with the prolapse reduced). Distribution of patients with prolapse and incontinence preoperatively between the groups is unclear
Outcomes	Primary incontinence outcome: combination of bladder diary, number of pads and stress test without clear definition: group A 9/23, group B 13/24 (P = 0.46) 1. Surgery for prolapse (4 years) 2. Surgery SUI (4 years)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinded assessors
Incomplete outcome data (attrition bias) All outcomes	Low risk	47/47 completed review
Selective reporting (reporting bias)	Unclear risk	Limited outcome data, 2 of 4 primary outcomes
Other bias	Unclear risk	COI or funding statement not included

Costantini 2013

Methods	Single-centre RCT
Participants	Inclusion Grade 3-4 prolapse POPq without contraindications to both procedures
Interventions	Group A 36 open sacrocolpopexy Group B 37 laparoscopic sacrocolpopexy
Outcomes	1. POpq point C (1 year) 2. Operating time (1 year) 3. Hospital stay (1 year)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation list
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Selective reporting (reporting bias)	Unclear risk	Limited outcome data (abstract)
Other bias	Unclear risk	Not stated

Culligan 2005

Methods	Single-centre RCT Fascia lata versus polypropylene mesh for sacral colpopexy Follow-up: 1 year
Participants	100 randomised Lost to follow-up: 11 (A 2, B 9) Inclusion criteria: post-hysterectomy vault prolapse Groups comparable at baseline on age, weight, height, parity, incontinence severity, POP-Q measurements, prolapse stage, previous prolapse or incontinence surgery (A 19/46, B 24/54)

Culligan 2005 (*Continued*)

	Randomised group compared with women who declined randomisation (101 women), no statistically significant differences found
Interventions	A (46): abdominal sacral colpopexy with cadaveric fascia lata graft (Tutoplast) attached with Goretex to anterior and posterior vaginal wall and to S1-S2, covered with peritoneum B (54): abdominal sacral colpopexy as above, using polypropylene mesh (Trelex) Concomitant surgery: TVT, paravaginal and rectocele repair; conditions not defined
Outcomes	Data from 1 and 5 year reports 1. Awareness of prolapse (Do you have any symptoms of prolapse?) 5 years 2. Prolpase on examination (2 or greater at any site) 5 years 3. Repeat prolapse surgery (5 year) 4. Repeat continence surgery 5. Apical prolapse 6. POPq points Ba, Bp, C, TVL 7. Peri-operative data: blood loss, operating time 8. Mesh exposure 9. Bladder injury 10. Transfusion
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Low risk	Opaque envelopes
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Patients blinded
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinded assessor nurse
Incomplete outcome data (attrition bias) All outcomes	Low risk	11/100 at 1 year: 5 years 42/100 lost to review
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Unclear risk	Authors had COI with Bard whose mesh was assessed. Funding study not stated

Culligan 2013

Methods	Single-centre, double-blinded RCT
Participants	Inclusion criteria: stage 2 or greater apical prolapse scheduled LSC Exclusion criteria: pregnancy or desire for pregnancy, prior mesh POP surgery 184 suitable and 120 randomised 58 porcine dermis 1 year 57 62 mesh 1 year 58 No difference between groups in preoperative assessment 1 in the porcine group converted to vaginal surgery and removed from the study?
Interventions	Mesh SC: polypropylene mesh (Pelvitex) Porcine SC: porcine dermis acellular collagen matrix (Pelvisoft) Technique y-shaped, ant graft 4 cm to 7 cm, posterior 8cm to 10 cm supracervical hysterectomy with morcellation, permanent sutures secured to anterior longitudinal ligament at level of sacral promontory with permanent sutures. Mid-urethral sling offered to all patients operating time: incision to removal of all trocars and excluded closure of trocars, mid-urethral sling and perineorrhaphy 95 RSC and 24 LSC (change access technique during trial) 70 underwent MUS. 64/70 dry 49 no MUS 34/49 dry: 4/49 underwent subsequent MUS: groups not defined
Outcomes	1. Re-operation prolapse (1 year) 2. Prolapse on examination (any stage 2 or greater:) 1 year 3. Surgery mesh exposure 4. Mesh exposure 5. Qol: PFDI-20, PFIQ-7, PISQ 6. Dyspareunia 7. Peri-operative data: hospital stay, 8. Bladder, bowel injuries 9. Transfusion
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Blocked computer-generated randomisation list
Allocation concealment (selection bias)	Low risk	Sealed opaque envelopes
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants blinded

Culligan 2013 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessor blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	1 year porcine 57/58: mesh 58/62
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	High risk	Author COI with bard supplier of porcine mesh and study funded by unrestricted Bard grant

da Silviera 2015

Methods	Multi-centre (4 sites, Brazil) RCT for stage 3-4 POPq (any compartment)
Participants	Inclusion criteria: Grade 3-4 POP (any POPq measurement > +1) No exclusion criteria 199 screened, 184 randomised Native tissue n = 90 randomised n = 81 completed 1 year Mesh n = 94 randomised n = 88 1 year
Interventions	Site-specific native tissue; site-specific anterior and or posterior 1.0 non-absorbable suture (polypropylene) apical 1.0 non absorbable sacrospinous right: uterine prolapse hysterectomy in both groups; mesh group: polypropylene macro porous monofilament Prolift mesh. Concomitant surgery allowed Prior to study each centre performed at least 3 surgeries Hb 24 hours postoperatively Assessed 1 week 1, 6 ,12 months Pain assessed variable rating scale NT group 74/90 anterior compartment prolapse ± other surgery, posterior alone n = 7, apical alone n = 9; mesh group similar breakdown Mid urethral slings: 5/90 native tissue, 9/94 mesh; vaginal hysterectomy 32/90 29/94
Outcomes	Assessed at one year post operatively Reports the following review outcomes: 1. repeat prolapse surgery 2. repeat surgery for prolapse, SUI or mesh exposure 3. bladder injury 4. bowel injury 5. repeat continence surgery 6. surgery for mesh exposure 7. anterior compartment prolapse (Ba) 8. POPq assessment points Ba, Bp,C 9. sexual function Quality of sexual function questionnaire data not entered not PISQ 10. dyspareunia

da Silviera 2015 (*Continued*)

	11. quality of Life PQOL end score 12. operating time 13. blood transfusion
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation lust
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	High risk	Patients unblinded
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessors blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Native tissue randomised 90 at 1 year 81 completed Mesh 94 randomised at 1 year 88 completed
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Low risk	J&J donated product no financial input study

de Tayrac 2008

Methods	Multi-centre RCT comparing Infracoccygeal sacropexy and sacrospinous suspension for uterine or vaginal vault prolapse
Participants	Inclusion: symptomatic uterine or vaginal vault prolapse (stage 2 or higher) Exclusion: isolated cystocele, stage 1 prolapse, rectal prolapse, and intestinal inflammatory disease 49 randomised 4 lost to follow-up 45 analysed
Interventions	Group A (21): infracoccygeal sacropexy (multi-filament polypropylene tape, posterior IVS) Group B (24): sacrospinous suspension

	Concomitant surgery: cystocele repair, posterior repair, hysterectomy, suburethral tape. Types of repair and indications for repair were not described
Outcomes	Assessed at "Medium term" follow-up Reports the following review outcomes: 1. repeat surgery for prolapse 2. recurrent prolapse on examination (not defined) 3. bladder injury 4. bowel injury 5. anterior compartment prolapse 6. posterior compartment prolapse 7. bladder function: de novo SUI, de novo voiding disorder 8. sexual function: PISQ end scores 9. operating time 10. days in hospital 11. prolapse assessment: POP-QValidated questionnaires: PFDI, PFIQ, PISQ-12, French version
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Randomisation centralised
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Participant completed questionnaires
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Unclear risk	COI or funding unstated

Detollenaere 2015

Methods	Open-label non inferiority RCT Multi-centre (4) Dutch centres, experienced surgeons (performed 20 procedures prior)
Participants	Inclusion criteria: POP-Q grade 2 or greater uterine descent Exclusion criteria: prior POP surgery, known malignancy, or abnormal cervical cystology, bleeding or ultrasound of uterus or ovaries, wish to preserve fertility, language barriers, unwilling to return Groups were similar except posterior repair was performed more frequently in the hysterectomy group (50%) than in the hysteropexy group 29% gp A 30/103 gp B 50/105 P = 0.003
Interventions	Group A sacrospinous hysteropexy (2 x permanent polypropylene sutures direct vision R sacrospinous ligament) Group B vaginal hysterectomy with suspension uterosacral ligament (sutures not specified) Concomitant surgery anterior and posterior repair or MUS 12-month review by doctor not related to surgery Unblinded surgeons and participants; impossible to do so
Outcomes	Reports outcomes at 1 year: 1. awareness of prolapse (symptoms of vaginal bulge from UDI) 2. repeat prolapse surgery 3. repeat surgery for SUI 4. recurrent prolapse on examination (stage 2 any site POPq) 5. anterior compartment prolapse 6. posterior compartment prolapse 7. apical prolapse 8. POPq assessments: Ba, Bp, C, TVL 9. sexual function: PISQ end scores 10. quality of Life: UDI and DDI (median and interquartile range) not included 11. hospital stay.
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer randomised stratified for each centre and stage of POP
Allocation concealment (selection bias)	Low risk	Allocated from web-based randomisation program
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not blinded

Detollenaere 2015 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	High risk	Not blinded. 12-month review conducted by non surgeon doctor
Incomplete outcome data (attrition bias) All outcomes	Low risk	12 months 98/103 Gp A: GP B 102/105
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Low risk	Funded by competitive grants from Isala hospital research foundation

Dietz 2010

Methods	RCT
Participants	Inclusion criteria: stage 2 or greater uterine prolapse Randomised = 71: group A, 34 group B, 37 Withdrew 3, 2 Surgery 31, 35 Lost to follow-up 0, 2 Analysed 31, 33 (the article results quote 34 SS hysteropexy group) Groups were comparable at baseline
Interventions	Group A (31) vaginal hysterectomy with uterosacral suspension Group B (34) vaginal sacrospinous hysteropexy with uterine preservation
Outcomes	Reported outcomes at 1 year: 1. repeat prolapse surgery 2. apical compartment prolapse 3. posterior compartment prolapse 4. anterior compartment prolapse 5. bladder injury 6. bowel injury 7. POPq assessments: Ba, Bp, TVL 8. quality of life: UDI and IIQ reported mean and SDs 9. hospital stay (Median and range)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Low risk	Via research nurse by mail

Dietz 2010 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Participant-completed questionnaires
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reported last data carried forward and worse case scenario 69/71 at 1 year
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Low risk	COI none: no statement on funding

Freeman 2013

Methods	RCT pilot comparing abdominal open and laparoscopic sacral colpopexy
Participants	Inclusion criteria: symptomatic vault prolapse stage ≥ 2 POP Exclusion criteria: medical unfitness for a sacral colpopexy, and the need for any concomitant pelvic or continence surgery, BMI > 35, prior prolapse surgery Randomised: 30 Analysed: 30 Demographic characteristics were similar in both groups
Interventions	Group A (24): abdominal (open) sacral colpopexy Group B (23): laparoscopic sacral colpopexy No concomitant surgeries in either group
Outcomes	Reported outcome data 1 year: 1. repeat surgery prolapse 2. recurrent prolapse on examination (any stage 2 or >) 3. repeat surgery SUI 4. POPq C, Bp 5. hospital stay 6. operating time 7. blood loss 8. quality of life (PQol mean and SDs) 9. bladder injury 10. bowel injury 11. morphine use postoperative (not included) 12. prolapse assessment: POP-Q 13. follow-up: 12 weeks
Notes	
Risk of bias	

Freeman 2013 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated blocked to ensure similar number patients per surgeon
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not blinded
Blinding of outcome assessment (detection bias) All outcomes	High risk	Not blinded - 1 year
Incomplete outcome data (attrition bias) All outcomes	Low risk	At 1 year: 24/27 open 23/26 laparoscopic
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Unclear risk	Competitive grant Plymouth surgical services trust; COI for some authors in products being evaluated

Halaska 2012

Methods	Multi-centre randomised trial
Participants	Inclusion criteria: central post-hysterectomy vault prolapse: POP-Q greater or equal Stage 2 POP greater or equal Excluded pelvic malignancy, < 18 years, prior radiotherapy, those requiring hysterectomy Allocated group A 83; group B (TVM) 85 I year group A 72; group B 79 Recurrence defined as stage 2 or greater POP-Q Not clear who performed assessments
Interventions	Group A (83) anterior repair(Sutures? type?) R sacrospinous colpopexy (2 x non-absorbable sutures Nurolen) ± Posterior repair (approximation of levator muscles) and moderate excision of redundant vagina Group B (85) Total Prolift mesh secured with 2.0 PDS sutures intervention performed by surgeons with greater than 20 cases experience of each type surgery
Outcomes	Assessed at 1 year Reports the following review outcomes: 1. repeat surgery for prolapse 2. recurrent prolapse 9 stage to or greater any site) 3. mesh exposure

	4. bladder injury 5. bowel injury 6. POPq assessments: reported graphically and without SD.s 7. bladder function: de novo SUI, de novo OAB 8. sexual function: dyspareunia, PISQ-12 no SDs reported 9. quality of life: POPIQ no SDs reported 10. operating time reported as mean and range 11. transfusion
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants accounted for in flow study: 151/168 (89%) reviewed 1 year
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Low risk	Funded by grant from Czeck ministry health care, authors no COI

Iglesia 2010

Methods	Multi-centre RCT
Participants	173 excluded variety reasons Group A 33; group B 32 Lost to follow-up: group A = 0; group B = 0 Prior to surgery all demographic details similar between the 2 groups: except group B lower POPDI-6 score than group A Inclusion criteria: ≥21 yrs, grade 2-4 (POP-Q) uterovaginal or vaginal prolapse who agreed to undergo vaginal surgery, available 12 months review and can complete questionnaires Exclusion criteria: multiple medical contraindications, short vagina, uterus > 12 weeks'

Iglesia 2010 (*Continued*)

	size, desire future fertility, and postpartum
Interventions	Group A uterosacral colpopexy with polytetrafluoroethylene sutures or sacrospinous colpopexy (Gortex sutures) and hysterectomy performed if uterus present Group B: B if point C or D on POPq was ≥-3 apical suspension with Total vaginal mesh (Prolift) and if C or D was <-3 anterior Prolift utilised. No T incisions were performed and hysterectomy performed if uterus present
Outcomes	Assessed at 1,2 and 3 years Reported outcomes 3 years unless otherwise stated: 1. awareness of prolapse (vaginal bulge) 2. repeat prolapse surgery 3. repeat surgery SUI 4. repeat surgery for prolapse, SUI or mesh exposure 5. recurrent prolapse (POPq stage >1) 6. mesh exposure 7. surgery mesh exposure 8. POPq points Ba, Bp and C (median and range) not included 9. bladder injury 10. bowel injury 11. bladder function: de novo SUI 12. sexual function: de novo dyspareunia, PISQ (median and range) not included 13. quality of life: PFDI-20, PFIQ-7, (median and range) 14. transfusion 15. days in hospital (P value only not included)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Low risk	Sealed envelopes
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Double-blinded
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Double-blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Equal assessment groups: 51/65 completed 3 years
Selective reporting (reporting bias)	Low risk	Main outcome data reported

Iglesia 2010 (*Continued*)

Other bias	Low risk	Funded by American Urogynecology Society foundation and Medstar research; authors reported no conflict of interest

Jeng 2005

Methods	RCT Total vaginal hysterectomy versus transvaginal sacrospinous uterine suspension Follow-up: 6 months
Participants	158 women Dropouts: 0 Inclusion criteria: age <50 years; Grade 2-3 uterine or cervical prolapse; sexually active Exclusion criteria: previous anterior or posterior vaginal wall repair, or oophorectomy Groups comparable at baseline on age, parity, height, weight, partners' health status, sexual functioning
Interventions	Group A (80): transvaginal sacrospinous uterine suspension (without hysterectomy) Group B (78): total vaginal hysterectomy All operations done by one surgeon
Outcomes	Reported outcomes 6 months: 1. dyspareunia: A, 4/80; B, 4/78 Adverse effects: 1. UTI: A, 1/80; B, 2/78 2. buttock pain: A, 12/80; B, 0/78 3. acute urinary retention: A, 0/80; B, 1/78 4. vaginal dryness after surgery: A, 4/80; B, 4/78 5. time to resumption of intercourse (mean weeks, range): A, 8 (4-16 weeks); B, 8 (5-16) 6. sexual functioning: no differences between the groups after surgery (P > 0.05)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not stated
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated

Jeng 2005 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Unclear
Selective reporting (reporting bias)	Unclear risk	Very limited outcome data
Other bias	Unclear risk	COI and funding not stated

Lim 2012

Methods	A multi-centre RCT
Participants	Inclusion criteria: post-hysterectomy anterior and vault prolapse of ≥ stage 2 POPQ Exclusion criteria: past history of urogenital fistula, SCP, VEULS or major mesh complications Screened: not stated Randomised: 80
Interventions	Group A: vaginal group fascial plication and overlay UltraPro (Ethicon,NJ). vaginal extra peritoneal uterosacral ligament suspension (VEULS) were performed with two 0 PDS sutures on each side Group B: Sacral Colpopexy performed laparoscopically or abdominally at surgeon's discretion concomitant continence surgery: Mid urethral slings were performed when required
Outcomes	Reported outcomes 1 year abstract (Mean follow-up of 14.1 (SD10.9) months): 1. recurrent prolapse examination (anterior or vault prolapse < POPQ stage 2) 2. bladder injury 3. mesh exposure 4. hospital stay (mean without SD) 5. sexual function PISQ-12 (P values, only not included) 6. quality of Life PFDI-20 and PFIQ-7 (statements without data)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated list
Allocation concealment (selection bias)	Low risk	Computer-generated off-site phone contact (personnel communication)_

Lim 2012 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No statement
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No statement
Incomplete outcome data (attrition bias) All outcomes	Low risk	70/80 reviewed 1 year
Selective reporting (reporting bias)	Unclear risk	Moderate outcome data, only 1 of 4 primary outcomes
Other bias	Low risk	Unfunded no author COI

Lo 1998

Methods	Single-centre RCT (using random number tables) Follow-up: 1 to 5.2 years (median 2.1)
Participants	138 randomised, 20 withdrew due to age or not willing to be followed up Inclusion criteria: prolapse at least Grade III (ICS classification) Exclusion criteria: UI Past medical history: previous pelvic surgery A: 19, B: 22 Sexually active: A: 11, B: 18
Interventions	Group A (52): abdominal sacral colpopexy with Mersiline mesh: + 7 posterior repair; + 12 posterior repair and abdominal hysterectomy; + 21 abdominal hysterectomy Group B (66): vaginal sacrospinous colpopexy with 1-0 nylon: + 20 anterior and posterior repair and vaginal hysterectomy; + 44 anterior and posterior repair Postoperatively, all women had oestrogen treatment
Outcomes	Reported outcomes median 2-year review: 1. recurrent prolapse on examination (stage 2 or >) 2. repeat surgery SUI 3. repeat surgery mesh exposure 4. bladder injury 5. bowel injury 6. mesh exposure 7. blood loss 8. operating time 9. hospital stay 10. sexual function < dyspareunia
Notes	

Risk of bias

Lo 1998 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random number list
Allocation concealment (selection bias)	Low risk	Consecutive sealed opaque envelopes (personal communication)
Blinding of participants and personnel (performance bias) All outcomes	High risk	Unable to blind
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Non-surgeon unaware allocation (personal communication)
Incomplete outcome data (attrition bias) All outcomes	Low risk	118/138 reviewed 2 years
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Low risk	No COI (personal communication)

Maher 2004

Methods	Multi-centre RCT (stratified by SUI); multiple surgeons
Participants	95 women Withdrawals: 0 Lost to follow-up: 6 (group A: 1, group B: 5) Inclusion: vault prolapse to introitus Exclusion: prior sacral colpopexy, unfit for general anaesthetic, foreshortened vagina
Interventions	Group A (46): abdominal group = sacral colpopexy prolene mesh, paravaginal repair, Moschcowitz, posterior vaginal repair and colposuspension for SUI Group B (43): vaginal group: R sided sacrospinous colpopexy, enterocele and anterior and post repair, colposuspension for SUI, PDS (slowly absorbable sutures) Both groups: colposuspension for occult or potential SUI
Outcomes	Reported outcomes 2 years: 1. awareness of prolapse 2. re-operation prolapse 3. re-operation SUI 4. recurrent prolapse on examination (Stage 2 or > any site) 5. bladder injury 6. blood loss 7. transfusion

Maher 2004 (*Continued*)

	8. hospital stay 9. sexual function: dyspareunia and de novo dyspareunia 10. bladder function: de novo SUI 11. operating time 12. cost (US dollars)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random number list
Allocation concealment (selection bias)	Low risk	Randomisation list held nurse
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Non-blinded non surgeon reviewer, participant-completed validated questionnaires
Incomplete outcome data (attrition bias) All outcomes	Low risk	Adequately accounted for 89/95 at 2 years
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Low risk	Funded by competitive research grant RANZCOG:

Maher 2011

Methods	Single-centre RCT
Participants	Inclusion criteria: consecutive women with symptomatic stage 2 or greater (point C $\geq$ -1 POP-Q) vault prolapse Exclusion criteria: Age < 18, inability to comprehend questionnaires, to give informed consent or to return for review, vault prolapse < St. 2, unable to undergo general anaesthesia, BMI > 35, $\geq$ 5 previous laparotomies, prior sacral colpopexy, or vaginal mesh prolapse procedure, vaginal length < 6 cm suitable participate 142 randomised and surgery group A 53; group B 55. Lost to full follow-up 2 years group A 2; group B 3
Interventions	Group A: laparoscopic sacral colpopexy Group: B TVM Prolift Concomitant surgery: yes

Maher 2011 (*Continued*)

	SUI or occult SUI Group A: laparoscopic colposuspension; group B: TVT-O Posterior repair and paravaginal surgery if required in A
Outcomes	Reported outcomes 2 years: 1. awareness of prolapse 2. re-operation prolapse 3. recurrent prolapse on examination (stage 2 or greater any site) 4. mesh exposure 5. surgery mesh exposure 6. bladder injury 7. bowel injury 8. POPq assessments: Ba, Bp, C, TVL 9. bladder function: SUI, overactive bladder, voiding dysfunction, urodynamic outcomes 10. transfusion 11. operating time and days in hospital (reported as median and range not included) 12. quality of life: PQoL and Australian Pelvic Flor Questionnaire (APFQ)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Low risk	Central randomisation
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinded non-surgeon reviewers validated patient-completed questionnaires
Incomplete outcome data (attrition bias) All outcomes	Low risk	Flow patients accounted for 103/108 2 years
Selective reporting (reporting bias)	Low risk	Main outcome data reported
Other bias	Low risk	Funded by competitive research grant Australian Gynaecology Fndoscopy Society authors no conflict of interest reported

Meschia 2004a

Methods	RCT (computer-generated number table, opaque envelopes) on posterior IVS and sacrospinous fixation for vault prolapse Median follow-up: group A 19, group B 17 months
Participants	66 randomised Group A 33, group B 33 No withdrawals or losses to follow-up Inclusion criteria: vault (vaginal cuff) prolapse ICS stage II or more Baseline SUI: group A 11/33, group B 7/33 Baseline overactive bladder: group A 14/33, group B 11/33 Baseline voiding dysfunction: group A 19/33, group B 18/33 Women in Group A were significantly younger than in group B (63 years vs 68 years, P < 0.05)
Interventions	Group A (33): infracoccygeal sacropexy (posterior IVS) using multi-filament Polypropylene tape Group B (33): sacrospinous ligament fixation (vaginal sacrospinous colpopexy) Concomitant surgery: anterior (A 64% B 66%) and posterior (70%, 88%) repair, high closure of pouch of Douglas if indicated (36%, 42%)
Outcomes	Reports the following outcomes at median 7-19 months: 1. awareness of prolapse (subjective success) 2. anterior wall prolapse 3. posterior wall prolapse 4. operative time 5. days in hospital 6. bladder function: SUI, overactive bladder 7. sexual function: dyspareunia
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation
Allocation concealment (selection bias)	Low risk	Adequate allocation concealment
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not stated

Meschia 2004a (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Data complete 66/66
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Unclear risk	No statement

Natale 2010

Methods	Single-centre RCT on vaginal vault suspension at time of vaginal hysterectomy. Multiple surgeons
Participants	229 women with apical POP stage 2 or more Excluded SUI, prior hysterectomy or prolapse or continence surgery All completed one-year follow-up Demographic parameters and previous prolapse surgeries did not differ between the two groups
Interventions	Group A: n= 116 high levator myorrhaphy Group B: n= 113 uterosacral vault suspension Concomitant surgery in all women: vaginal hysterectomy and "tension-free" cystocele repair with self-styled monofilament polypropylene mesh group A113 and group B 106. Operations performed by three different surgeons
Outcomes	Reported outcomes at 1 year: 1. apical prolapse (Stage 2 Point C) 2. anterior compartment prolapse (Stage 2 Point Ba) 3. posterior compartment prolapse (Stage 2 point Bp) 4. sexual function: de novo dyspareunia, PISQ (mean without SDs not included) 5. quality of Life; PQoL (Mean and SDs reported) 6. bladder function:SUI, Overactive bladder, 7. ureteric injury 8. POPq assessment: TVL 9. mesh erosion 10. POPQ, urodynamics, 11. Q-tip testPQoL, 12. Wexner score for constipation 13. PISQ-12
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation

Natale 2010 (*Continued*)

Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Data complete
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Unclear risk	No COI statement

Paraiso 2011

Methods	Single-centre, single-blinded RCT
Participants	inclusion: > 21 years, Stages 2-4 apical post-hysterectomy vaginal prolapse Partcipants were excluded if they were not candidates for general anaesthesia, underwent a prior sacral colpopexy or rectopexy, had a suspicious adnexal mass or other factors that may indicate pelvic malignancy, reported a history of pelvic inflammatory disease, were morbidly obese (BMI > 40 kg/m2), or were scheduled for a concomitant laparoscopic rectopexy with or without sigmoid resection Concomitant continence and prolapse surgery at surgeons discretion
Interventions	Group A (32): laparoscopic SC Group B (35): robotic assisted laparoscopic sacral colpopexy
Outcomes	Reported the following outcomes 1 year: Primary outcome operating time from skin to closure 1. prolapse on examination (Stage 2 or > any site) 2. POPq assessment: Ba, Bp, C TVL (reported mean and range, not included) 3. bladder injury 4. bowel injury 5. mesh exposure 6. operating time 7. hospital stay 8. cost surgery (US dollars) 9. pain score (VAS 0-10) 10. PFDI -20 11. PFIQ -7 12. PISQ
Notes	

Paraiso 2011 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated
Allocation concealment (selection bias)	Low risk	Adequate opaque envelopes
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Patients blinded 12 months
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessors blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Data complete 61/70 reviewed 1 year
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Low risk	Funded Cleveland clinic research institute and authors report no conflict of interest

Rahmanou 2015

Methods	Single-centre RCT
Participants	Symptomatic uterine prolapse Grade 2 and above requesting surgery 132 eligible: Inclusion criteria: with no desire to preserve fertility Exclusion criteria: abnormal cervical cytology or uterine bleeding: enlarged uterus and those not suitable for steep Trendelberg position 101 randomised 1 year group A 32/50; group B 31/51
Interventions	Group A vaginal hysterectomy; group B laparoscopic hysteropexy Performed more than 50 of each intervention: Group A: vaginal hysterectomy group vault attached to uterosacral lig Vicryl 1 and with sacrospinous (PDS 2.0) fixation in those with complete procidentia Group B:uterus suspended permanent polypropylene mesh (Prolite, Atrium) fixed to the cervix anteriorly (ethibond sutures) and reperitonealised
Outcomes	Reported the following outcomes at 1 year: 1. re-operation for prolapse 2. POPq assessments; Point Ba, Bp, C (reported mean with SDs) not included 3. blood loss (reported mean and range not included) 4. hospital stay (reported mean and range not included) 5. quality ol life: ICIQ-VS (reported mean without SD not included)

Rahmanou 2015 (*Continued*)

Notes		
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not stated
Allocation concealment (selection bias)	Low risk	Blinded envelopes
Blinding of participants and personnel (performance bias) All outcomes	High risk	Unable to be blinded
Blinding of outcome assessment (detection bias) All outcomes	High risk	Unable to be blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	Group A hysterectomy: 35/50: Group B hysterectomy 37/51 at 1 year:
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Low risk	No funding and no COI

Rondini 2015

Methods	RCT
Participants	Inclusion criteria: apical defects point C $\geq$ 1, sexually active Exclusion criteria: if not sexually active or prior apical reconstruction surgery Objective success point c < 2 Demographics and PFDI-20, P-QOL, and PISQ-12 equal both groups preoperatively Rrandomised group A 63; group B 61 Declined surgery: group A 9; group B 5 4 years 106/124 group A 50; group B 56
Interventions	Group A (54): sacral colpopexy (prolene mesh: 4 polypropylene sutures anterior and posterior) subtotal hysterectomy in those with uterine prolapse: no posterior repair Group B (56): High uterosacral vault suspension (Shull technique 4 PDS sutures to USL above ischial spine)
Outcomes	Reported outcomes at 1 year full manuscript, 4 years abstract: 1. re-operation prolapse 2. pical compartment prolapse (Point C stage 2 or >) 3. posterior compartment prolapse (Point Bp stage 2 or >) 4. anterior compartment prolapse (Point Ba stage 2 or >)

	5. bladder injury 6. ureteric injury identified at surgery 7. mesh exposure 8. sexual function: PISQ-12 9. quality of life: PFDI-20, PQoL
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Participants were assigned with equal probability using Millers and Park minimal standard method, which allocated patients in a 1:1 ratio
Allocation concealment (selection bias)	Low risk	Group allocation was performed by a gynaecologist at the hospital who did not participate in the baseline assessment, surgery, or postoperative follow-up and the surgeon was unaware of allocation until surgery
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	USLS 54/54: SCP 56/56
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Unclear risk	No statement

Roovers 2004

Methods	RCT multi-centre Definition of cure/failure: failure defined as recurrent prolapse stage $\geq$ 2 plus symptoms of pelvic floor dysfunction Follow-up (mean): 94 months (range 84 to 120) Prolapse assessment: POP-Q
Participants	82 women Inclusion criteria: uterine prolapse stage 2-4 on POP-Q Exclusion criteria: uterus size > 12 weeks gestation, prior hysterectomy, adnexal mass, previous abdominal pelvic surgeries > 2, BMI > 35, prior inflammatory bowel or pelvic disease, faecal incontinence d/t sphincter defect

	Offered participation: 124, 3 excluded, 39 refused to participate, 2 withdrew from abdominal group as wanted vaginal surgery Randomised: 82 (41 in each arm) Analysed: 82 At 8 years follow-up: 74 of the original 84 patients were alive and able to be contacted. 60/74 (81%) completed questionnaires and 31/74 (42%) were examined
Interventions	Group A (41): abdominal: sacral colpopexy with preservation of uterus: colposuspension for SUI Group B (41): vaginal: vaginal hysterectomy with vaginal repair and uterosacral ligament plication: bladder neck needle suspension for SUI Concomitant surgery: anterior colporrhaphy, posterior colporrhaphy, Burch colposuspension, Pereyra or Raz needle bladder neck suspension
Outcomes	Reported following outcomes with reviews 1-year, and median 8 years abstract) 1. re-operation prolapse (performed or planned) 2. operating time 3. blood loss 4. days in hospital 5. bowel injury 6. transfusion 7. quality of life: UDI, DDI, IIQ
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random number chart, computer-generated random number table
Allocation concealment (selection bias)	Low risk	Sealed envelopes
Blinding of participants and personnel (performance bias) All outcomes	High risk	Unblinded
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Non-surgeon review
Incomplete outcome data (attrition bias) All outcomes	Low risk	Incomplete data set: 60/82 completed 7 year review
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Unclear risk	No statement

Svabik 2014

Methods	Single-centre RCT
Participants	Inclusion criteria: symptomatic post-hysterectomy patients with at least two-compartment prolapse (with affected apical/vault compartment, stage II or higher (POP-Q), requesting pelvic floor reconstructive surgery, and diagnosed with a complete unilateral or bilateral avulsion injury Exclusion criteria: nil further stated Assessment pre- and postoperative POP-Q examination, 4D ultrasonography with acquisition of volume data sets at rest, during pelvic floor muscle contraction (PFMC), and on maximum Valsalva manoeuvre, PISQ-12, POPDI, UDI, CRADI 142 reviewed and 72 excluded (70 no avulsion, 2 refused) SSF 34 1 year 31 Mesh : 36 1 year 36
Interventions	Native tissue SSF: all cases: anterior repair with 2.0 Vicryl plus (ethicon), posterior high levatorplasty Vicryl plus 1: 2x Nurolon 1.0 ethicon permanent R sacrospinous ligament Mesh Prolift total ethicon: 3 arms each side with mesh secured to apex with Vicryl plus 2.0 and to introitus posteriorly Primary outcome: Failure defined: Ba, C, or Bp at hymen or below USS definition ≈ 10mm descent of the bladder below the lower margin of the symphysis pubis on maximum Valsalva
Outcomes	Assessed at 3 months and 1 year Reported outcomes at 1 year include: 1. recurrent prolapse (POPq grade 2 or >) 2. mesh exposure 3. Surgery for mesh exposure 4. POPq assessments: Ba, Bp, C, TVL 5. bladder function: de novo SUI 6. sexual function: PISQ-12 end score 7. quality of life (UDI, POPDI, CRADI questionnaires mean and SDs)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer randomisation based on hospital number
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias)	High risk	No attempt to blind

Svabik 2014 (*Continued*)

All outcomes		
Incomplete outcome data (attrition bias) All outcomes	Low risk	1 year 31/34 SSF, Prolift mesh 36/38
Selective reporting (reporting bias)	Low risk	Significant outcome data
Other bias	Low risk	Funded by Czech ministry health and Charles university Prague: one author financial COI

Trabuco 2014

Methods	Single-blinded randomised trial
Participants	113 patients randomised 53 MUS; 57 Burch 104 6 months; MUS 53; 51 Burch
Interventions	Group A Sc with MUS; group B SC with Burch
Outcomes	Reported in abstract with 6-month review: 1. objective continence (defined as above, not included) 2. satisfaction rate (somewhat or completely +ve response, not included) 3. patient perception of improvement (VAS 0-10 not included) 4. bladder function: de novo UUI 5. mesh exposure (statement with no outcomes, not included)
Notes	Authors summary: MUS resulted in greater pt satisfaction higher continence rates compared to Burch standardised surgery No POP outcomes Consort and intention-to-treat not stated

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not stated
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not clear
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessors blinded

Incomplete outcome data (attrition bias) All outcomes	Low risk	6 months MUS 53/53 colposuspension: 51/57
Selective reporting (reporting bias)	Unclear risk	Main prolapse outcomes not reported, focused on continence outcomes in abstract
Other bias	Unclear risk	No statement

BMI = Body mass index
BPMT = behavioural therapy and pelvic floor muscle training
Hb = Haemoglobin
ICS = International Continence Society
IIQ = Incontinence impact questionnaire
IVS = intravaginal slingplasty
LSC = laparoscopically
OAB = Overactive bladder
PDS = Absorbable polydioxanone surgical suture (PDS)
PFDI = Pelvic Floor Distress Inventory
PFIQ = Pelvic Floor Impact Questionnaire
PISQ = Pelvic organ prolapse/urinary Incontinence Sexual Questionnaire
PGI-I= Patient Global Impression of Improvement
POP = Pelvic organ prolapse
POP-Q = Pelvic organ prolapse quantification (according to ICS)
P-QOL= Prolapse Quality of Life Questionnaire
QoL = Quality of Life
RCT = randomised controlled trial
RSC = robotically
SUI = Stress Urinary Incontinence (symptom diagnosis)
TVT = Tension-free vaginal tape
UDI = Urogenital Distress Inventory
UI = Urinary incontinence
USLS = uterosacral colpopexy
UTI = Urinary tract infection
VAS = visual analogue scale

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Altman 2013	Not a RCT
Balci 2011	Not a RCT
Chao 2012	Evaluated effects of intraoperative traction on uterine descent without randomisation of prolapse interventions

(*Continued*)

Heinonen 2011	Heinonen and Nieminen evaluated outcomes of anterior vaginal wall mesh augmentation with concomitant sacrospinous ligament fixation (SSLF) (n = 14) or with concomitant posterior intravaginal slingplasty (IVS) (n = 8) for uterovaginal or vaginal vault prolapse. Due to a predefined decision that papers with less than 20 in each treatment group would not be included in the review the manuscript was excluded
Juneja 2010	Juneja and colleagues compared in a pilot randomised study hysterectomy (n = 9) versus no hysterectomy (n = 7) for uterine prolapse in conjunction with posterior infracoccygeal colpopexy. Due to a pre-defined decision that papers with less than 20 in each treatment group would not be included in the review the manuscript was excluded

RCT = Randomised controlled trial

Characteristics of ongoing studies *[ordered by study ID]*

Cortesse 2010

Trial name or title	ATHENA
Methods	RCT
Participants	Women with occult UI
Interventions	POP+SUI surgery vs POP surgery alone
Outcomes	
Starting date	
Contact information	
Notes	

Glazener 2009

Trial name or title	PROSPECT (PROlapse Surgery: Pragmatic Evaluaiton and randomised Controlled Trials)
Methods	RCT
Participants	Women having prolapse surgery
Interventions	Anterior and posterior repair (colporrhaphy) with or without non-absorbable or biological mesh inlay, or mesh kit
Outcomes	Prolapse symptoms (POP-SS); prolapse stage (POP-Q), economic outcomes
Starting date	01 09 2009

Glazener 2009 (*Continued*)

Contact information	c.glazener@abdn.ac.uk
Notes	HTA funded study in UK

van der Steen 2010

Trial name or title	CUPIDO 1 and CUPIDO 2
Methods	RCT
Participants	Women with SUI (CUPIDO 1) and women with occult SUI (CUPIDO 2)
Interventions	POP+SUI surgery vs POP surgery alone
Outcomes	
Starting date	
Contact information	
Notes	

Verleyen 2004

Trial name or title	Porcine dermis versus Vicryl plug in Raz cystocele repair
Methods	
Participants	79 women (76 with concomitant prolapse)
Interventions	RCT, porcine dermis versus Vicryl
Outcomes	UDI, IIQ, urinary urgency, recurrent cystocele
Starting date	2003?
Contact information	Dr P Verleyen, University Hospitals, Gasthuisberg
Notes	Abstract of ongoing study reported ICS/IUGA Paris 2004

IIQ = Incontinence impact questionnaire
POP = Pelvic organ prolapse
POP-Q = Pelvic organ prolapse quantification (according to ICS)
RCT = randomised controlled trial
SUI = Stress Urinary Incontinence
UDI = Urogenital Distress Inventory

UI = urinary infection

DATA AND ANALYSES

Comparison 1. Vaginal procedure versus sacral colpopexy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Awareness of prolapse (2 years)	3	277	Risk Ratio (M-H, Fixed, 95% CI)	2.11 [1.06, 4.21]
1.1 Total vaginal mesh versus abdominal sacrocolpopexy	1	108	Risk Ratio (M-H, Fixed, 95% CI)	4.15 [0.48, 35.94]
1.2 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy	2	169	Risk Ratio (M-H, Fixed, 95% CI)	1.90 [0.91, 3.93]
2 Repeat surgery (2-4 years)	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Repeat surgery prolapse (2-4 years)	4	383	Risk Ratio (M-H, Fixed, 95% CI)	2.28 [1.20, 4.32]
2.2 Repeat surgery for Urinary incontinence 2 years	4	395	Risk Ratio (M-H, Fixed, 95% CI)	1.87 [0.72, 4.86]
3 Any recurrent prolapse (1-2 years)	4	390	Risk Ratio (M-H, Fixed, 95% CI)	1.89 [1.33, 2.70]
4 Mesh exposure (1-4 years)	6	574	Risk Ratio (M-H, Fixed, 95% CI)	1.13 [0.47, 2.69]
4.1 Vaginal mesh versus abdominal sacrocolpopexy	2	178	Risk Ratio (M-H, Fixed, 95% CI)	2.40 [0.74, 7.83]
4.2 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy	3	286	Risk Ratio (M-H, Fixed, 95% CI)	0.31 [0.03, 2.91]
4.3 Uterosacral colpopexy versus sacral colpopexy	1	110	Risk Ratio (M-H, Fixed, 95% CI)	0.21 [0.01, 4.22]
5 Injuries	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
5.1 Bladder	5	511	Risk Ratio (M-H, Fixed, 95% CI)	0.57 [0.14, 2.36]
5.2 Bowel	3	306	Risk Ratio (M-H, Fixed, 95% CI)	0.63 [0.12, 3.23]
6 Repeat surgery for mesh exposure (2-4 years)	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7 Objective failure (2-4 years)	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Anterior compartment prolapse (2-4 years)	2	199	Risk Ratio (M-H, Fixed, 95% CI)	4.02 [1.71, 9.49]
7.2 Apical compartment prolapse (2-4 years)	3	275	Risk Ratio (M-H, Fixed, 95% CI)	8.15 [2.71, 24.49]
7.3 Posterior compartment prolapse (2-4 years)	2	199	Risk Ratio (M-H, Fixed, 95% CI)	3.43 [1.10, 10.66]
8 POPQ assessment (2 years)	1		Std. Mean Difference (IV, Fixed, 95% CI)	Subtotals only
8.1 Point Ba (POPQ)	1	108	Std. Mean Difference (IV, Fixed, 95% CI)	0.80 [0.41, 1.19]
8.2 Point Bp (POPQ)	1	108	Std. Mean Difference (IV, Fixed, 95% CI)	0.77 [0.38, 1.16]
8.3 Point C (POPQ)	1	108	Std. Mean Difference (IV, Fixed, 95% CI)	0.50 [0.11, 0.88]
8.4 Total vaginal length	1	108	Std. Mean Difference (IV, Fixed, 95% CI)	-0.89 [-1.29, -0.50]
9 Stress urinary incontinence (2 years)	3	263	Risk Ratio (M-H, Fixed, 95% CI)	1.86 [1.17, 2.94]
9.1 vaginal mesh versus abdominal sacrocolpopexy	1	108	Risk Ratio (M-H, Fixed, 95% CI)	1.93 [0.84, 4.40]

9.2 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy (persistent)	2	155	Risk Ratio (M-H, Fixed, 95% CI)	1.82 [1.05, 3.17]
10 Urge incontinence (de novo (2 years)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
10.1 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy (de novo)	1	62	Risk Ratio (M-H, Fixed, 95% CI)	1.61 [0.68, 3.81]
11 Urinary Voiding dysfunction (de novo)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
11.1 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy (de novo)	1	75	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.07, 15.82]
12 Dyspareunia	3	106	Risk Ratio (M-H, Fixed, 95% CI)	2.53 [1.17, 5.50]
12.1 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy (persistent)	3	106	Risk Ratio (M-H, Fixed, 95% CI)	2.53 [1.17, 5.50]
13 Sexual function	1	110	Mean Difference (IV, Fixed, 95% CI)	7.90 [0.70, 15.10]
13.1 Pelvic floor distress inventory (PFD1-20) 0-300	1	110	Mean Difference (IV, Fixed, 95% CI)	7.90 [0.70, 15.10]
14 Quality of life and satisfaction (4 years)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
14.1 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ)	1	110	Mean Difference (IV, Fixed, 95% CI)	-1.20 [-4.35, 1.95]
14.2 Prolapse quality of life questionnaire (P-QOL) 0-100	1	110	Mean Difference (IV, Fixed, 95% CI)	22.70 [-7.53, 52.93]
15 Operating time (minutes)	4	403	Mean Difference (IV, Fixed, 95% CI)	-21.49 [-26.00, -14.98]
15.1 vaginal sacrospinous colpopexy versus sacral colpopexy	3	293	Mean Difference (IV, Fixed, 95% CI)	-21.04 [-29.94, -12.15]
15.2 vaginal mesh versus sacral colpopexy	0	0	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
15.3 uterosacral colpopexy versus sacral colpopexy	1	110	Mean Difference (IV, Fixed, 95% CI)	-22.0 [-31.56, -12.44]
16 Length of hospital stay	4	403	Mean Difference (IV, Random, 95% CI)	0.19 [-0.50, 0.89]
16.1 vaginal sacrospinous colpopexy versus sacral colpopexy	3	293	Mean Difference (IV, Random, 95% CI)	-0.12 [-1.13, 0.90]
16.2 uterosacral colpopexy versus sacral colpopexy	1	110	Mean Difference (IV, Random, 95% CI)	0.80 [0.57, 1.03]
17 Blood transfusion	3	277	Risk Ratio (M-H, Fixed, 95% CI)	0.26 [0.04, 1.57]
17.1 Total vaginal mesh versus abdominal sacrocolpopexy	1	108	Risk Ratio (M-H, Fixed, 95% CI)	0.32 [0.01, 7.72]
17.2 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy	2	169	Risk Ratio (M-H, Fixed, 95% CI)	0.24 [0.03, 2.11]

Comparison 2. Vaginal surgery with mesh versus without mesh

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Awareness of prolapse (3 years)	1	54	Risk Ratio (M-H, Fixed, 95% CI)	1.08 [0.35, 3.30]
2 Repeat surgery (1-3 years)	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Prolapse	5	497	Risk Ratio (M-H, Fixed, 95% CI)	0.69 [0.30, 1.60]
2.2 Urinary incontinence	2	220	Risk Ratio (M-H, Fixed, 95% CI)	4.91 [0.86, 27.94]
3 Recurrent prolapse on examination (1-3 years)	4		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
3.1 hymen or beyond anterior compartment	1	169	Risk Ratio (M-H, Random, 95% CI)	0.84 [0.52, 1.38]
3.2 hymen or beyond apical compartment	1	169	Risk Ratio (M-H, Random, 95% CI)	0.50 [0.21, 1.18]
3.3 hymen or beyond posterior compartment	1	169	Risk Ratio (M-H, Random, 95% CI)	0.11 [0.03, 0.45]
3.4 POP	3	269	Risk Ratio (M-H, Random, 95% CI)	0.36 [0.09, 1.40]
4 Injuries	4		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Bladder	4	445	Risk Ratio (M-H, Fixed, 95% CI)	3.00 [0.91, 9.89]
4.2 Bowel	3	389	Risk Ratio (M-H, Fixed, 95% CI)	3.0 [0.12, 72.65]
5 Objective failure	2	336	Risk Ratio (M-H, Fixed, 95% CI)	0.78 [0.45, 1.34]
5.1 Anterior vaginal prolapse	2	111	Risk Ratio (M-H, Fixed, 95% CI)	0.61 [0.31, 1.20]
5.2 Apical vaginal prolapse	2	111	Risk Ratio (M-H, Fixed, 95% CI)	3.20 [0.34, 29.78]
5.3 Posterior vaginal prolapse	2	114	Risk Ratio (M-H, Fixed, 95% CI)	0.85 [0.29, 2.45]
6 POPQ assessment (1 year)	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
6.1 Point Ba POPQ	2	239	Mean Difference (IV, Random, 95% CI)	-1.71 [-2.88, -0.55]
6.2 Point Bp POPQ	2	239	Mean Difference (IV, Random, 95% CI)	-0.59 [-1.07, -0.12]
6.3 Point C POPQ	2	239	Mean Difference (IV, Random, 95% CI)	-1.93 [-3.99, 0.13]
7 Stress urinary incontinence (1-3 years))	6		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Mesh versus no mesh (de novo)	4	295	Risk Ratio (M-H, Fixed, 95% CI)	1.37 [0.94, 1.99]
7.2 native tissue versus mesh	3	178	Risk Ratio (M-H, Fixed, 95% CI)	1.12 [0.66, 1.92]
7.3 high levator myorrhaphy versus uterosacral colpopexy (de novo)	1	116	Risk Ratio (M-H, Fixed, 95% CI)	0.33 [0.16, 0.68]
7.4 high levator myorrhaphy versus uterosacral colpopexy	1	116	Risk Ratio (M-H, Fixed, 95% CI)	1.75 [0.54, 5.66]
8 Urge incontinence	4	362	Risk Ratio (M-H, Fixed, 95% CI)	1.42 [0.72, 2.82]
8.1 sacrospinous colpopexy versus PIVS mesh (de novo)	2	95	Risk Ratio (M-H, Fixed, 95% CI)	1.47 [0.30, 7.31]
8.2 vaginal colpopexy versus transvaginal polypropylene mesh (de novo)	1	151	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.36, 2.30]
8.3 high levator myorrhaphy versus uterosacral colpopexy (de novo)	1	116	Risk Ratio (M-H, Fixed, 95% CI)	3.5 [0.76, 16.14]
9 Voiding dysfunction	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
9.1 sacrospinous colpopexy versus PIVS mesh	2	111	Risk Ratio (M-H, Fixed, 95% CI)	0.59 [0.29, 1.24]

10 Dyspareunia (1-3 years)	5	501	Risk Ratio (M-H, Fixed, 95% CI)	1.21 [0.55, 2.66]
10.1 sacrospinous colpopexy versus PIVS mesh	1	66	Risk Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 7.90]
10.2 transvaginal polypropylene mesh versus native tissue repair	4	435	Risk Ratio (M-H, Fixed, 95% CI)	1.35 [0.59, 3.10]
11 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ) (1 year)	3	180	Mean Difference (IV, Fixed, 95% CI)	-1.72 [-3.57, 0.14]
12 Patient Global Impression of Improvement (PGI-I)(much or very much better 3 years)	1	51	Odds Ratio (M-H, Fixed, 95% CI)	1.75 [0.37, 8.24]
12.1 transvaginal polypropylene mesh versus native tissue repair	1	51	Odds Ratio (M-H, Fixed, 95% CI)	1.75 [0.37, 8.24]
13 Quality of life PROLAPSE	1	167	Mean Difference (IV, Fixed, 95% CI)	5.70 [1.53, 9.87]
13.1 Prolapse Quality of Life Questioannaire (P-QOL) 0-100	1	167	Mean Difference (IV, Fixed, 95% CI)	5.70 [1.53, 9.87]
14 Operating time (mins)	3		Mean Difference (IV, Random, 95% CI)	Subtotals only
14.1 Transvaginal mesh versus native tissue repair	3	294	Mean Difference (IV, Random, 95% CI)	-3.27 [-14.96, 8.43]
15 Blood transfusion	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
15.1 vaginal mesh versus transvaginal colpopexy	2	249	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.17, 5.46]

Comparison 3. Vaginal surgery: comparison of one native tissue repair versus another

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Awareness of prolapse (2 years)	1	303	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.58, 1.43]
2 Repeat surgery (2 years)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Prolapse	1	316	Risk Ratio (M-H, Fixed, 95% CI)	1.20 [0.33, 4.40]
3 Injuries	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Bladder	1	316	Risk Ratio (M-H, Fixed, 95% CI)	8.67 [0.47, 159.64]
3.2 ureteric injury (detected intra-operative)	2	544	Risk Ratio (M-H, Fixed, 95% CI)	15.91 [2.13, 118.51]
3.3 ureteric injury (detected post-operatively)	2	544	Risk Ratio (M-H, Fixed, 95% CI)	2.89 [0.12, 70.38]
3.4 Bowel	1	316	Risk Ratio (M-H, Fixed, 95% CI)	0.32 [0.01, 7.82]
4 Objective failure	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Anterior compartment prolapse (1-2 years)	2	537	Risk Ratio (M-H, Fixed, 95% CI)	1.15 [0.85, 1.57]
4.2 Apical compartment prolapse (1-2 years)	2	536	Risk Ratio (M-H, Fixed, 95% CI)	0.80 [0.38, 1.67]
4.3 Posterior compartment prolapse (1-2 years)	2	537	Risk Ratio (M-H, Fixed, 95% CI)	1.14 [0.63, 2.06]
5 POPQ assessment	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only

5.1 Point Ba POPQ	1	374	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-0.39, 0.19]
5.2 Point Bp POPQ	1	374	Mean Difference (IV, Fixed, 95% CI)	0.0 [-0.04, 0.04]
6 Stress urinary incontinence de novo(1 year)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
6.1 uterosacral colpopexy versus high levator myorrhaphy de novo	1	228	Risk Ratio (M-H, Fixed, 95% CI)	1.60 [0.64, 3.98]
7 Urge incontinence	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 uterosacral colpopexy versus high levator myorrhaphy (de novo)	1	116	Risk Ratio (M-H, Fixed, 95% CI)	3.5 [0.76, 16.14]
8 Dyspareunia (1 year)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
8.1 uterosacral colpopexy versus levator myorrhaphy	1	228	Risk Ratio (M-H, Fixed, 95% CI)	1.19 [0.73, 1.95]
8.2 uterosacral colpopexy versus high levator myorrhaphy (de novo)	1	228	Risk Ratio (M-H, Fixed, 95% CI)	1.31 [0.50, 3.39]
9 Blood transfusion	1	315	Risk Ratio (M-H, Fixed, 95% CI)	1.67 [0.50, 5.60]

Comparison 4. Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Awareness of prolapse	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Vaginal hysterectomy vs vaginal uterus-preserving surgery (1 year review)	1	208	Risk Ratio (M-H, Fixed, 95% CI)	0.98 [0.33, 2.94]
1.2 Vaginal hysterectomy vs abdominal uterus-preserving surgery (1 year review)	1	84	Risk Ratio (M-H, Fixed, 95% CI)	0.38 [0.15, 0.98]
2 Repeat prolapse surgery	5		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
2.1 Vaginal vs abdominal hysterectomy	1	47	Risk Ratio (M-H, Random, 95% CI)	2.88 [0.12, 67.29]
2.2 Vaginal hysterectomy vs vaginal uterus-preserving surgery (1 year review)	2	270	Risk Ratio (M-H, Random, 95% CI)	1.31 [0.19, 8.91]
2.3 Vaginal hysterectomy vs abdominal uterus-preserving surgery 1-8 year review)	2	182	Risk Ratio (M-H, Random, 95% CI)	0.68 [0.36, 1.31]
3 Objective failure any site (POP)	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Vaginal vs abdominal hysterectomy	1	47	Risk Ratio (M-H, Fixed, 95% CI)	4.8 [0.24, 94.90]
3.2 Vag hysterectomy vs vag uterus-preserving surgery (1 year review)	1	204	Risk Ratio (M-H, Fixed, 95% CI)	0.90 [0.67, 1.21]
4 Bladder injuries	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only

4.1 Vag hysterectomy vs vag uterus-preserving surgery (1 year review)	1	65	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Bowel injuries (1 year review)	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
5.1 Vag hysterectomy vs vag uterus-preserving surgery	1	67	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	82	Risk Ratio (M-H, Fixed, 95% CI)	3.0 [0.13, 71.56]
6 Mesh exposure	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
6.1 Vaginal vs abdominal hysterectomy	1	47	Risk Ratio (M-H, Fixed, 95% CI)	0.32 [0.01, 7.48]
6.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	82	Risk Ratio (M-H, Fixed, 95% CI)	0.2 [0.01, 4.04]
7 Repeat surgery for mesh exposure	0		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Vag hysterectomy vs abdo uterus-preserving surgery	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
8 Repeat surgery for incontinence	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
8.1 Vag hysterectomy vs vag uterus-preserving surgery	1	204	Risk Ratio (M-H, Fixed, 95% CI)	4.0 [0.45, 35.18]
9 Anterior compartment prolapse (1 year review)	3		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
9.1 Vag hysterectomy vs vag uterus-preserving surgery	2	265	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.53, 1.70]
9.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	83	Risk Ratio (M-H, Random, 95% CI)	1.04 [0.60, 1.82]
10 Apical compartment prolapse	3		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
10.1 Vag hysterectomy vs vag uterus-preserving surgery	2	267	Risk Ratio (M-H, Random, 95% CI)	0.80 [0.04, 17.59]
10.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	82	Risk Ratio (M-H, Random, 95% CI)	1.0 [0.15, 6.76]
11 Posterior compartment prolapse	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
11.1 Vag hysterectomy vs vag uterus-preserving surgery	2	265	Risk Ratio (M-H, Fixed, 95% CI)	2.43 [1.22, 4.87]
11.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	83	Risk Ratio (M-H, Fixed, 95% CI)	3.07 [0.66, 14.35]
12 POPQ assessment Point Ba	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
12.1 Vag hysterectomy vs vag uterus-preserving surgery	1	57	Mean Difference (IV, Fixed, 95% CI)	0.40 [-0.48, 1.28]
12.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	208	Mean Difference (IV, Fixed, 95% CI)	-0.30 [-0.65, 0.05]
13 POPQ assessment: Point Bp	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
13.1 Vag hysterectomy vs vag uterus-preserving surgery	1	57	Mean Difference (IV, Fixed, 95% CI)	0.20 [-0.45, 0.85]
13.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	208	Mean Difference (IV, Fixed, 95% CI)	0.10 [-0.14, 0.34]
14 POPQ assessment: Point C	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
14.1 Vag hysterectomy vs abdo uterus-preserving surgery	1	208	Mean Difference (IV, Fixed, 95% CI)	0.80 [0.27, 1.33]

15 POPQ assessment: Total vaginal length	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
15.1 Vag hysterectomy vs vag uterus-preserving surgery	2	265	Mean Difference (IV, Random, 95% CI)	-0.98 [-1.86, -0.11]
16 Dyspareunia	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
16.1 Vag hysterectomy vs vag uterus-preserving surgery	1	158	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.27, 3.96]
17 Quality of life:Pelvic organ prolapse/ urinary incontinence sexual questionnaire	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
17.1 Vag hysterectomy vs vag uterus-preserving surgery	1	208	Mean Difference (IV, Fixed, 95% CI)	0.0 [-1.23, 1.23]
18 Operating time (minutes)	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
18.1 Vag hysterectomy vs vag uterus-preserving surgery	1	207	Mean Difference (IV, Fixed, 95% CI)	13.0 [8.26, 17.74]
18.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	83	Mean Difference (IV, Fixed, 95% CI)	10.0 [8.20, 11.80]
19 Hospital stay	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
19.1 Vag hysterectomy vs vag uterus-preserving surgery	1	207	Mean Difference (IV, Fixed, 95% CI)	0.0 [-0.27, 0.27]
19.2 Vag hysterectomy vs abdo uterus-preserving surgery	1	83	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-0.21, 0.01]
20 Blood transfusion	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
20.1 Vag hysterectomy vs abdo uterus-preserving surgery	1	82	Risk Ratio (M-H, Fixed, 95% CI)	2.0 [0.19, 21.21]

Comparison 5. Sacral colpopexy mesh versus biological

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Awareness of prolapse (1-5 years)	1	58	Risk Ratio (M-H, Fixed, 95% CI)	0.33 [0.04, 3.02]
1.1 polypropylene mesh versus cadaveric fascia	1	58	Risk Ratio (M-H, Fixed, 95% CI)	0.33 [0.04, 3.02]
2 Prolapse surgery (1-5 year)	2	173	Risk Ratio (M-H, Fixed, 95% CI)	1.0 [0.07, 15.24]
2.1 polypropylene mesh versus cadaveric fascia	1	58	Risk Ratio (M-H, Fixed, 95% CI)	1.0 [0.07, 15.24]
2.2 polypropylene mesh versus porcine dermis graft	1	115	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Surgery stress urinary incontinence 5 years	1	58	Risk Ratio (M-H, Fixed, 95% CI)	3.0 [0.13, 70.74]
3.1 polypropylene mesh versus cadaveric fascia	1	58	Risk Ratio (M-H, Fixed, 95% CI)	3.0 [0.13, 70.74]
4 Recurrent prolapse (any site on examination (1-5 year))	2	173	Risk Ratio (M-H, Fixed, 99% CI)	0.49 [0.20, 1.25]
4.1 polypropylene mesh versus cadaveric fascia	1	58	Risk Ratio (M-H, Fixed, 99% CI)	0.22 [0.03, 1.48]
4.2 polypropylene mesh versus porcine dermis graft	1	115	Risk Ratio (M-H, Fixed, 99% CI)	0.71 [0.24, 2.14]

5 Mesh exposure (1-5 year)	2	173	Risk Ratio (M-H, Fixed, 95% CI)	2.35 [0.36, 15.40]
5.1 polypropylene mesh versus cadaveric fascia	1	58	Risk Ratio (M-H, Fixed, 95% CI)	2.0 [0.19, 20.86]
5.2 polypropylene mesh versus porcine dermis SC	1	115	Risk Ratio (M-H, Fixed, 95% CI)	3.05 [0.13, 73.39]
6 Bladder injury	2	224	Risk Ratio (M-H, Fixed, 95% CI)	2.51 [0.10, 60.13]
6.1 polypropylene mesh versus porcine dermis graft	1	125	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.2 polypropylene mesh versus cadaveric fascia	1	99	Risk Ratio (M-H, Fixed, 95% CI)	2.51 [0.10, 60.13]
7 Bowel injury	1	115	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
7.1 polypropylene mesh versus porcine dermis graft	1	115	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
7.2 polypropylene mesh versus cadaveric fascia	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
8 Surgery mesh exposure 1-5 years	2	173	Risk Ratio (M-H, Fixed, 95% CI)	2.0 [0.19, 20.86]
8.1 polypropylene mesh versus cadaveric fascia	1	58	Risk Ratio (M-H, Fixed, 95% CI)	2.0 [0.19, 20.86]
8.2 polypropylene mesh versus porcine dermis graft	1	115	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
9 apical prolapse	2	204	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
10 POPQ assessment	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
10.1 Point Ba POPQ	1	58	Mean Difference (IV, Fixed, 95% CI)	0.8 [0.20, 1.40]
10.2 Point Bp POPQ	1	58	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-0.51, 0.11]
10.3 Point C POPQ	1	58	Mean Difference (IV, Fixed, 95% CI)	0.31 [-0.41, 1.03]
10.4 Total vaginal length	1	58	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-0.69, 0.49]
11 Dyspareunia (de novo 1 year))	1	115	Risk Ratio (M-H, Fixed, 95% CI)	1.47 [0.26, 8.50]
11.1 polypropylene mesh versus porcine graft SC	1	115	Risk Ratio (M-H, Fixed, 95% CI)	1.47 [0.26, 8.50]
11.2 polypropylene mesh versus cadaveric fascia	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
12 Sexual function	1	115	Mean Difference (IV, Fixed, 95% CI)	-1.60 [-3.67, 0.47]
12.1 Pelvic organ prolapse/ urinary incontinence sexual questionnare (PISQ)	1	115	Mean Difference (IV, Fixed, 95% CI)	-1.60 [-3.67, 0.47]
13 Quality of life PROLAPSE (i year)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
13.1 Pelvic Floor Impact Questionnaire (PFIQ-7) 0-400	1	115	Mean Difference (IV, Fixed, 95% CI)	-7.0 [-29.48, 15.48]
13.2 Pelvic floor distress inventory (PFD1-20) 0-300	1	115	Mean Difference (IV, Fixed, 95% CI)	-6.0 [-25.75, 13.75]
14 Operating time (mins)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
14.1 polypropylene mesh versus cadaveric fascia	1	100	Mean Difference (IV, Random, 95% CI)	-6.0 [-31.51, 19.51]
15 Hospital stay	1	115	Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
15.1 polypropylene mesh versus porcine dermis	1	115	Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
16 Blood transfusion	2	215	Risk Ratio (M-H, Fixed, 95% CI)	2.56 [0.11, 61.45]
16.1 polypropylene mesh versus porcine dermis graft	1	115	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

16.2 polypropylene mesh versus cadaveric fascia	1	100	Risk Ratio (M-H, Fixed, 95% CI)	2.56 [0.11, 61.45]
17 pain at normal acivities (week one)	1	78	Mean Difference (IV, Fixed, 95% CI)	-0.90 [-1.86, 0.06]
18 Surgery or pessary for prolapse	3	256	Risk Ratio (M-H, Fixed, 95% CI)	0.71 [0.24, 2.15]

Comparison 6. Sacral colpopexy: Laparoscopic versus other

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Repeat Prolapse Surgery	1	47	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.16, 6.80]
1.1 laparoscopic versus open sacral colpopexy	1	47	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.16, 6.80]
1.2 laparoscopic versus robotic sacral colpopexy	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Recurrent prolapse (any site on examination)	2	96	Risk Ratio (M-H, Fixed, 95% CI)	0.87 [0.25, 3.06]
2.1 laparoscopic versus open sacral colpopexy	1	47	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.16, 6.80]
2.2 laparoscopic versus robotic sacral colpopexy	1	49	Risk Ratio (M-H, Fixed, 95% CI)	0.75 [0.14, 4.12]
3 Mesh exposure	3	186	Risk Ratio (M-H, Fixed, 95% CI)	0.22 [0.01, 4.40]
3.1 laparoscopic versus open sacral colpopexy	1	47	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.2 laparoscopic versus robotic sacral colpopexy	2	139	Risk Ratio (M-H, Fixed, 95% CI)	0.22 [0.01, 4.40]
4 Bladder injury	3	199	Risk Ratio (M-H, Fixed, 95% CI)	1.75 [0.43, 7.14]
4.1 laparoscopic versus open sacral colpopexy	1	53	Risk Ratio (M-H, Fixed, 95% CI)	3.11 [0.13, 73.09]
4.2 laparoscopic versus robotic sacral colpopexy	2	146	Risk Ratio (M-H, Fixed, 95% CI)	1.48 [0.30, 7.24]
5 Bowel injury	2	108	Risk Ratio (M-H, Fixed, 95% CI)	0.36 [0.04, 3.32]
5.1 laparoscopic versus open sacral colpopexy	1	47	Risk Ratio (M-H, Fixed, 95% CI)	0.35 [0.01, 8.11]
5.2 laparoscopic versus robotic sacral colpopexy	1	61	Risk Ratio (M-H, Fixed, 95% CI)	0.37 [0.02, 8.66]
6 Point Ba	1	78	Mean Difference (IV, Fixed, 95% CI)	0.05 [-0.31, 0.41]
6.1 laparoscopic versus robotic sacral colpopexy	1	78	Mean Difference (IV, Fixed, 95% CI)	0.05 [-0.31, 0.41]
7 Point Bp	2	125	Mean Difference (IV, Fixed, 95% CI)	-0.40 [-0.76, -0.05]
7.1 laparoscopic versus open sacral colpopexy	1	47	Mean Difference (IV, Fixed, 95% CI)	-0.60 [-1.21, 0.01]
7.2 laparoscopic versus robotic sacral colpopexy	1	78	Mean Difference (IV, Fixed, 95% CI)	-0.30 [-0.74, 0.14]
8 Point C	3	197	Mean Difference (IV, Fixed, 95% CI)	0.15 [-0.52, 0.83]
8.1 laparoscopic versus open sacral colpopexy	2	119	Mean Difference (IV, Fixed, 95% CI)	0.08 [-0.65, 0.80]

8.2 laparoscopic versus robotic sacral colpopexy	1	78	Mean Difference (IV, Fixed, 95% CI)	0.70 [-1.23, 2.63]
9 Stress urinary incontinence (de novo and persistent)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
10 Quality of life PROLAPSE	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
10.1 questionnaire (P-QOL) 0-100	1	47	Mean Difference (IV, Fixed, 95% CI)	0.70 [-19.14, 20.54]
10.2 Pelvic Floor Impact Questionnaire (PFIQ-7) 0-400	1	78	Mean Difference (IV, Fixed, 95% CI)	21.0 [-46.76, 88.76]
10.3 Pelvic floor distress inventory (PFD1-20) 0-300	1	78	Mean Difference (IV, Fixed, 95% CI)	21.0 [-46.76, 88.76]
11 Operating time (mins)	4	265	Mean Difference (IV, Random, 95% CI)	-12.30 [-52.65, 28.05]
11.1 laparoscopic versus open sacral-colpopexy	2	120	Mean Difference (IV, Random, 95% CI)	19.93 [2.42, 37.45]
11.2 laparoscopic versus robotic sacral colpopexy	2	145	Mean Difference (IV, Random, 95% CI)	-45.27 [-85.45, -5.09]
12 Hospital stay	3	194	Mean Difference (IV, Random, 95% CI)	-0.99 [-1.85, -0.14]
12.1 Laparoscopic versus open sacral colpopexy	2	126	Mean Difference (IV, Random, 95% CI)	-1.35 [-2.12, -0.57]
12.2 laparoscopic versus robotic sacral colpopexy	1	68	Mean Difference (IV, Random, 95% CI)	-0.39 [-0.81, 0.03]
13 Blood transfusion	1	78	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
13.1 laparoscopic versus robotic sacral colpopexy	1	78	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
14 continence surgery	2	125	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.24, 4.29]
14.1 laparoscopic versus open sacral colpopexy	1	47	Risk Ratio (M-H, Fixed, 95% CI)	0.32 [0.01, 7.48]
14.2 laparoscopic versus robotic sacral colpopexy	1	78	Risk Ratio (M-H, Fixed, 95% CI)	1.58 [0.28, 8.94]

Comparison 7. Sacral colpopexy with continence surgery vs without

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Awareness of prolapse (7 years)	1	144	Risk Ratio (M-H, Fixed, 95% CI)	1.19 [0.75, 1.89]
2 Repeat prolapse surgery or pessary (2-7 years))	3	256	Risk Ratio (M-H, Fixed, 95% CI)	0.71 [0.24, 2.15]
3 Repeat surgery for incontinence (7 years))	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4 Objective failure any site (POP 7 years)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
5 POPQ assessment Point Ba	1	322	Mean Difference (IV, Fixed, 95% CI)	-0.40 [-0.62, -0.18]
6 POPQ assessment: Point Bp	1	322	Mean Difference (IV, Fixed, 95% CI)	0.30 [0.11, 0.49]
7 POPQ assessment: Point C	1	322	Mean Difference (IV, Fixed, 95% CI)	0.20 [-0.11, 0.51]
8 Stress urinary incontinence (4-7 years)	3	295	Risk Ratio (M-H, Random, 95% CI)	1.13 [0.63, 2.04]
9 Operating time (minutes)	1	322	Mean Difference (IV, Fixed, 95% CI)	20.0 [7.44, 32.56]

10 Blood transfusion	1	66	Risk Ratio (M-H, Fixed, 95% CI)	0.94 [0.20, 4.33]

Analysis 1.1. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 1 Awareness of prolapse (2 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 1 Awareness of prolapse (2 years)

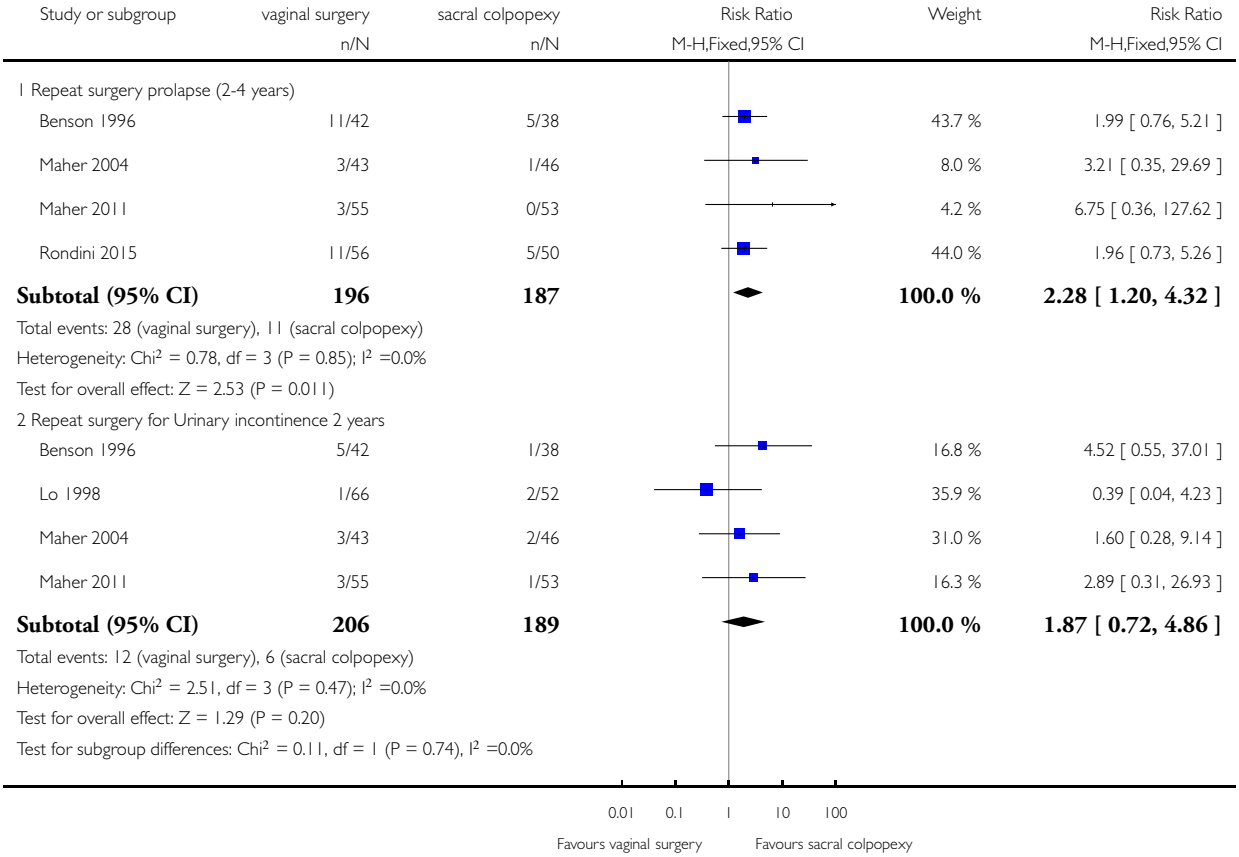
Study or subgroup	vaginal surgery n/N	sacral colpopexy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 Total vaginal mesh versus abdominal sacrocolpopexy					
Maher 2011	4/53	1/55		9.6 %	4.15 [0.48, 35.94]
Subtotal (95% CI)	**53**	**55**		**9.6 %**	**4.15 [0.48, 35.94]**
Total events: 4 (vaginal surgery), 1 (sacral colpopexy)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.29 (P = 0.20)					
2 Vaginal sacrospinous colpopexy vs abdominal sacral colpopexy					
Benson 1996	14/42	6/38		61.9 %	2.11 [0.90, 4.94]
Maher 2004	4/43	3/46		28.5 %	1.43 [0.34, 6.01]
Subtotal (95% CI)	**85**	**84**		**90.4 %**	**1.90 [0.91, 3.93]**
Total events: 18 (vaginal surgery), 9 (sacral colpopexy)					
Heterogeneity: Chi^2 = 0.21, df = 1 (P = 0.65); I^2 =0.0%					
Test for overall effect: Z = 1.72 (P = 0.086)					
Total (95% CI)	**138**	**139**		**100.0 %**	**2.11 [1.06, 4.21]**
Total events: 22 (vaginal surgery), 10 (sacral colpopexy)					
Heterogeneity: Chi^2 = 0.66, df = 2 (P = 0.72); I^2 =0.0%					
Test for overall effect: Z = 2.13 (P = 0.033)					
Test for subgroup differences: Chi^2 = 0.45, df = 1 (P = 0.50), I^2 =0.0%					

Analysis 1.2. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 2 Repeat surgery (2-4 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 2 Repeat surgery (2-4 years)



Analysis 1.3. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 3 Any recurrent prolapse (1-2 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 3 Any recurrent prolapse (1-2 years)

Study or subgroup	vaginal surgery n/N	sacral colpopexy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Lim 2012	10/38	9/38		25.7 %	1.11 [0.51, 2.42]
Maher 2004	13/42	11/46		29.9 %	1.29 [0.65, 2.57]
Maher 2011	32/55	12/53		34.8 %	2.57 [1.49, 4.44]
Lo 1998	13/66	3/52		9.6 %	3.41 [1.03, 11.35]
Total (95% CI)	**201**	**189**		**100.0 %**	**1.89 [1.33, 2.70]**

Total events: 68 (vaginal surgery), 35 (sacral colpopexy)

Heterogeneity: Chi^2 = 5.10, df = 3 (P = 0.16); I^2 =41%

Test for overall effect: Z = 3.54 (P = 0.00040)

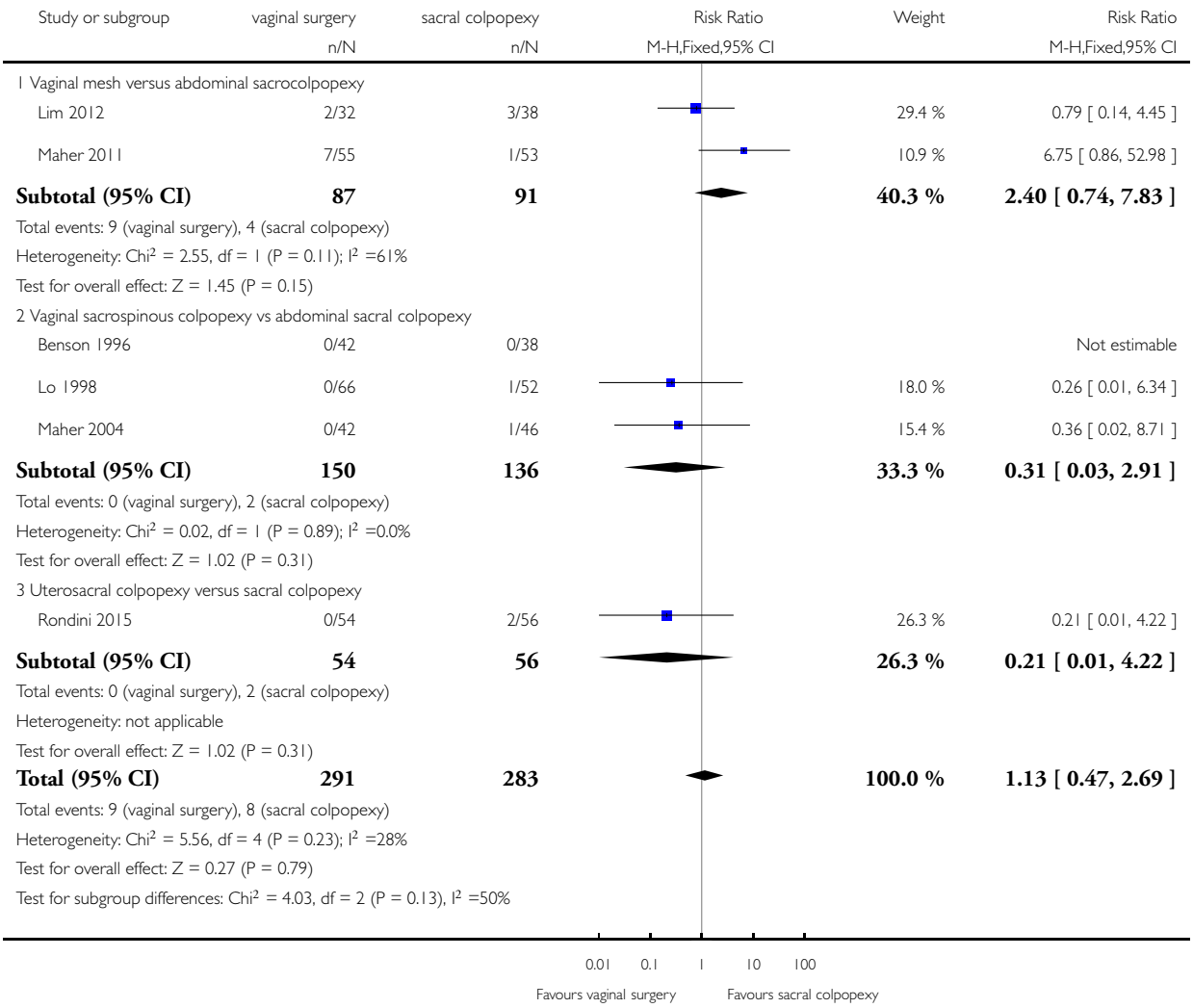
Test for subgroup differences: Not applicable

Analysis 1.4. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 4 Mesh exposure (1-4 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 4 Mesh exposure (1-4 years)

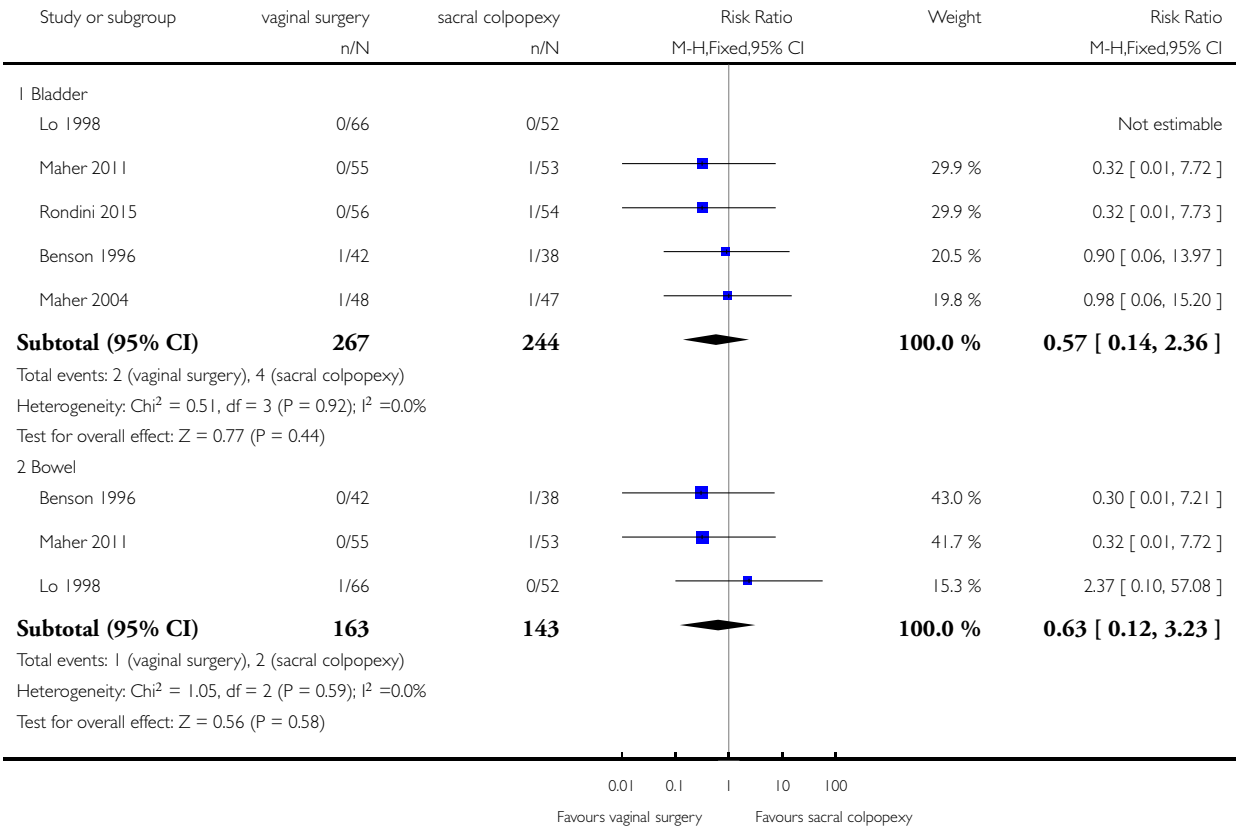


Analysis 1.5. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 5 Injuries.

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 5 Injuries



Analysis 1.6. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 6 Repeat surgery for mesh exposure (2-4 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 6 Repeat surgery for mesh exposure (2-4 years)

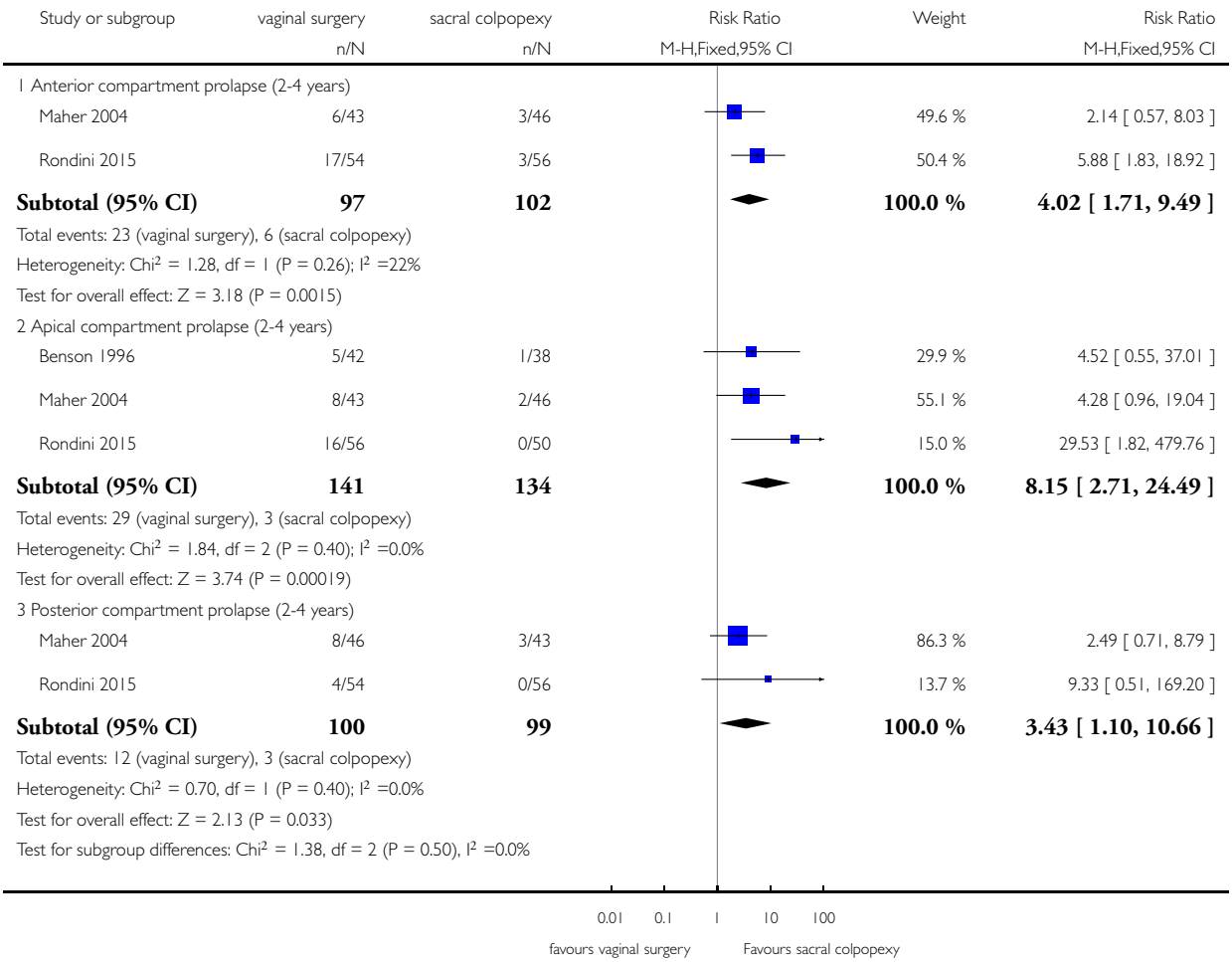
Study or subgroup	vaginal surgery n/N	sacral colpopexy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Lim 2012	0/32	0/38			Not estimable
Lo 1998	0/66	0/52			Not estimable
Maher 2004	0/48	1/47			0.33 [0.01, 7.82]
Maher 2011	5/55	1/53			4.82 [0.58, 39.89]
Rondini 2015	0/56	2/50			0.18 [0.01, 3.64]
Test for subgroup differences: Not applicable					

Analysis 1.7. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 7 Objective failure (2-4 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 7 Objective failure (2-4 years)



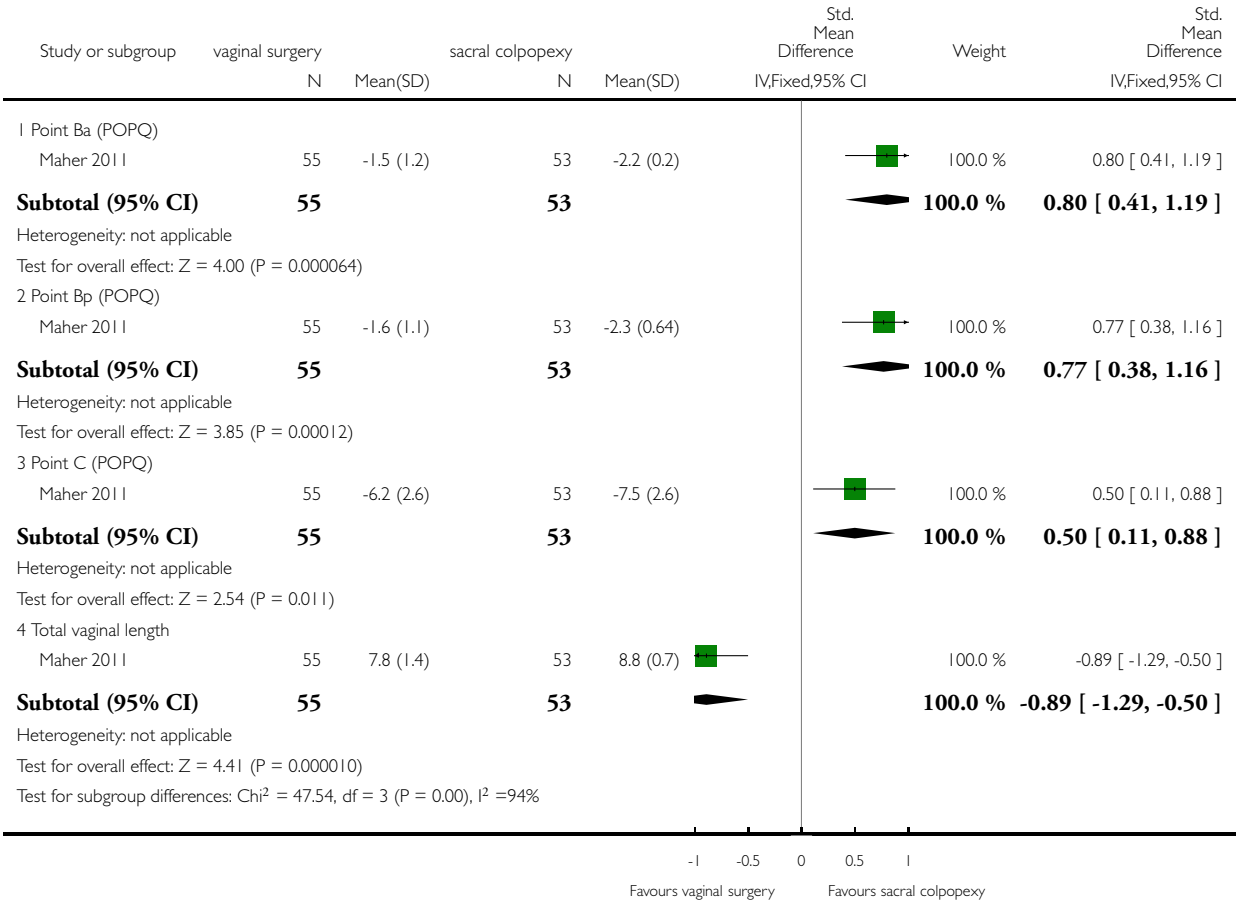
Analysis 1.8. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 8 POPQ assessment (2 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 8 POPQ assessment (2 years)

Study or subgroup	vaginal surgery N	Mean(SD)	sacral colpopexy N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 Point Ba (POPQ)							
Maher 2011	55	-1.5 (1.2)	53	-2.2 (0.2)		100.0 %	0.80 [0.41, 1.19]
Subtotal (95% CI)	**55**		**53**			**100.0 %**	**0.80 [0.41, 1.19]**
Heterogeneity: not applicable							
Test for overall effect: Z = 4.00 (P = 0.000064)							
2 Point Bp (POPQ)							
Maher 2011	55	-1.6 (1.1)	53	-2.3 (0.64)		100.0 %	0.77 [0.38, 1.16]
Subtotal (95% CI)	**55**		**53**			**100.0 %**	**0.77 [0.38, 1.16]**
Heterogeneity: not applicable							
Test for overall effect: Z = 3.85 (P = 0.00012)							
3 Point C (POPQ)							
Maher 2011	55	-6.2 (2.6)	53	-7.5 (2.6)		100.0 %	0.50 [0.11, 0.88]
Subtotal (95% CI)	**55**		**53**			**100.0 %**	**0.50 [0.11, 0.88]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.54 (P = 0.011)							
4 Total vaginal length							
Maher 2011	55	7.8 (1.4)	53	8.8 (0.7)		100.0 %	-0.89 [-1.29, -0.50]
Subtotal (95% CI)	**55**		**53**			**100.0 %**	**-0.89 [-1.29, -0.50]**
Heterogeneity: not applicable							
Test for overall effect: Z = 4.41 (P = 0.000010)							
Test for subgroup differences: Chi^2 = 47.54, df = 3 (P = 0.00), I^2 =94%							

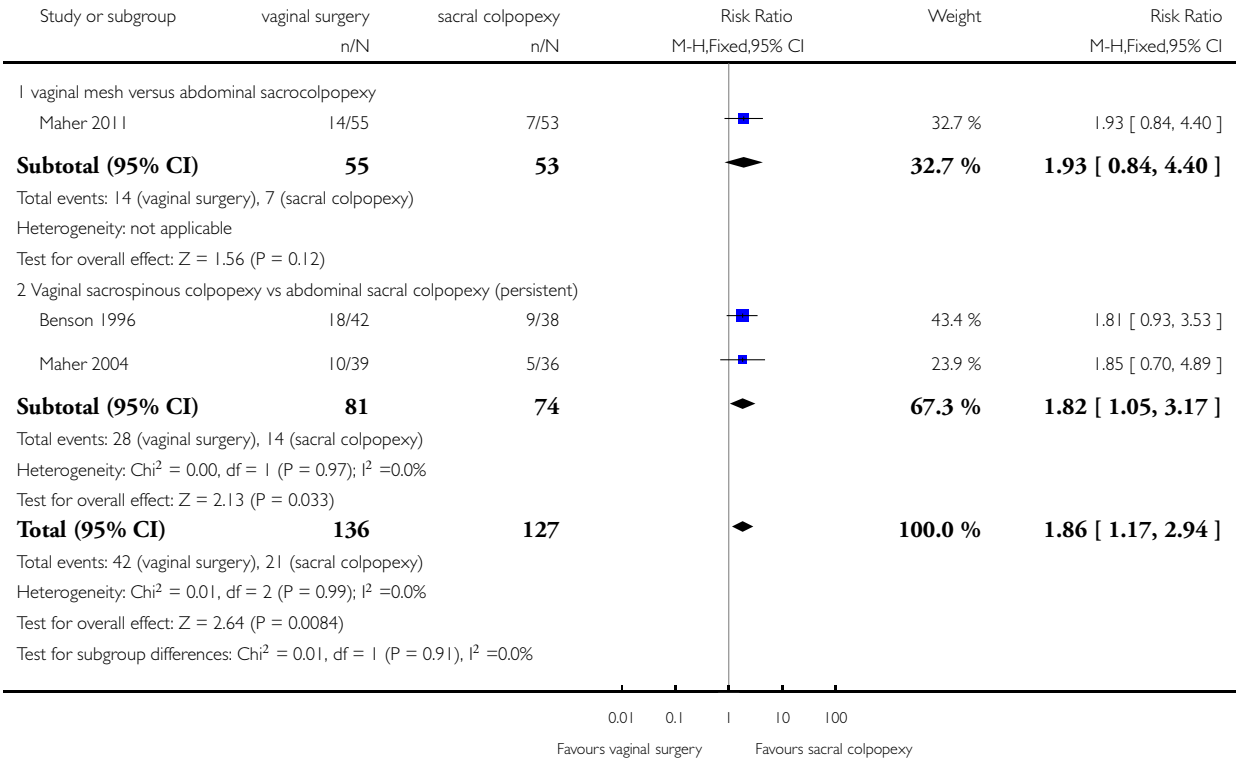


Analysis 1.9. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 9 Stress urinary incontinence (2 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 9 Stress urinary incontinence (2 years)

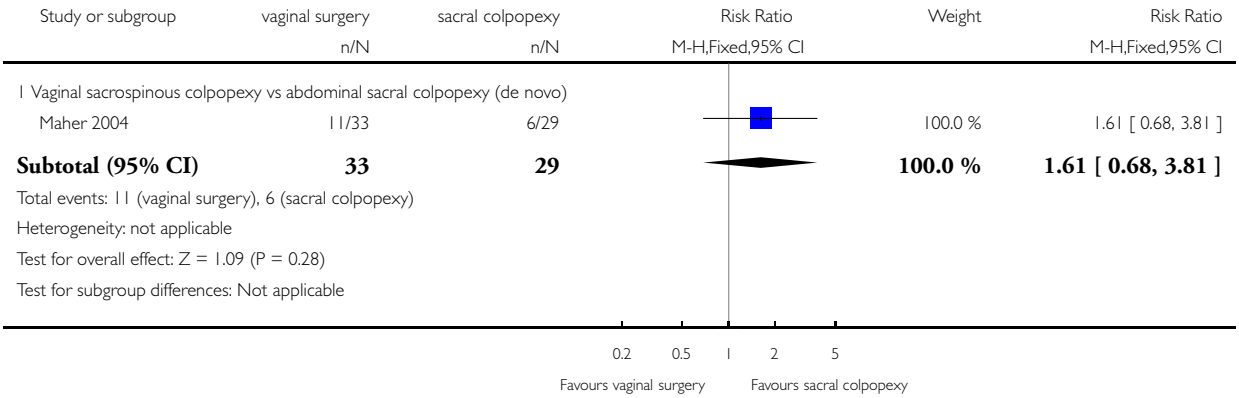


Analysis 1.10. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 10 Urge incontinence (de novo (2 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 10 Urge incontinence (de novo (2 years)

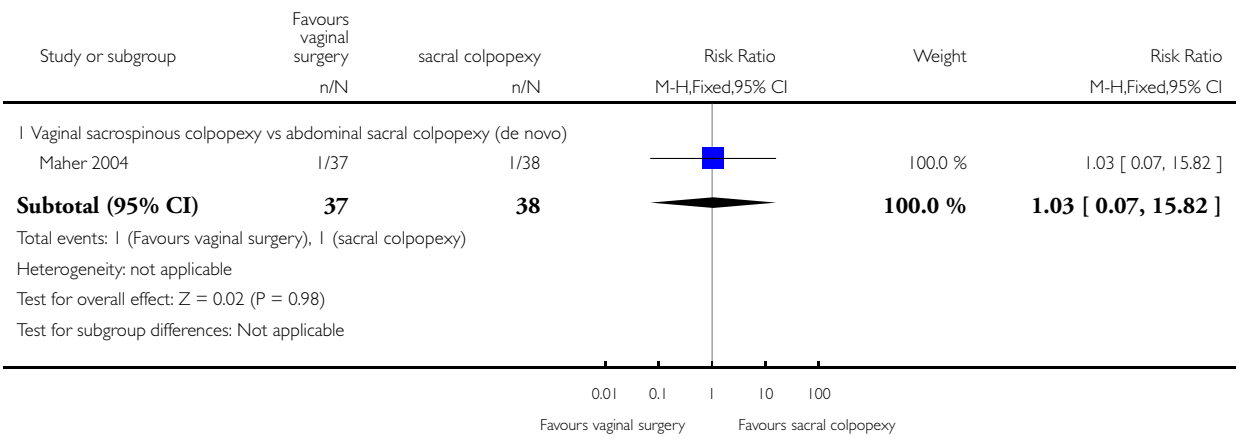


Analysis 1.11. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 11 Urinary Voiding dysfunction (de novo).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 11 Urinary Voiding dysfunction (de novo)

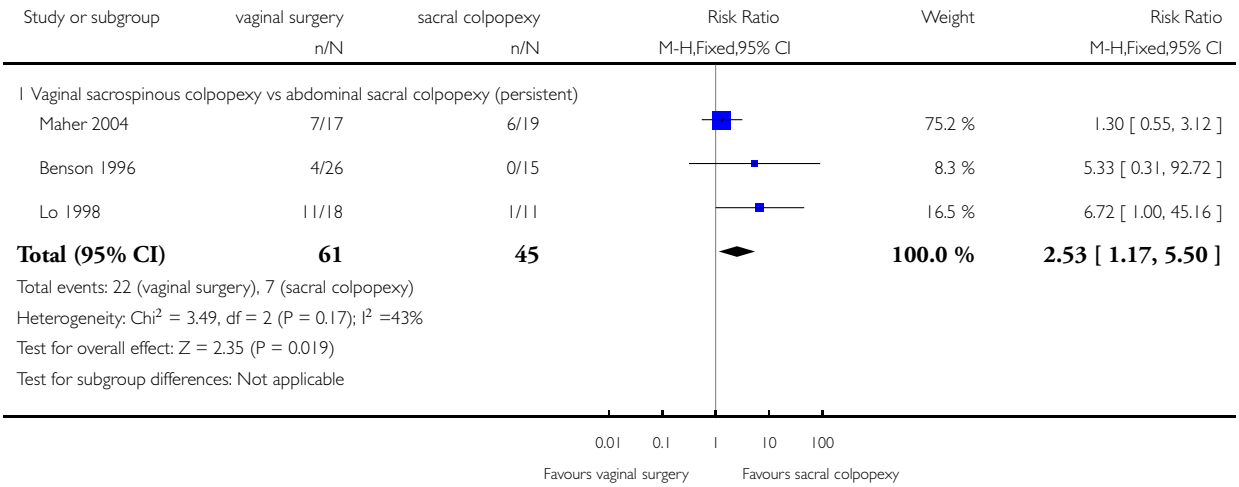


Analysis 1.12. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 12 Dyspareunia.

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 12 Dyspareunia



Analysis 1.13. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 13 Sexual function.

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 13 Sexual function

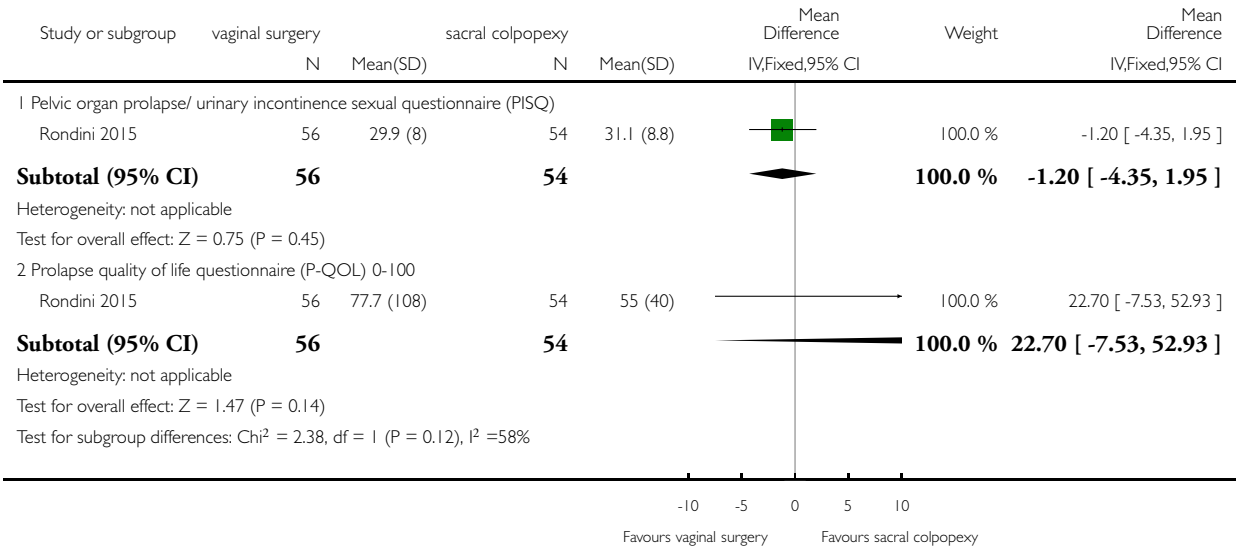
Study or subgroup	Favours vaginal surgery N	Mean(SD)	Favours sacral colpopexy N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Pelvic floor distress inventory (PFD1-20) 0-300							
Rondini 2015	56	29.9 (26)	54	22 (8.8)		100.0 %	7.90 [0.70, 15.10]
Total (95% CI)	**56**		**54**			**100.0 %**	**7.90 [0.70, 15.10]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.15 (P = 0.032)							
Test for subgroup differences: Not applicable							

Analysis 1.14. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 14 Quality of life and satisfaction (4 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 14 Quality of life and satisfaction (4 years)

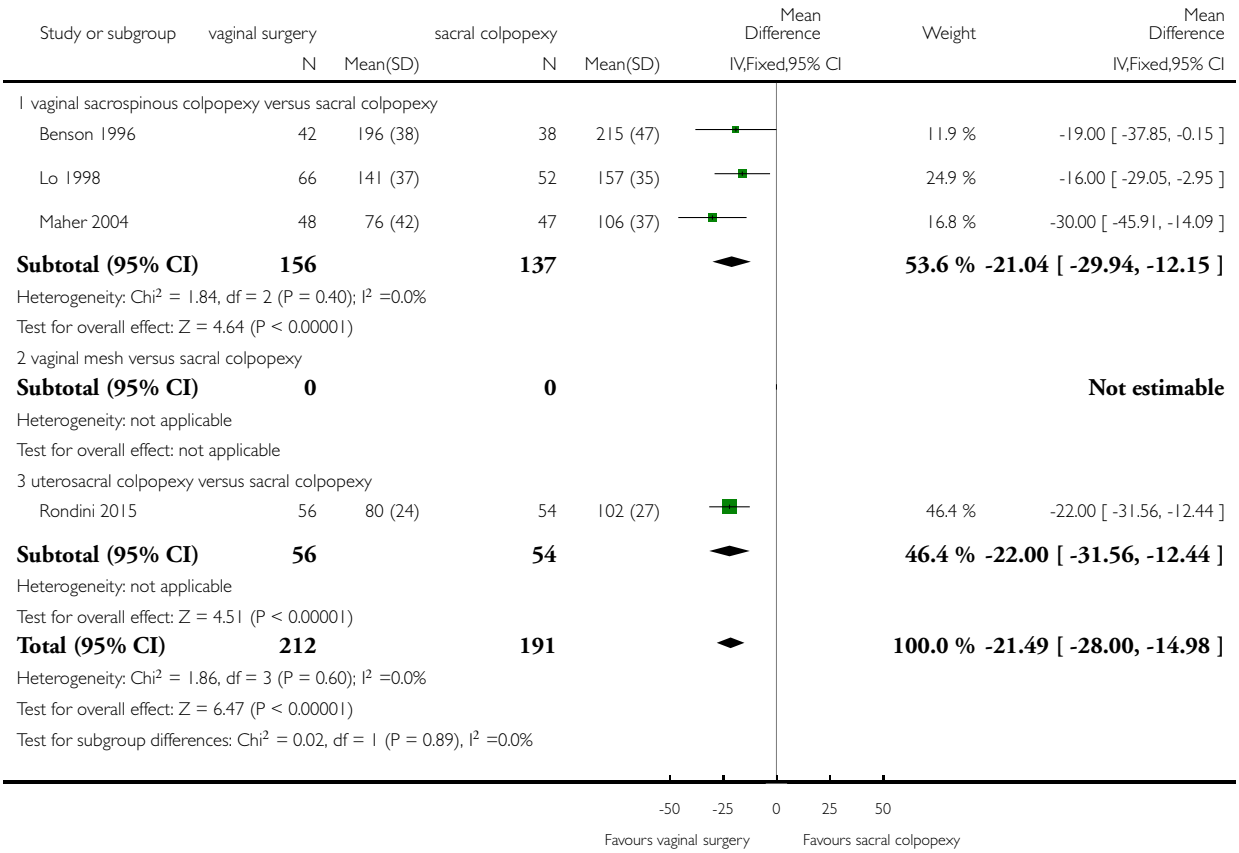


Analysis 1.15. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 15 Operating time (minutes).

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 15 Operating time (minutes)

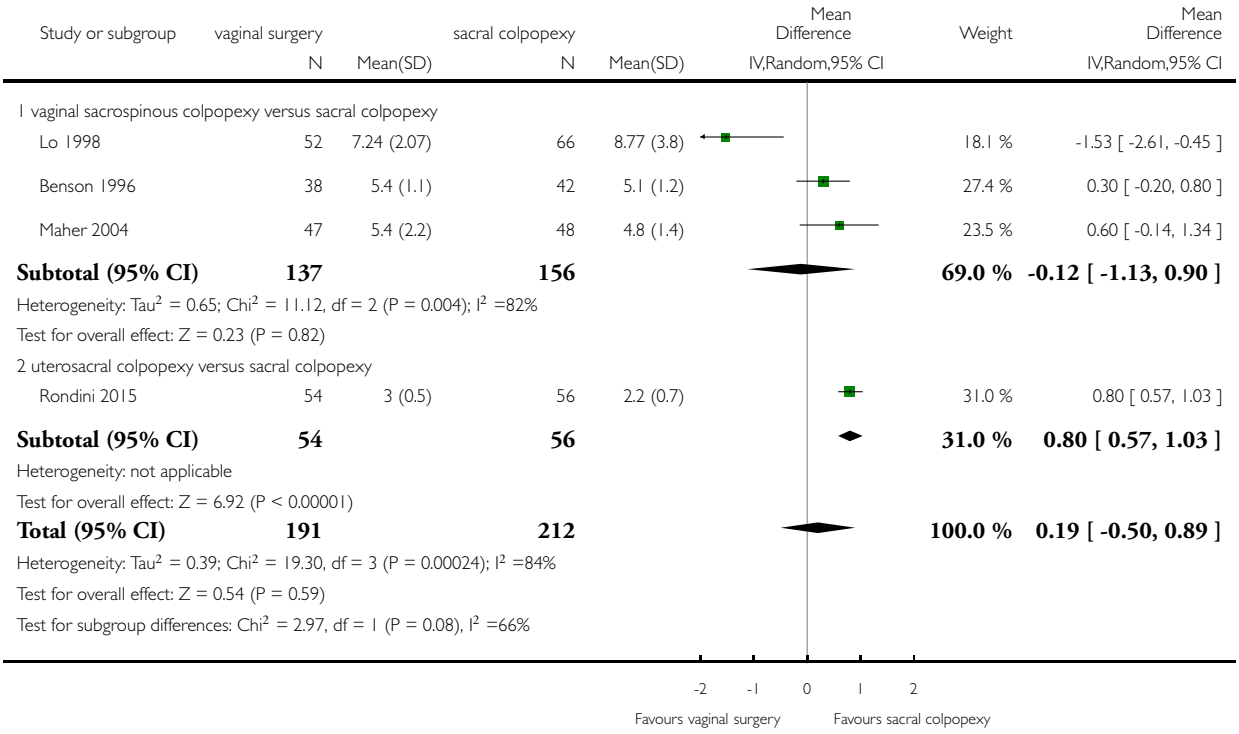


Analysis 1.16. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 16 Length of hospital stay.

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 16 Length of hospital stay

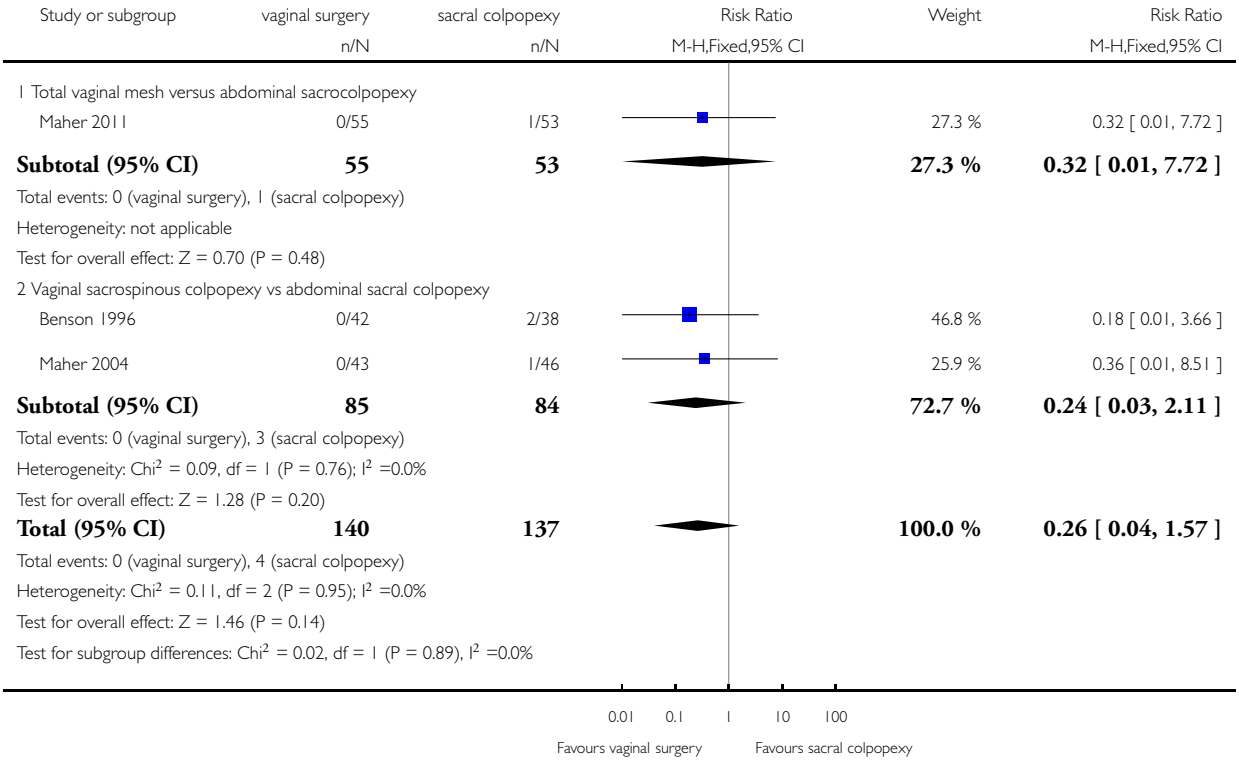


Analysis 1.17. Comparison 1 Vaginal procedure versus sacral colpopexy, Outcome 17 Blood transfusion.

Review: Surgery for women with apical vaginal prolapse

Comparison: 1 Vaginal procedure versus sacral colpopexy

Outcome: 17 Blood transfusion



Analysis 2.1. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 1 Awareness of prolapse (3 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 1 Awareness of prolapse (3 years)

Study or subgroup	vaginal mesh n/N	vaginal colpopexy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Iglesia 2010	5/26	5/28		100.0 %	1.08 [0.35, 3.30]
Total (95% CI)	**26**	**28**		**100.0 %**	**1.08 [0.35, 3.30]**

Total events: 5 (vaginal mesh), 5 (vaginal colpopexy)

Heterogeneity: not applicable

Test for overall effect: Z = 0.13 (P = 0.90)

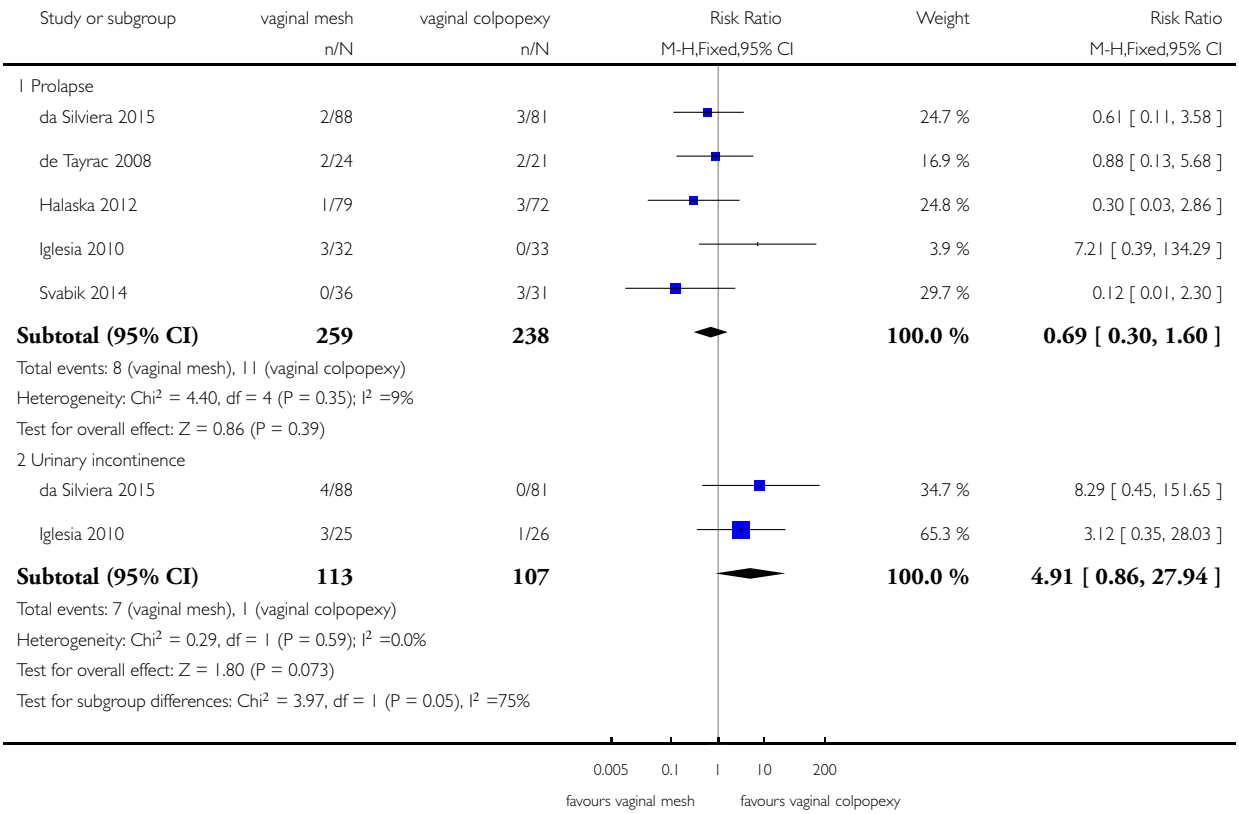
Test for subgroup differences: Not applicable

Analysis 2.2. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 2 Repeat surgery (1-3 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 2 Repeat surgery (1-3 years)

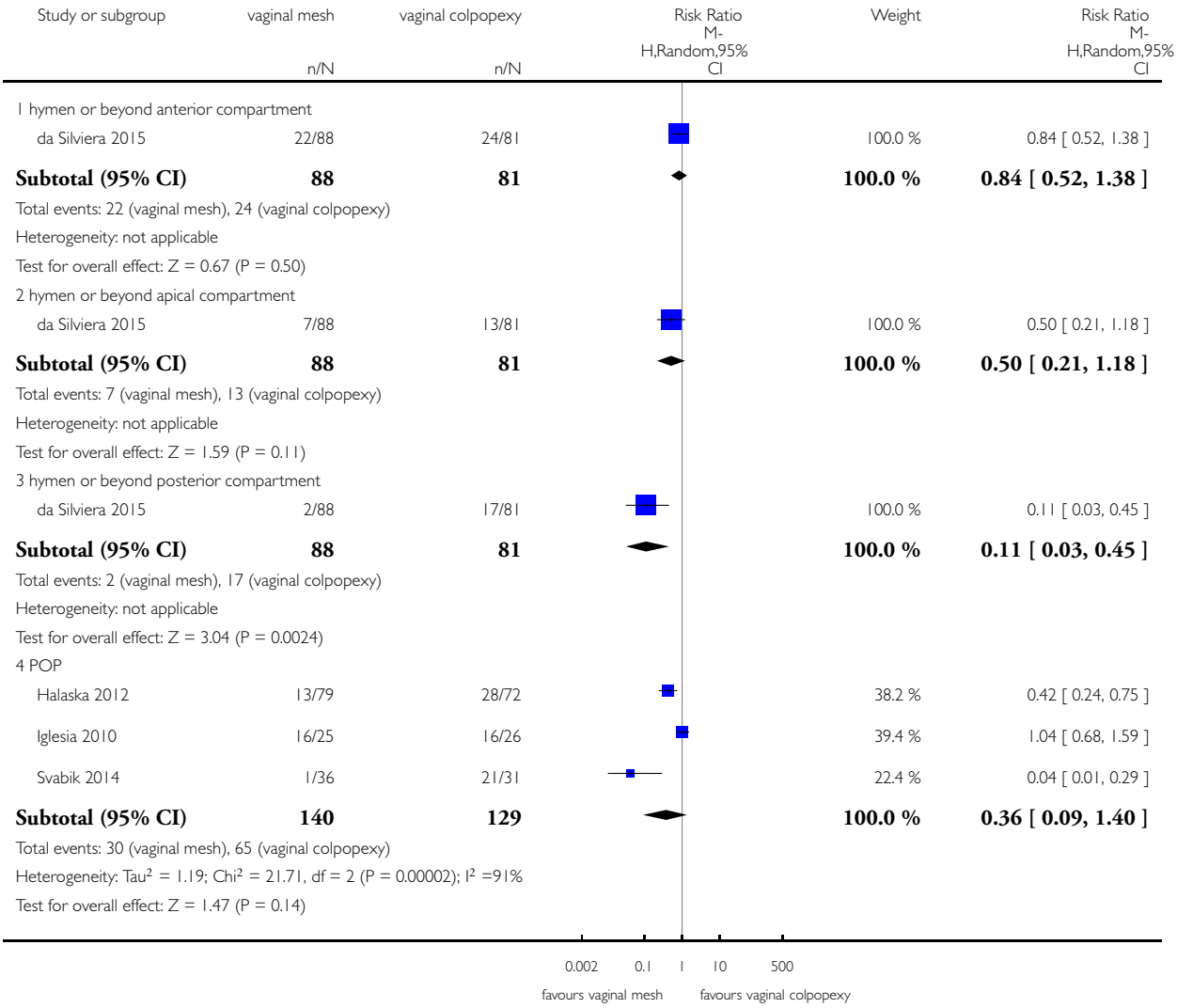


Analysis 2.3. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 3 Recurrent prolapse on examination (1-3 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 3 Recurrent prolapse on examination (1-3 years)

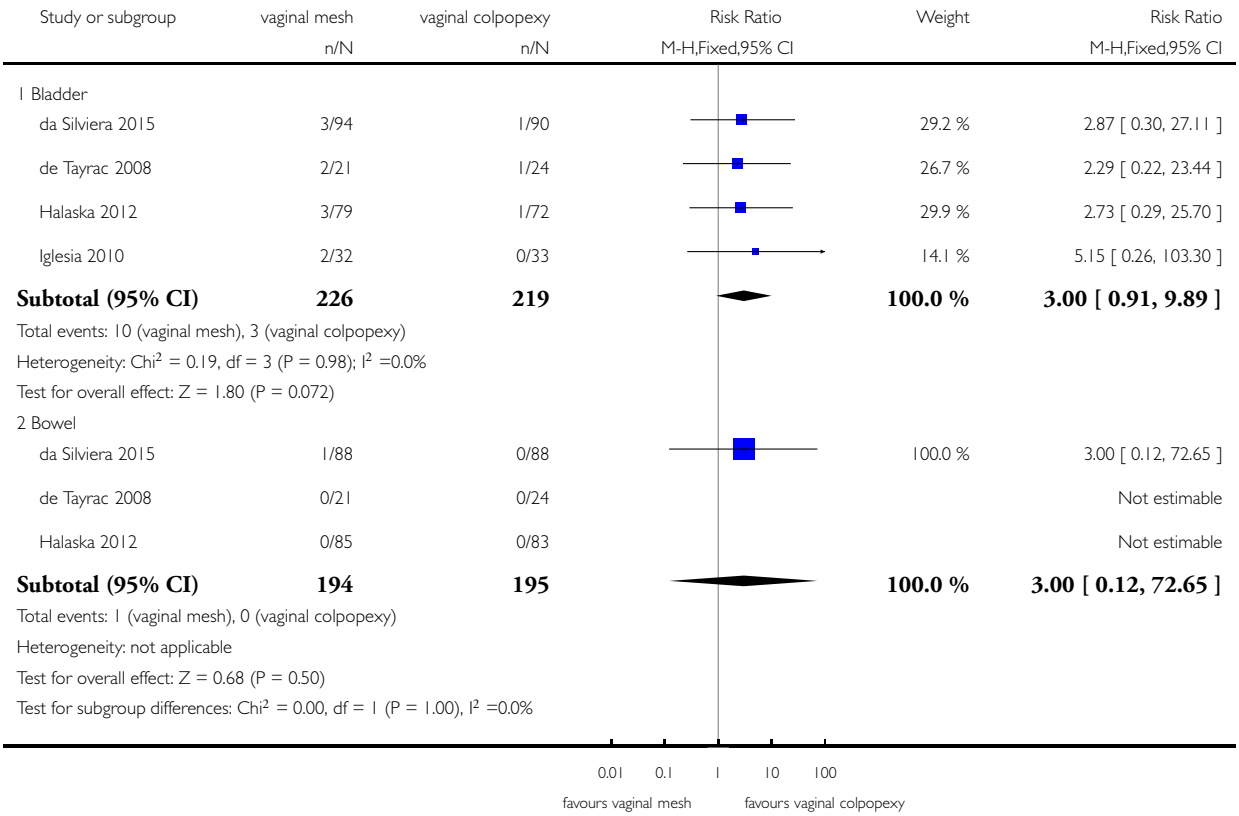


Analysis 2.4. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 4 Injuries.

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 4 Injuries

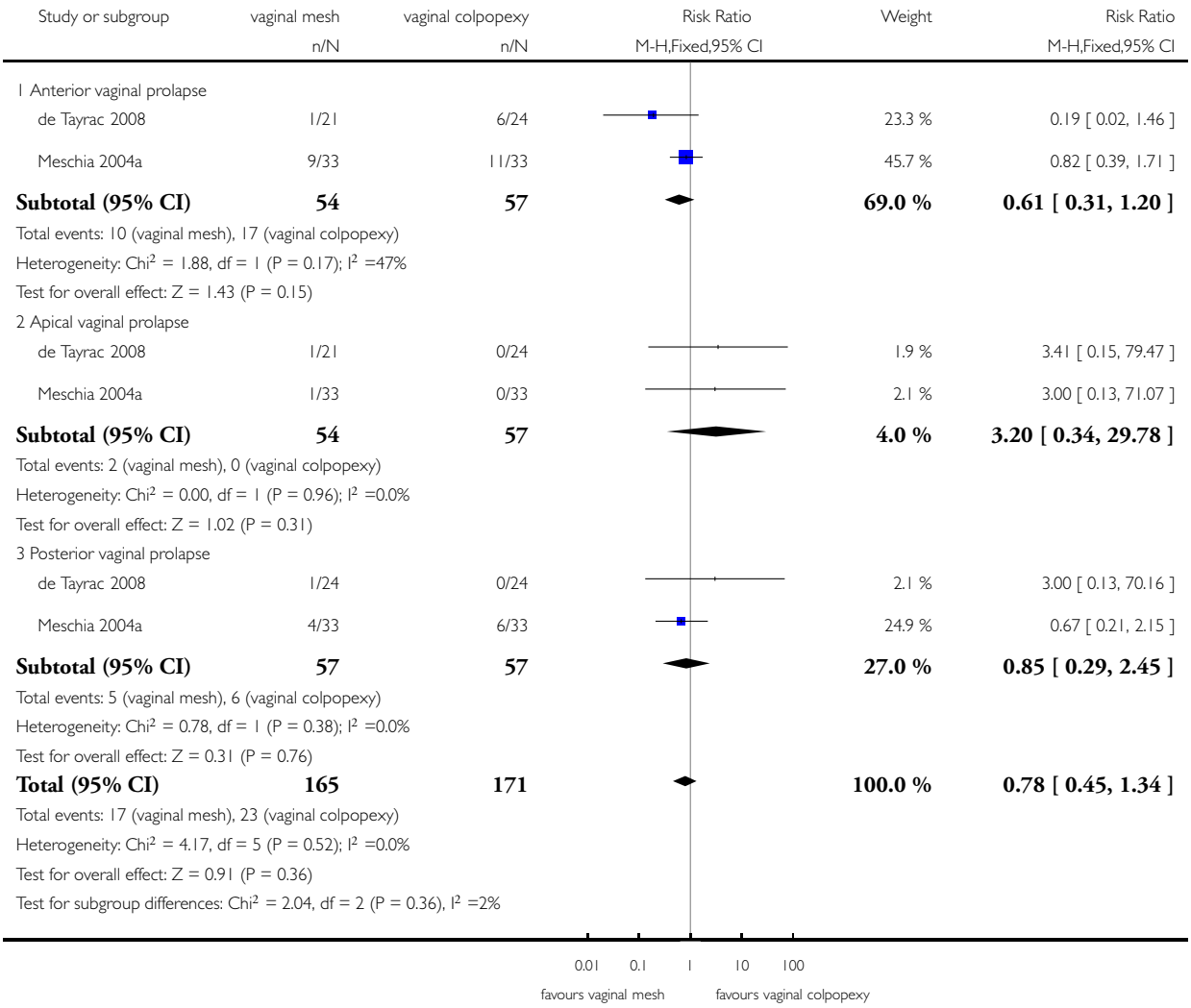


Analysis 2.5. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 5 Objective failure.

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 5 Objective failure



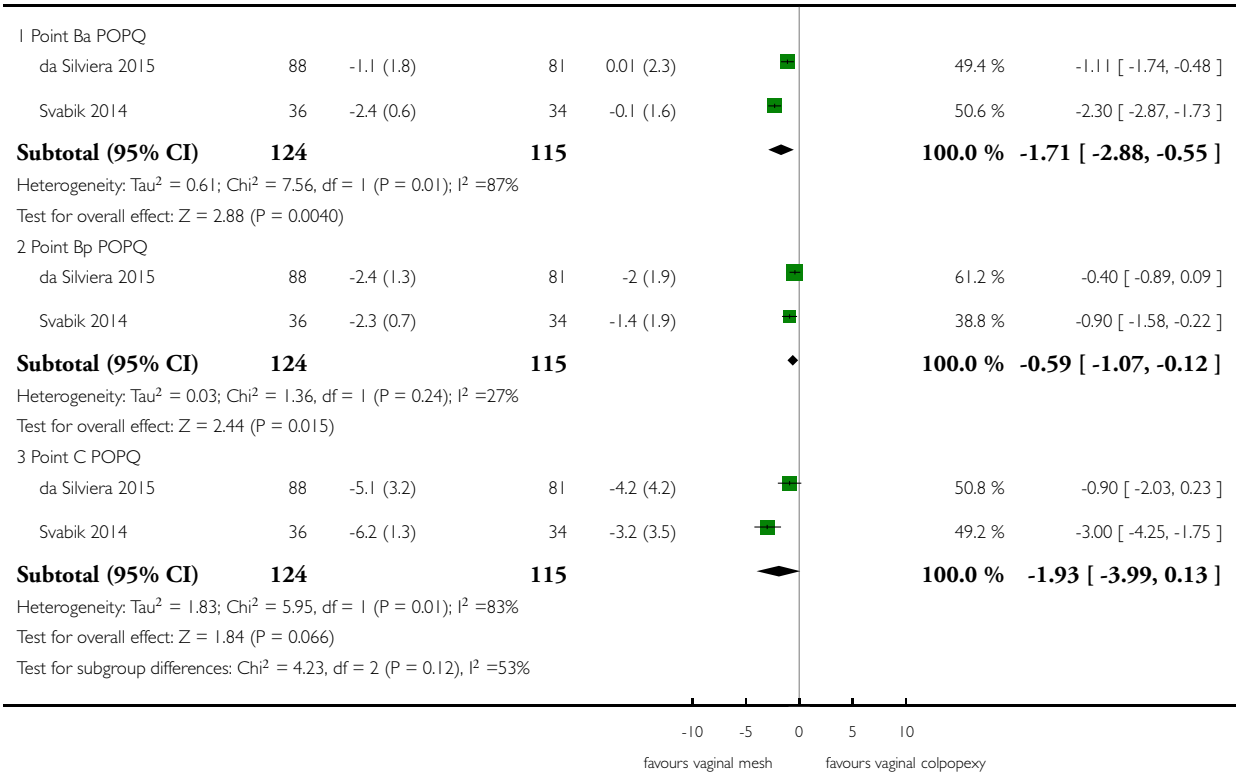
Analysis 2.6. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 6 POPQ assessment (1 year).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 6 POPQ assessment (1 year)

Study or subgroup	vaginal mesh N	Mean(SD)	vaginal colpopexy N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Point Ba POPQ							
da Silviera 2015	88	-1.1 (1.8)	81	0.01 (2.3)		49.4 %	-1.11 [-1.74, -0.48]
Svabik 2014	36	-2.4 (0.6)	34	-0.1 (1.6)		50.6 %	-2.30 [-2.87, -1.73]
Subtotal (95% CI)	**124**		**115**			**100.0 %**	**-1.71 [-2.88, -0.55]**
Heterogeneity: Tau^2 = 0.61; Chi^2 = 7.56, df = 1 (P = 0.01); I^2 =87%							
Test for overall effect: Z = 2.88 (P = 0.0040)							
2 Point Bp POPQ							
da Silviera 2015	88	-2.4 (1.3)	81	-2 (1.9)		61.2 %	-0.40 [-0.89, 0.09]
Svabik 2014	36	-2.3 (0.7)	34	-1.4 (1.9)		38.8 %	-0.90 [-1.58, -0.22]
Subtotal (95% CI)	**124**		**115**			**100.0 %**	**-0.59 [-1.07, -0.12]**
Heterogeneity: Tau^2 = 0.03; Chi^2 = 1.36, df = 1 (P = 0.24); I^2 =27%							
Test for overall effect: Z = 2.44 (P = 0.015)							
3 Point C POPQ							
da Silviera 2015	88	-5.1 (3.2)	81	-4.2 (4.2)		50.8 %	-0.90 [-2.03, 0.23]
Svabik 2014	36	-6.2 (1.3)	34	-3.2 (3.5)		49.2 %	-3.00 [-4.25, -1.75]
Subtotal (95% CI)	**124**		**115**			**100.0 %**	**-1.93 [-3.99, 0.13]**
Heterogeneity: Tau^2 = 1.83; Chi^2 = 5.95, df = 1 (P = 0.01); I^2 =83%							
Test for overall effect: Z = 1.84 (P = 0.066)							
Test for subgroup differences: Chi^2 = 4.23, df = 2 (P = 0.12), I^2 =53%							

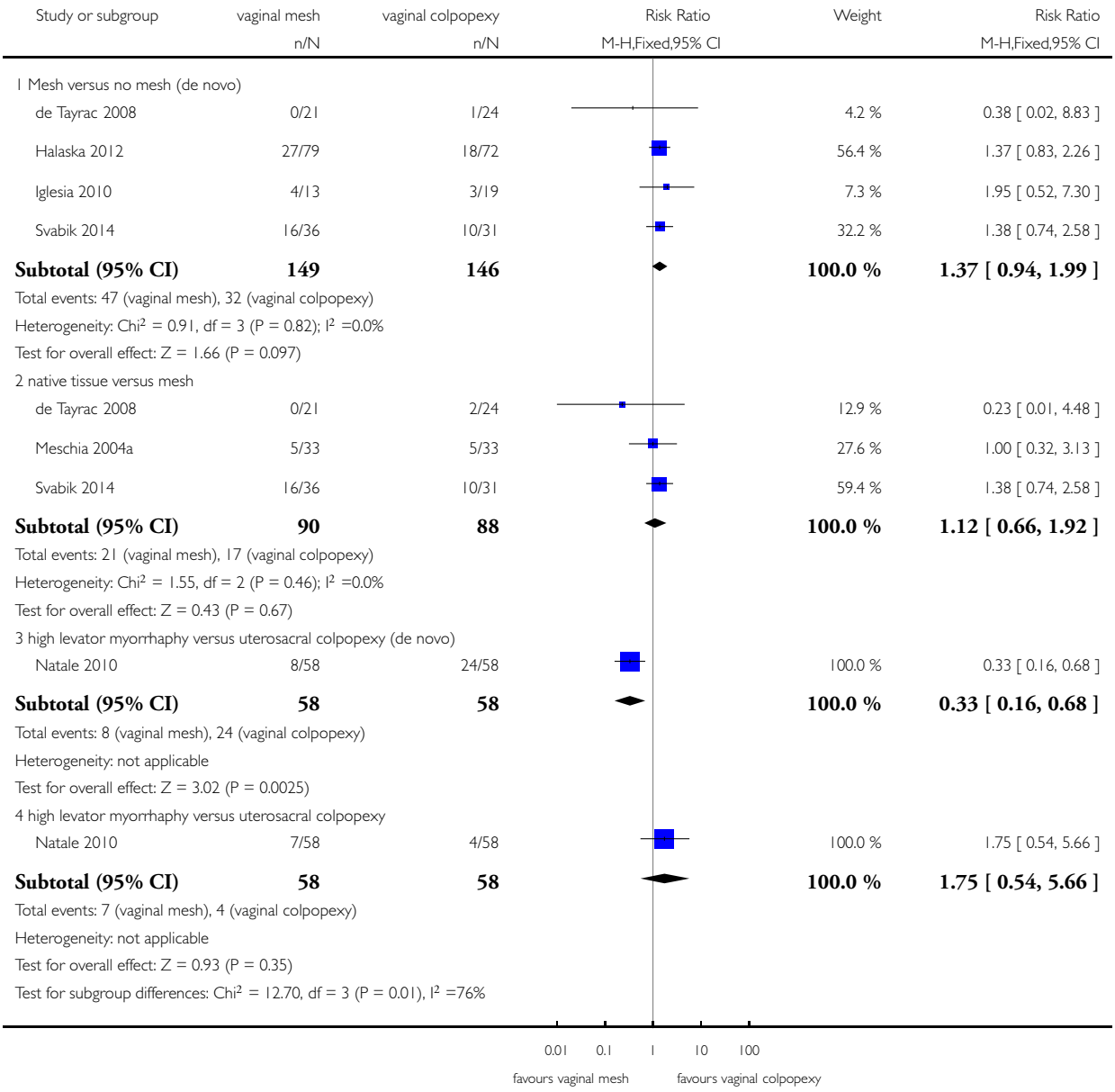


Analysis 2.7. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 7 Stress urinary incontinence (1-3 years)).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 7 Stress urinary incontinence (1-3 years))

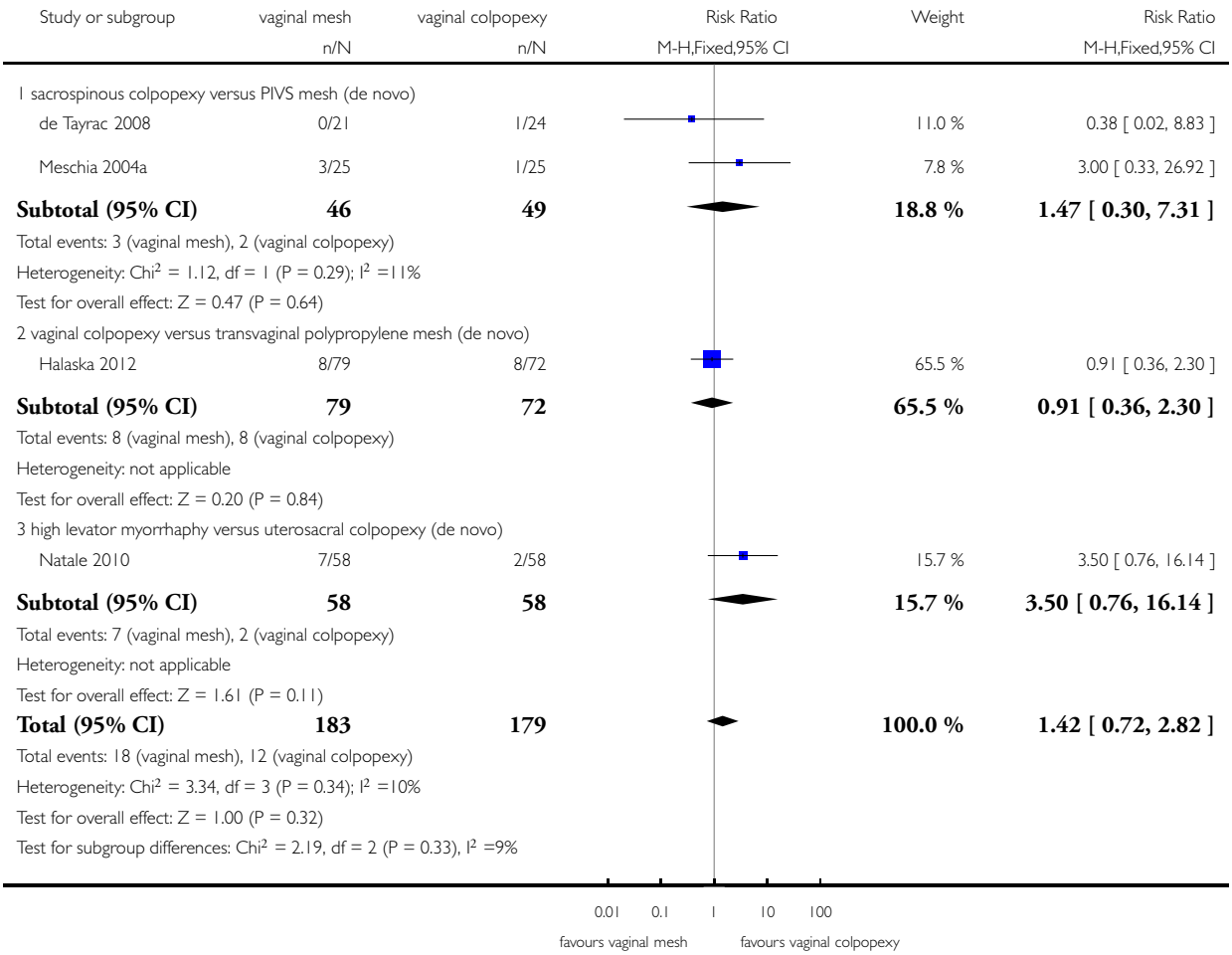


Analysis 2.8. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 8 Urge incontinence.

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 8 Urge incontinence



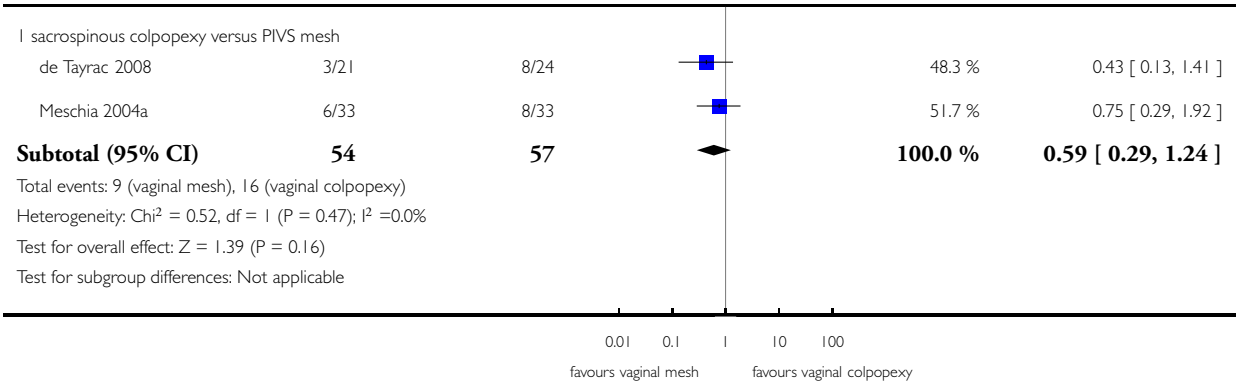
Analysis 2.9. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 9 Voiding dysfunction.

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 9 Voiding dysfunction

Study or subgroup	vaginal mesh n/N	vaginal colpopexy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 sacrospinous colpopexy versus PIVS mesh					
de Tayrac 2008	3/21	8/24		48.3 %	0.43 [0.13, 1.41]
Meschia 2004a	6/33	8/33		51.7 %	0.75 [0.29, 1.92]
Subtotal (95% CI)	**54**	**57**		**100.0 %**	**0.59 [0.29, 1.24]**
Total events: 9 (vaginal mesh), 16 (vaginal colpopexy)					
Heterogeneity: Chi^2 = 0.52, df = 1 (P = 0.47); I^2 =0.0%					
Test for overall effect: Z = 1.39 (P = 0.16)					
Test for subgroup differences: Not applicable					

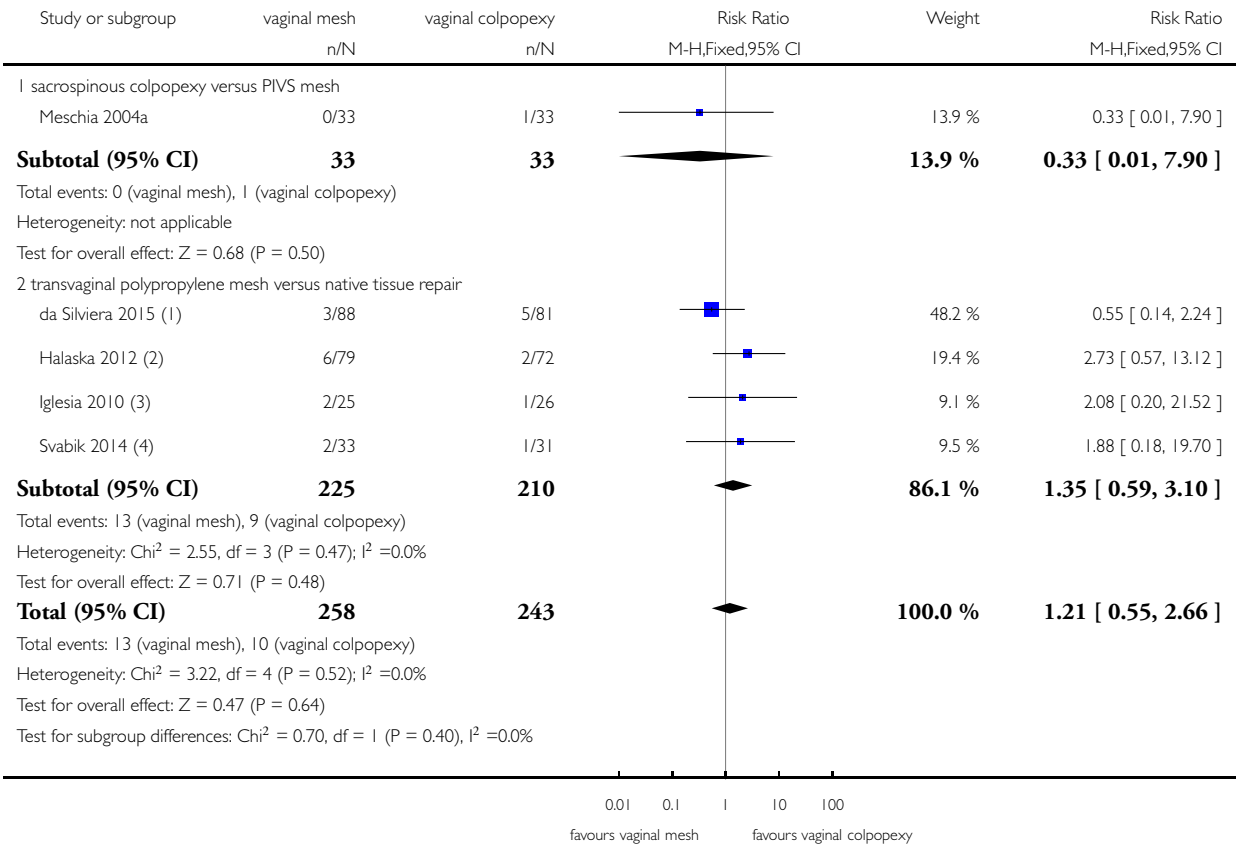


Analysis 2.10. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 10 Dyspareunia (1-3 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 10 Dyspareunia (1-3 years)



(1) Persistent

(2) persistent

(3) de novo

(4) persistent

Analysis 2.11. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 11 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ) (1 year).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 11 Pelvic organ prolapse/ urinary incontinence sexual questionnaire (PISQ) (1 year)

Study or subgroup	vaginal mesh		vaginal colpopexy		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI		IV,Fixed,95% CI
de Tayrac 2008	21	13.6 (9.3)	24	12.5 (9.3)		11.6 %	1.10 [-4.35, 6.55]
Iglesia 2010	32	34 (6)	33	35 (6)		40.4 %	-1.00 [-3.92, 1.92]
Svabik 2014	36	32.6 (6.3)	34	35.6 (5.1)		48.0 %	-3.00 [-5.68, -0.32]
Total (95% CI)	**89**		**91**			**100.0 %**	**-1.72 [-3.57, 0.14]**

Heterogeneity: Chi^2 = 2.14, df = 2 (P = 0.34); I^2 =7%

Test for overall effect: Z = 1.81 (P = 0.070)

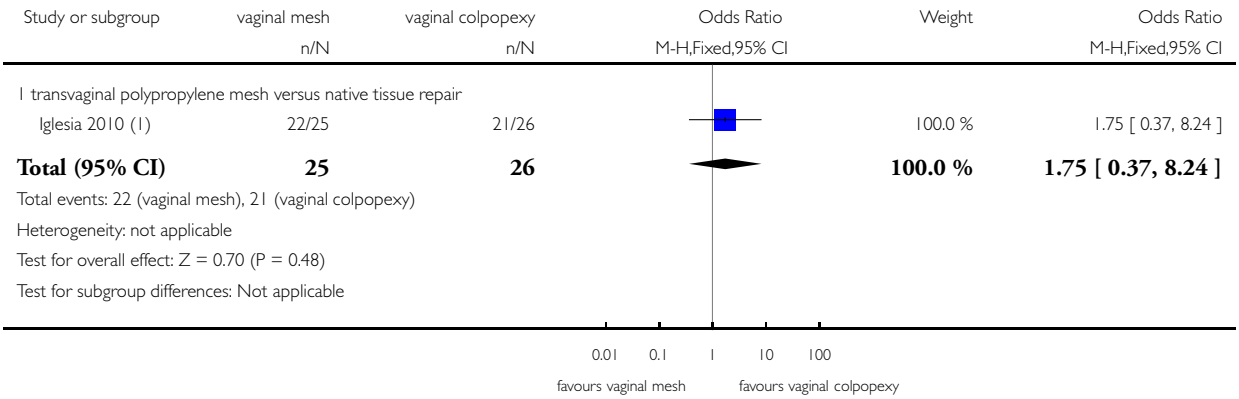
Test for subgroup differences: Not applicable

Analysis 2.12. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 12 Patient Global Impression of Improvement (PGI-I)(much or very much better 3 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 12 Patient Global Impression of Improvement (PGI-I)(much or very much better 3 years)



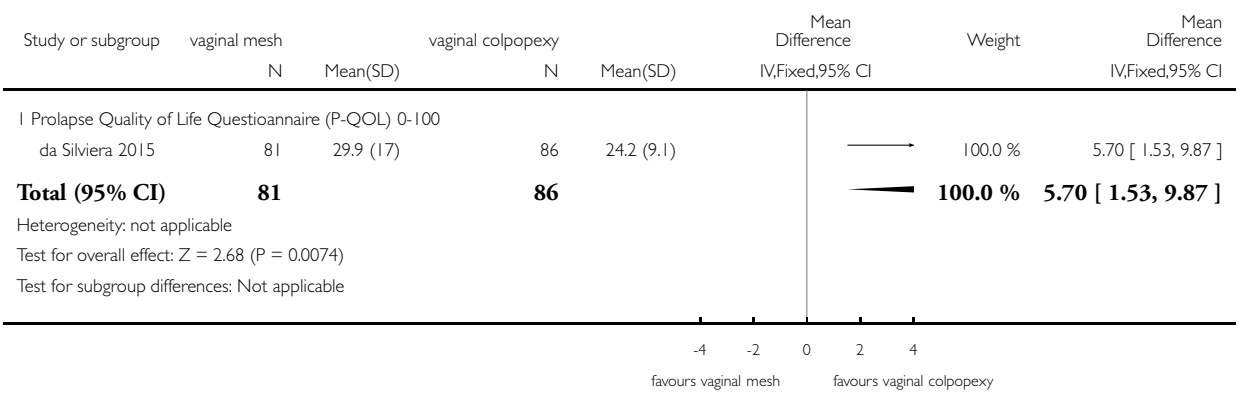
(1) de novo

Analysis 2.13. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 13 Quality of life PROLAPSE.

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 13 Quality of life PROLAPSE



Analysis 2.14. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 14 Operating time (mins).

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 14 Operating time (mins)

Study or subgroup	vaginal mesh N	Mean(SD)	vaginal colpopexy N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Transvaginal mesh versus native tissue repair							
da Silviera 2015	90	110 (43)	94	106 (46)		35.9 %	4.00 [-8.86, 16.86]
de Tayrac 2008	21	105 (41)	23	101 (46)		15.6 %	4.00 [-21.71, 29.71]
Meschia 2004a	33	58 (17)	33	69 (17)		48.4 %	-11.00 [-19.20, -2.80]
Subtotal (95% CI)	**144**		**150**			**100.0 %**	**-3.27 [-14.96, 8.43]**

Heterogeneity: $Tau^2 = 55.99$; $Chi^2 = 4.33$, df = 2 (P = 0.11); $I^2 = 54\%$

Test for overall effect: Z = 0.55 (P = 0.58)

Test for subgroup differences: Not applicable

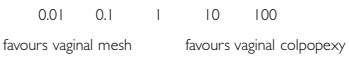
Analysis 2.15. Comparison 2 Vaginal surgery with mesh versus without mesh, Outcome 15 Blood transfusion.

Review: Surgery for women with apical vaginal prolapse

Comparison: 2 Vaginal surgery with mesh versus without mesh

Outcome: 15 Blood transfusion

Study or subgroup	vaginal mesh n/N	vaginal colpopexy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 vaginal mesh versus transvaginal colpopexy					
da Silviera 2015	1/94	2/90		80.1 %	0.48 [0.04, 5.19]
Iglesia 2010	1/33	0/32		19.9 %	2.91 [0.12, 68.95]
Subtotal (95% CI)	**127**	**122**		**100.0 %**	**0.96 [0.17, 5.46]**
Total events: 2 (vaginal mesh), 2 (vaginal colpopexy)					
Heterogeneity: Chi^2 = 0.80, df = 1 (P = 0.37); I^2 =0.0%					
Test for overall effect: Z = 0.04 (P = 0.97)					
Test for subgroup differences: Not applicable					



Analysis 3.1. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 1 Awareness of prolapse (2 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 1 Awareness of prolapse (2 years)

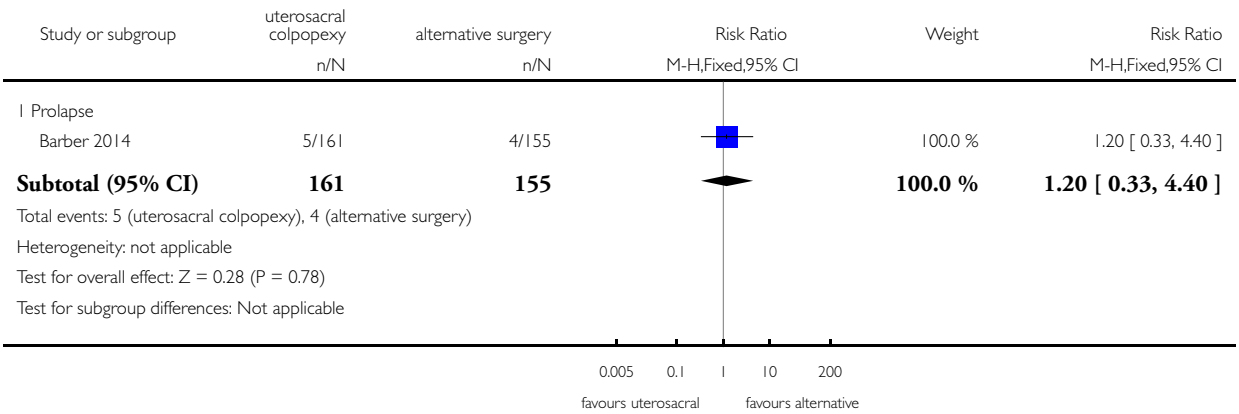
Study or subgroup	uterosacral colpopexy n/N	alternative surgery n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Barber 2014	29/151	32/152		100.0 %	0.91 [0.58, 1.43]
Total (95% CI)	**151**	**152**		**100.0 %**	**0.91 [0.58, 1.43]**
Total events: 29 (uterosacral colpopexy), 32 (alternative surgery)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.40 (P = 0.69)					
Test for subgroup differences: Not applicable					

Analysis 3.2. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 2 Repeat surgery (2 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 2 Repeat surgery (2 years)

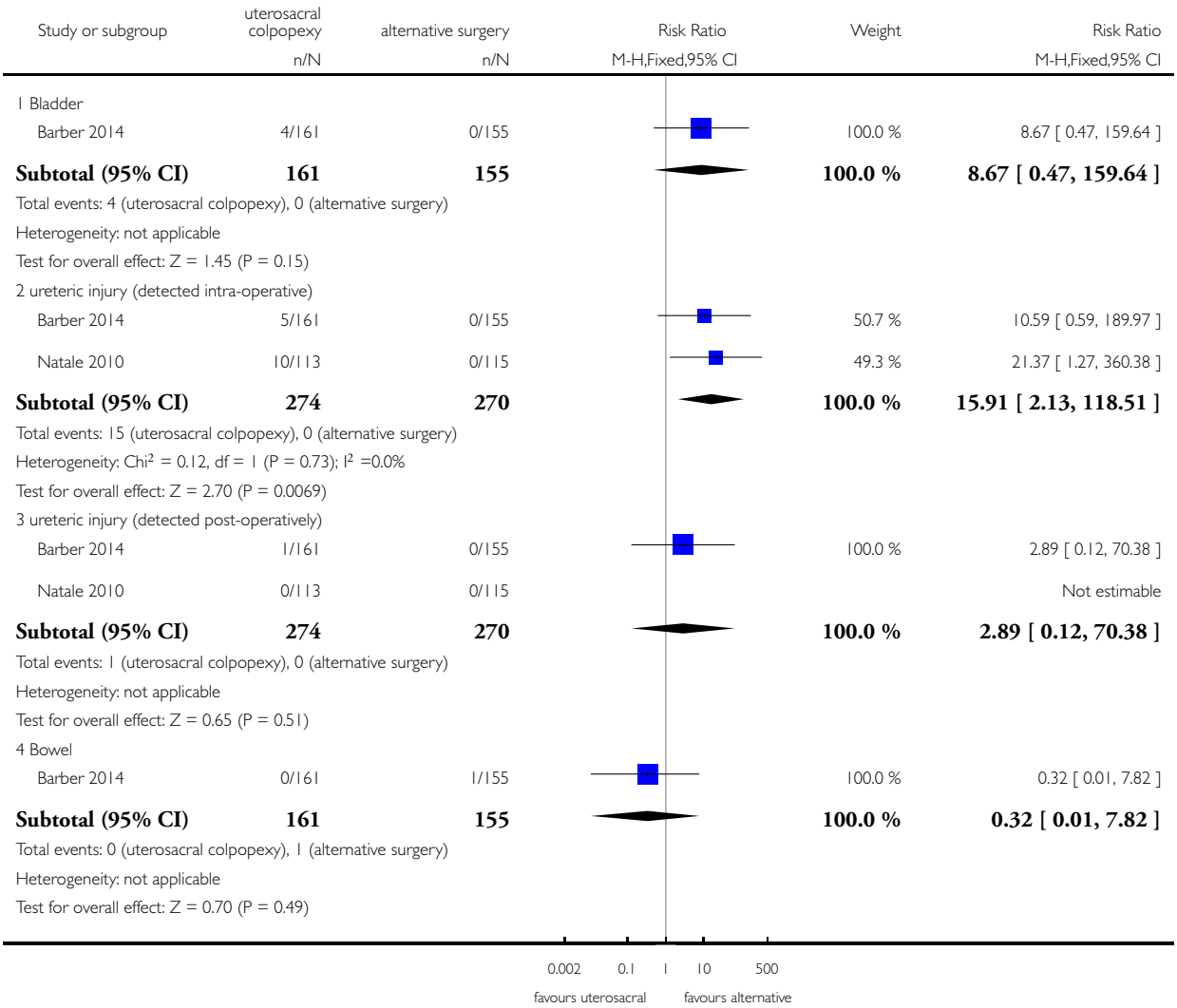


Analysis 3.3. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 3 Injuries.

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 3 Injuries

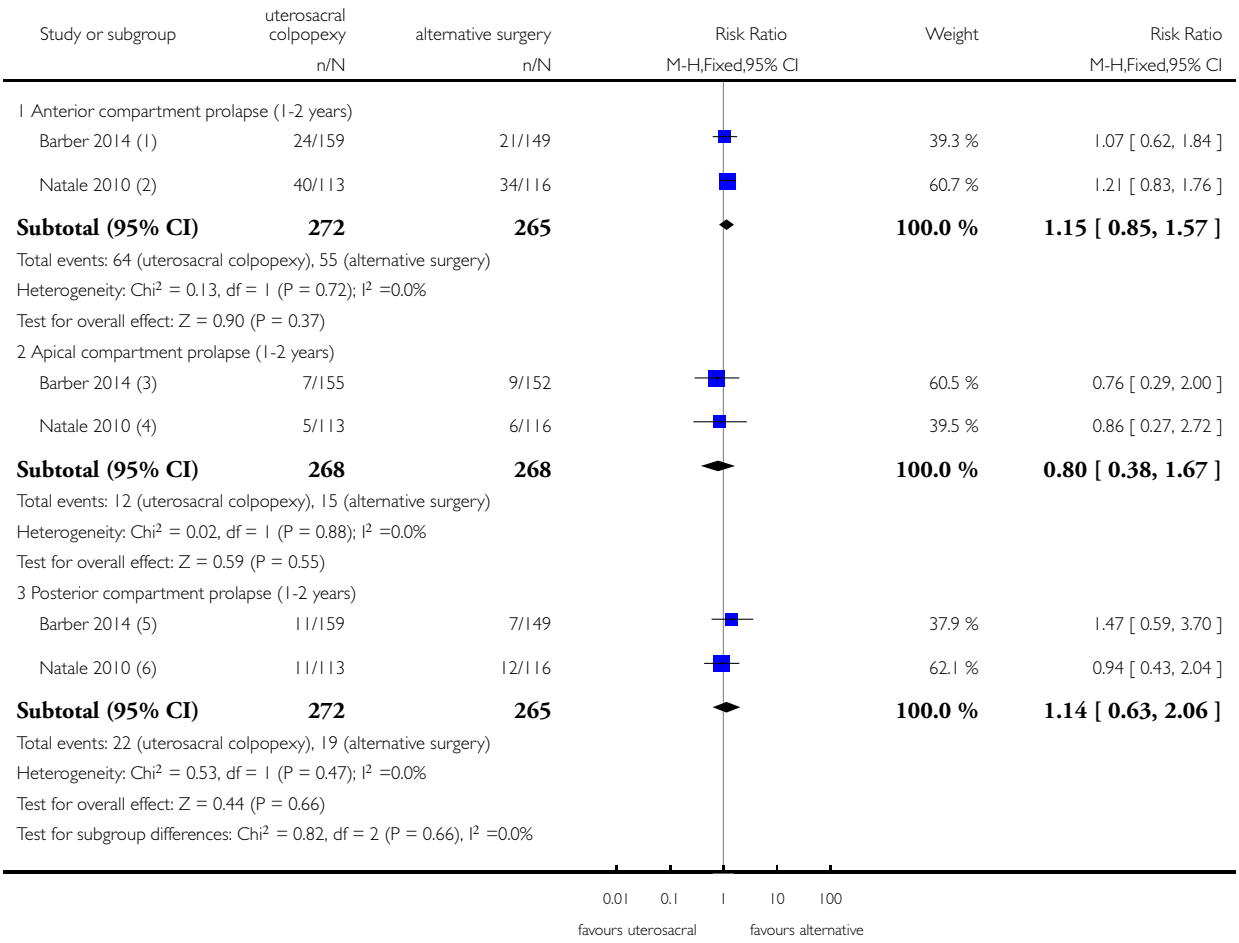


Analysis 3.4. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 4 Objective failure.

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 4 Objective failure



(1) uterosacral versus sacrospinous colpopexy

(2) uterosacral colpopexy versus high levator myorrhaphy

(3) uterosacral versus sacrospinous colpopexy (beyond hymen)

(4) uterosacral colpopexy versus high levator myorrhaphy

(5) uterosacral versus sacrospinous colpopexy

(6) uterosacral colpopexy versus high levator myorrhaphy

Analysis 3.5. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 5 POPQ assessment.

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 5 POPQ assessment

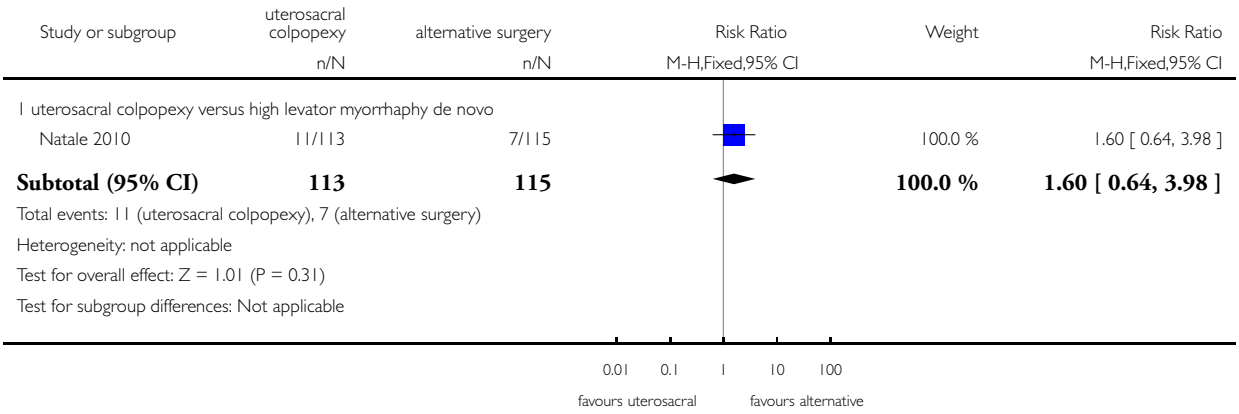
Study or subgroup	uterosacral colpopexy N	Mean(SD)	alternative surgery N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Point Ba POPQ							
Barber 2014	188	-0.5 (2)	186	-0.4 (0.2)		100.0 %	-0.10 [-0.39, 0.19]
Subtotal (95% CI)	**188**		**186**			**100.0 %**	**-0.10 [-0.39, 0.19]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.68 (P = 0.50)							
2 Point Bp POPQ							
Barber 2014	188	-1.6 (0.2)	186	-1.6 (0.2)		100.0 %	0.0 [-0.04, 0.04]
Subtotal (95% CI)	**188**		**186**			**100.0 %**	**0.0 [-0.04, 0.04]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.0 (P = 1.0)							
Test for subgroup differences: Chi^2 = 0.46, df = 1 (P = 0.50), I^2 =0.0%							

Analysis 3.6. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 6 Stress urinary incontinence de novo(1 year).

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 6 Stress urinary incontinence de novo(1 year)

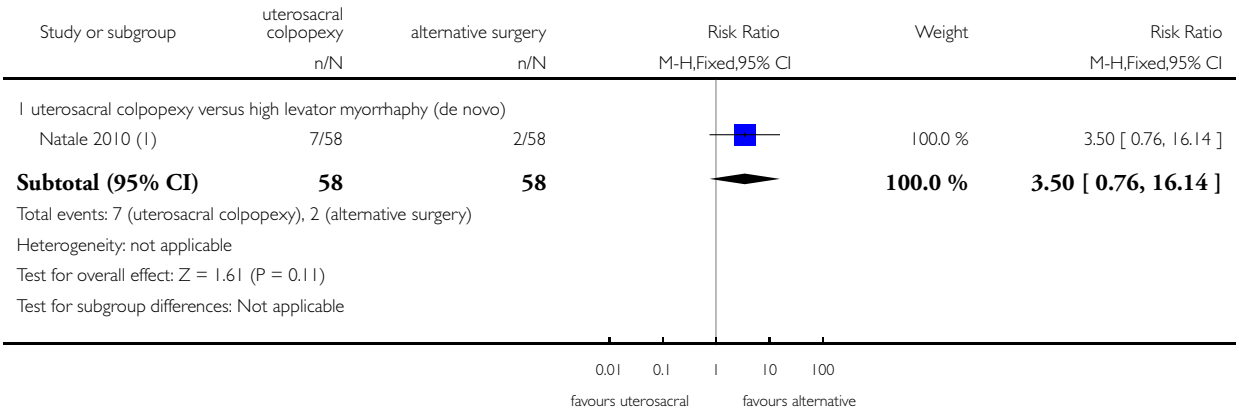


Analysis 3.7. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 7 Urge incontinence.

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 7 Urge incontinence



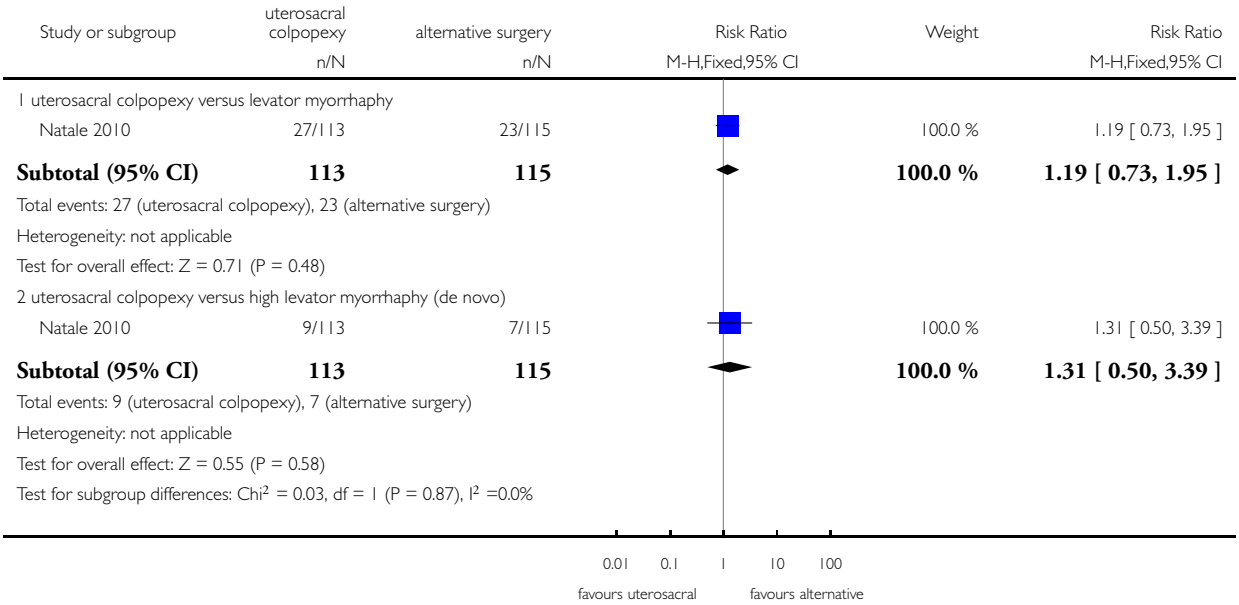
(1) High levator myorrhaphy vs uterosacral vag vault suspension

Analysis 3.8. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 8 Dyspareunia (1 year).

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 8 Dyspareunia (1 year)

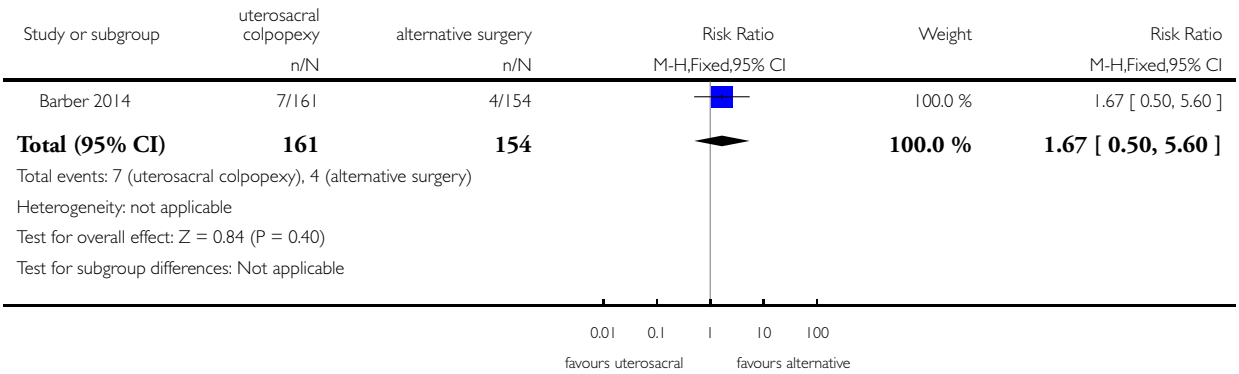


Analysis 3.9. Comparison 3 Vaginal surgery: comparison of one native tissue repair versus another, Outcome 9 Blood transfusion.

Review: Surgery for women with apical vaginal prolapse

Comparison: 3 Vaginal surgery: comparison of one native tissue repair versus another

Outcome: 9 Blood transfusion

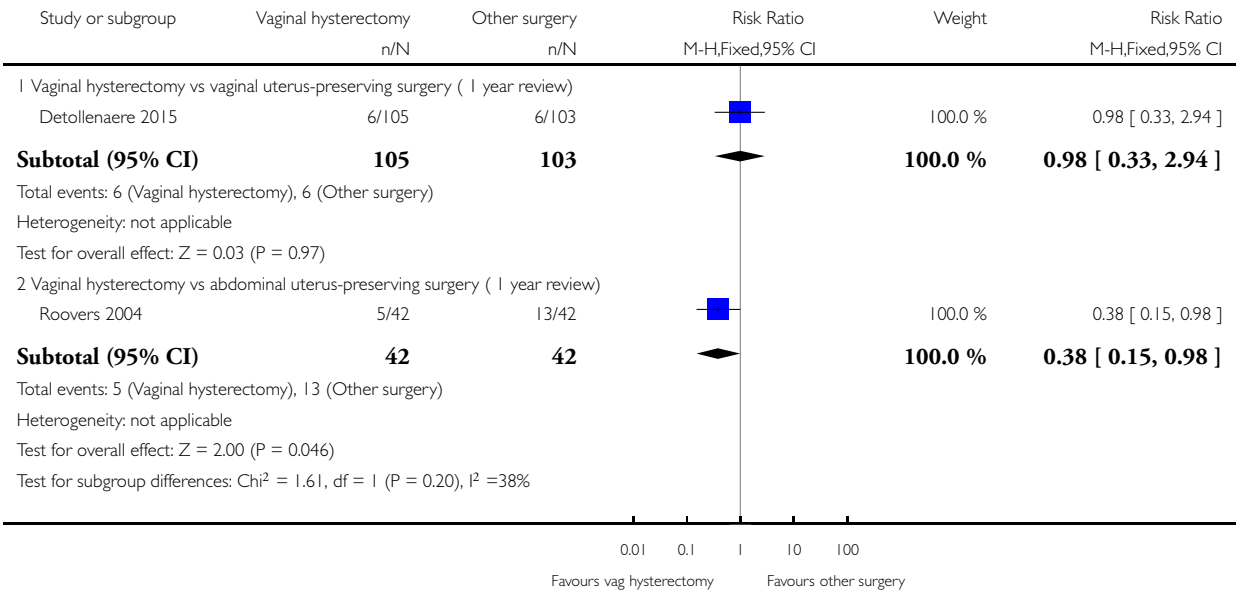


Analysis 4.1. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 1 Awareness of prolapse.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 1 Awareness of prolapse

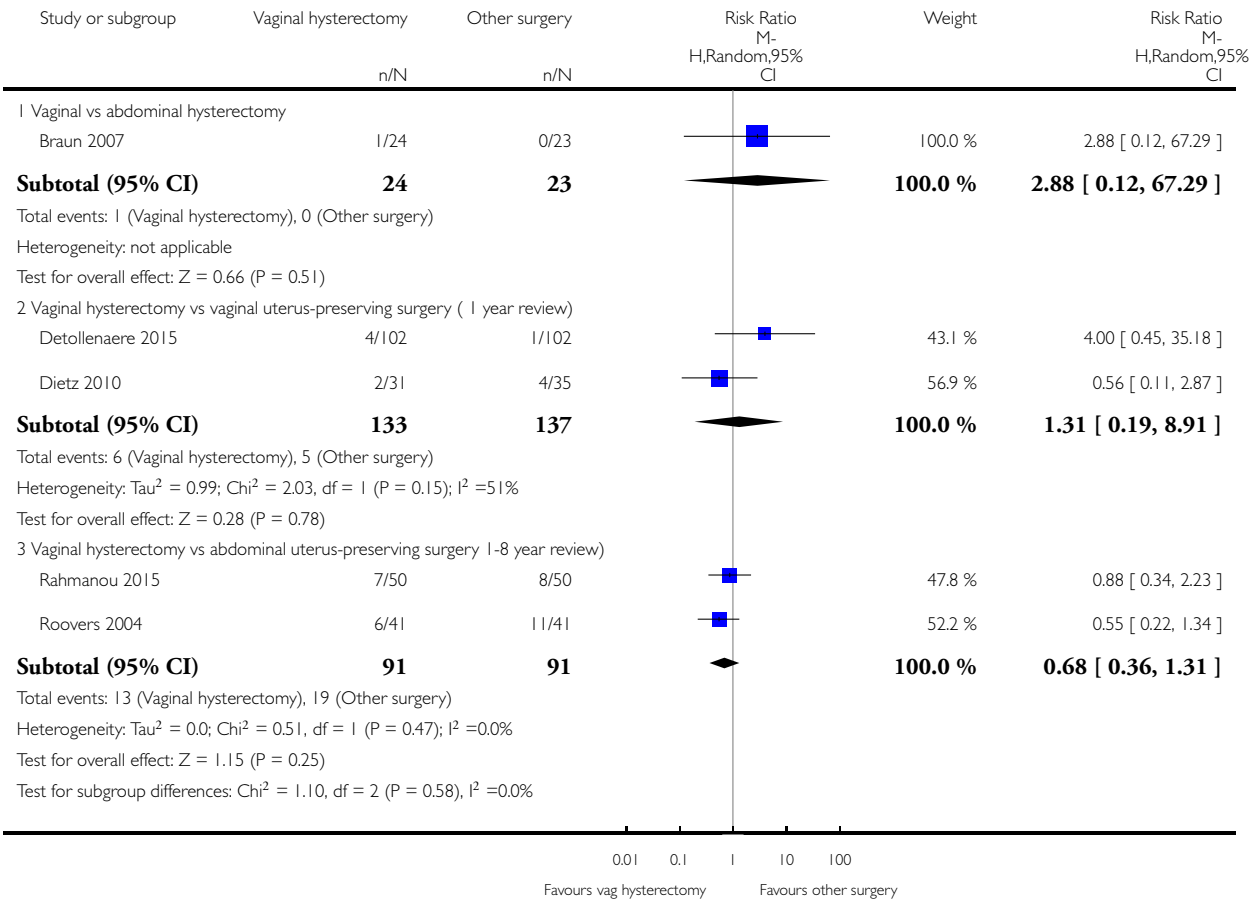


Analysis 4.2. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 2 Repeat prolapse surgery.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 2 Repeat prolapse surgery

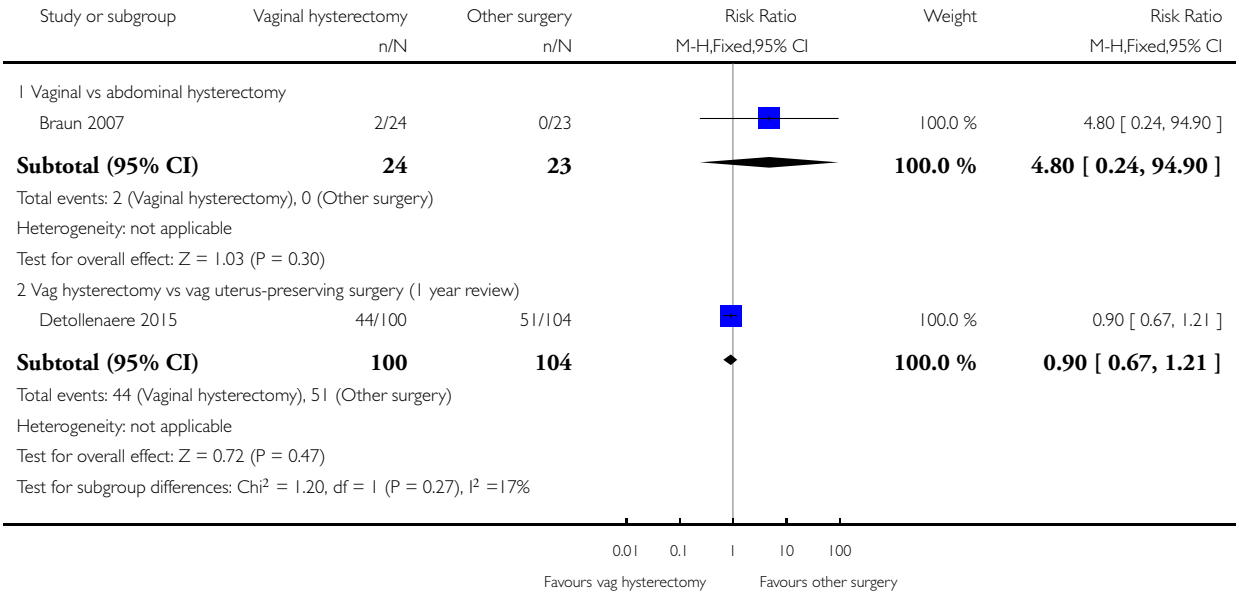


Analysis 4.3. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 3 Objective failure any site (POP).

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 3 Objective failure any site (POP)



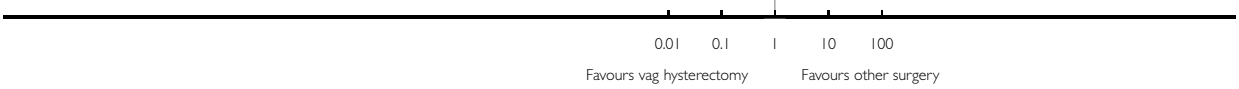
Analysis 4.4. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 4 Bladder injuries.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 4 Bladder injuries

Study or subgroup	Vaginal hysterectomy n/N	Other surgery n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 Vag hysterectomy vs vag uterus-preserving surgery (1 year review)					
Dietz 2010	0/31	0/34			Not estimable
Subtotal (95% CI)	**31**	**34**			**Not estimable**
Total events: 0 (Vaginal hysterectomy), 0 (Other surgery)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Chi^2 = 0.0, df = -1 (P = 0.0), I^2 =0.0%					

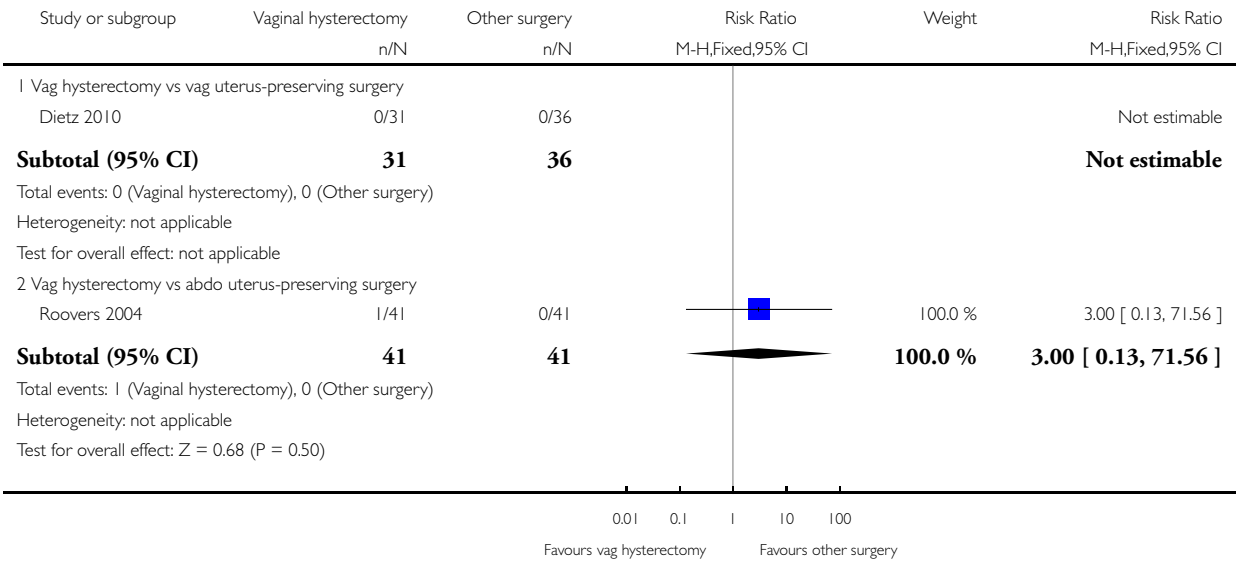


Analysis 4.5. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 5 Bowel injuries (1 year review).

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 5 Bowel injuries (1 year review)

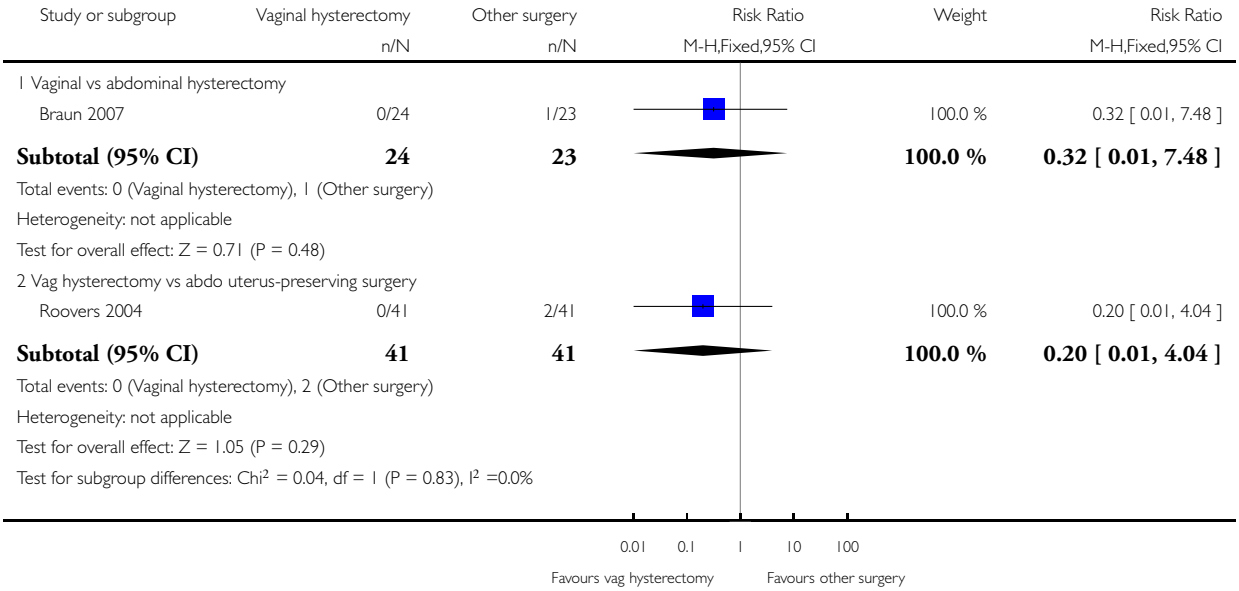


Analysis 4.6. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 6 Mesh exposure.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 6 Mesh exposure

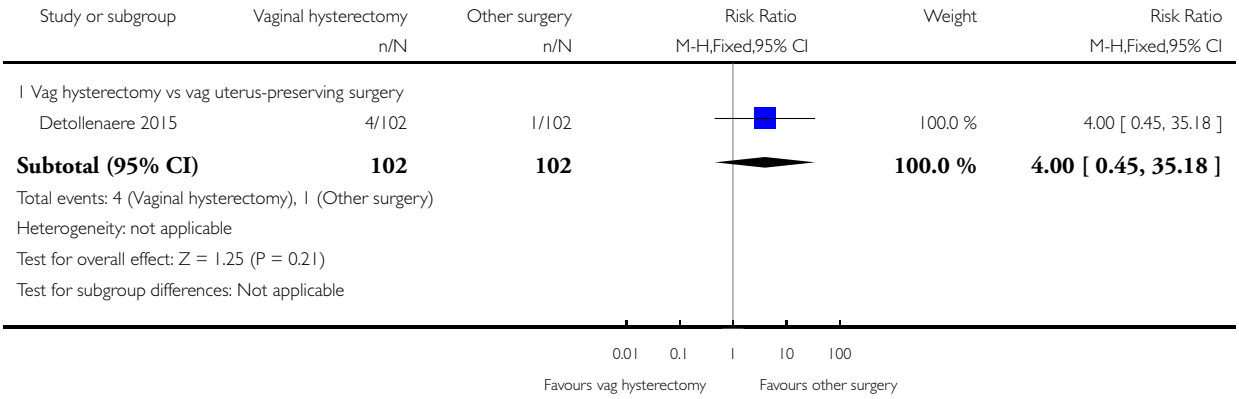


Analysis 4.8. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 8 Repeat surgery for incontinence.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 8 Repeat surgery for incontinence

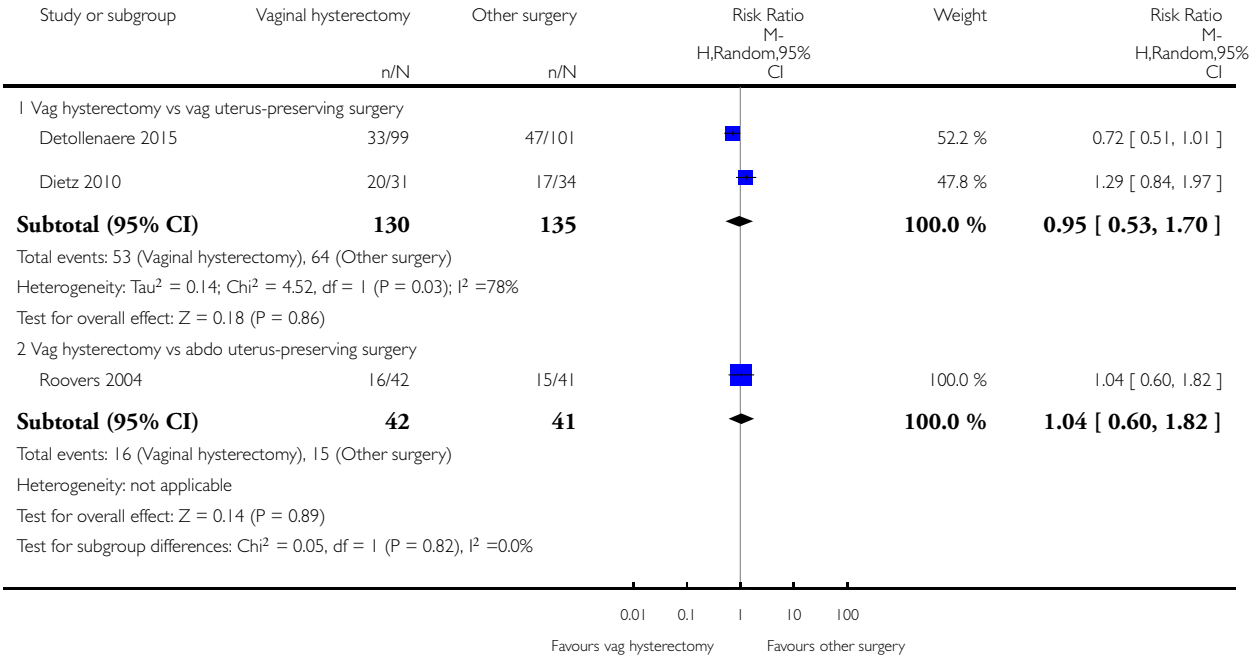


Analysis 4.9. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 9 Anterior compartment prolapse (1 year review).

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 9 Anterior compartment prolapse (1 year review)

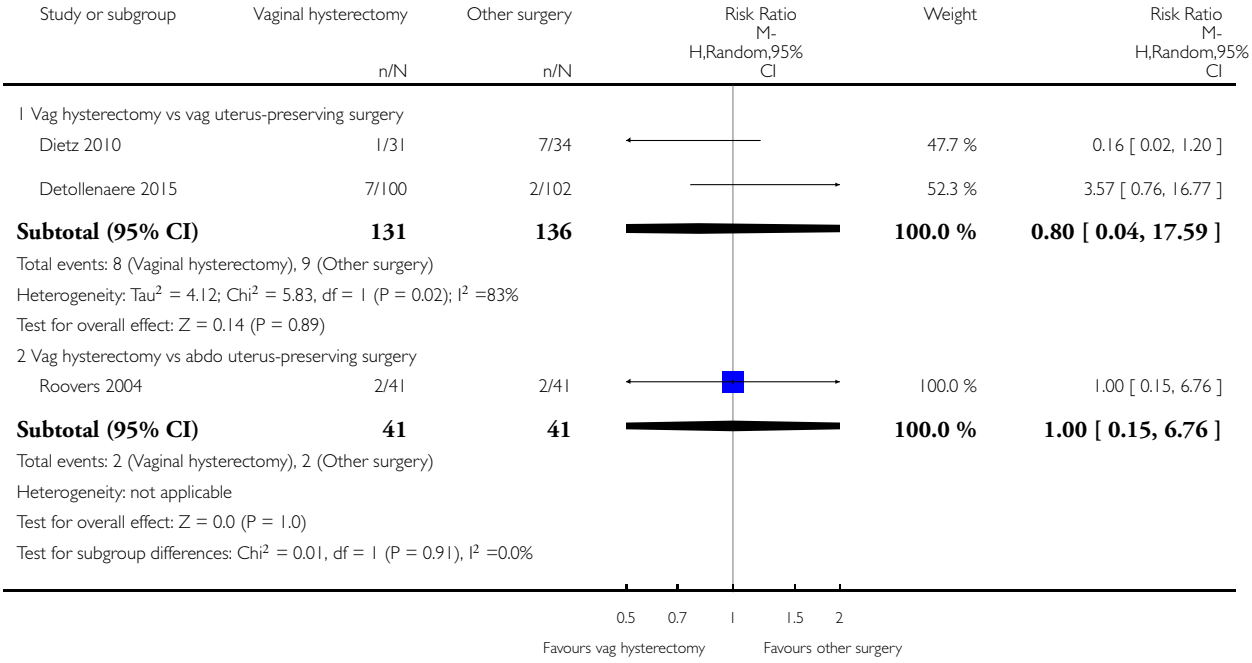


Analysis 4.10. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 10 Apical compartment prolapse.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 10 Apical compartment prolapse

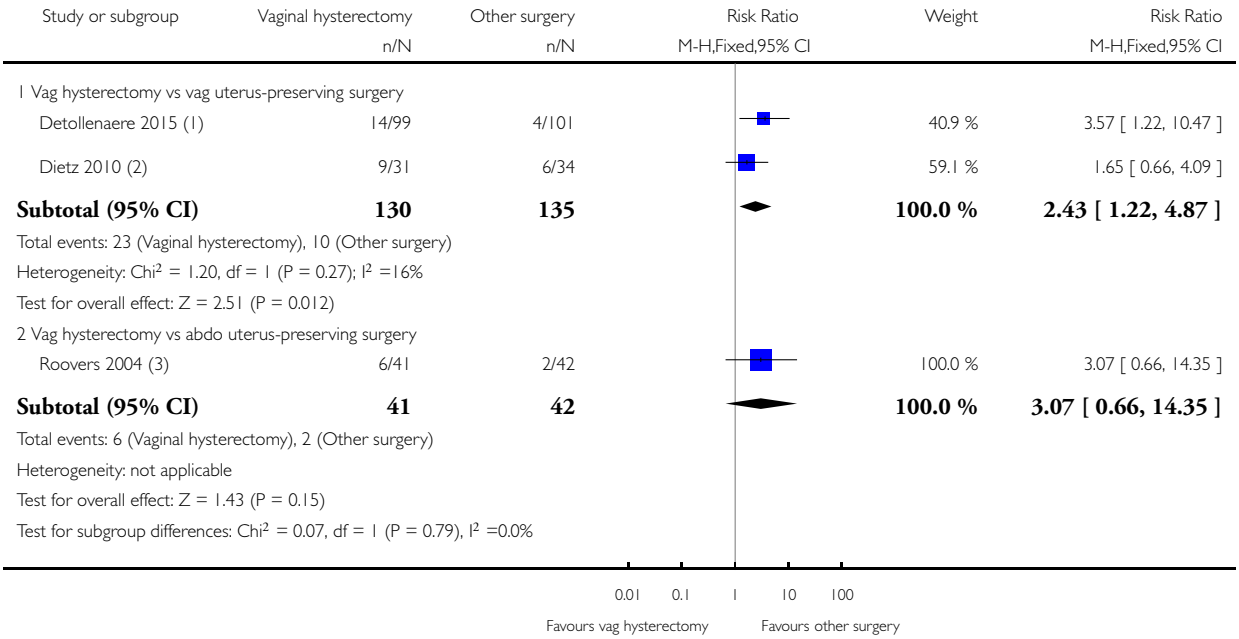


Analysis 4.11. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 11 Posterior compartment prolapse.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 11 Posterior compartment prolapse



(1) vaginal hysterectomy versus sacrospinous hysteropexy

(2) vaginal hysterectomy with apical suspension versus sacrospinous hysteropexy

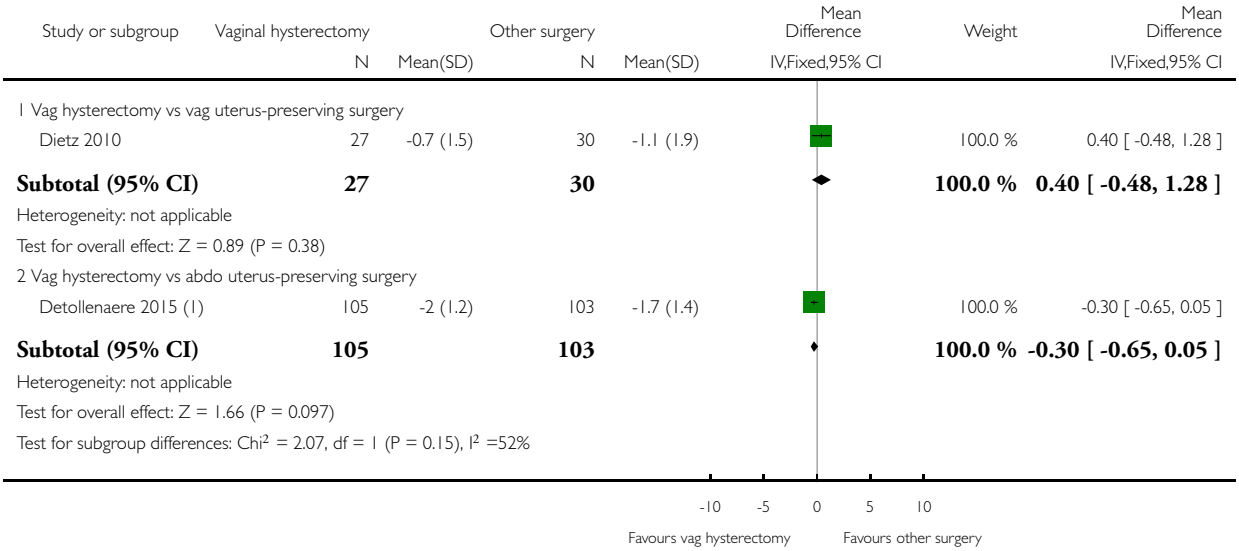
(3) vaginal hysterectomy versus abdo sacrohysteropexy

Analysis 4.12. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 12 POPQ assessment Point Ba.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 12 POPQ assessment Point Ba



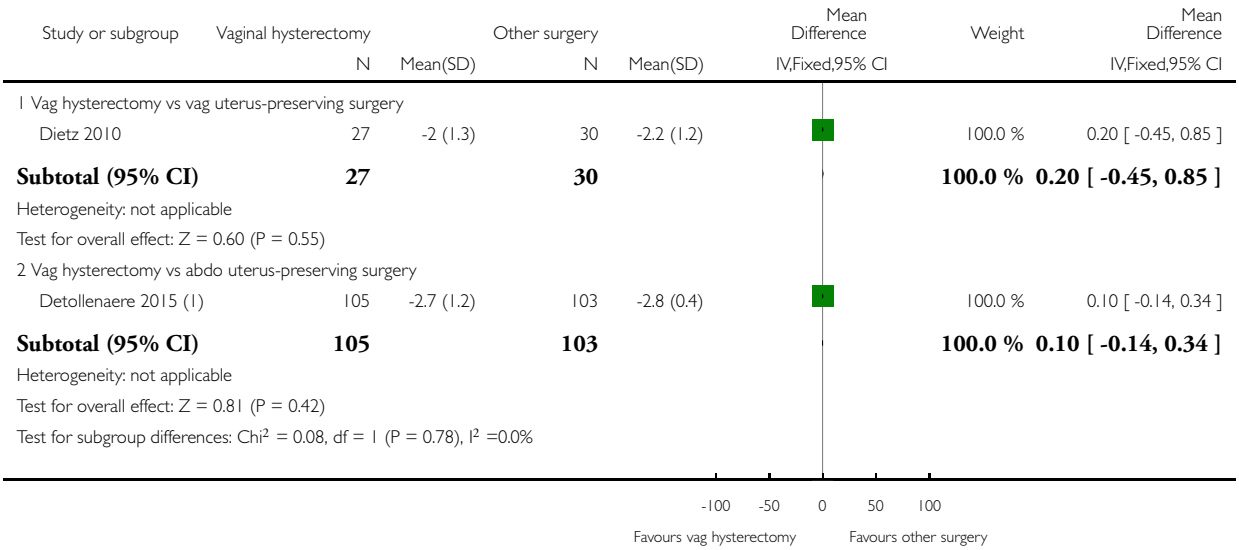
(1) vaginal hysterectomy versus sacrospinous hysteropexy

Analysis 4.13. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 13 POPQ assessment: Point Bp.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 13 POPQ assessment: Point Bp



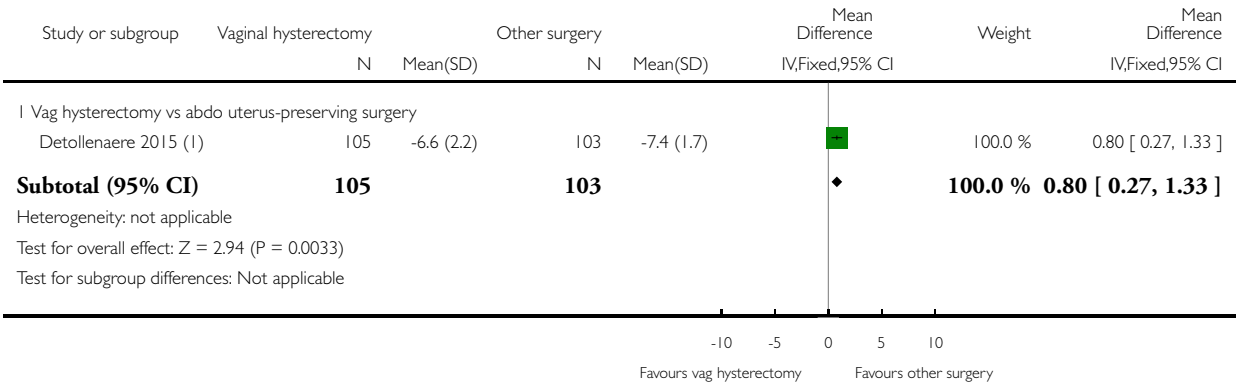
(1) vaginal hysterectomy versus sacrospinous hysteropexy

Analysis 4.14. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 14 POPQ assessment: Point C.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 14 POPQ assessment: Point C



(1) vaginal hysterectomy versus sacrospinous hysteropexy

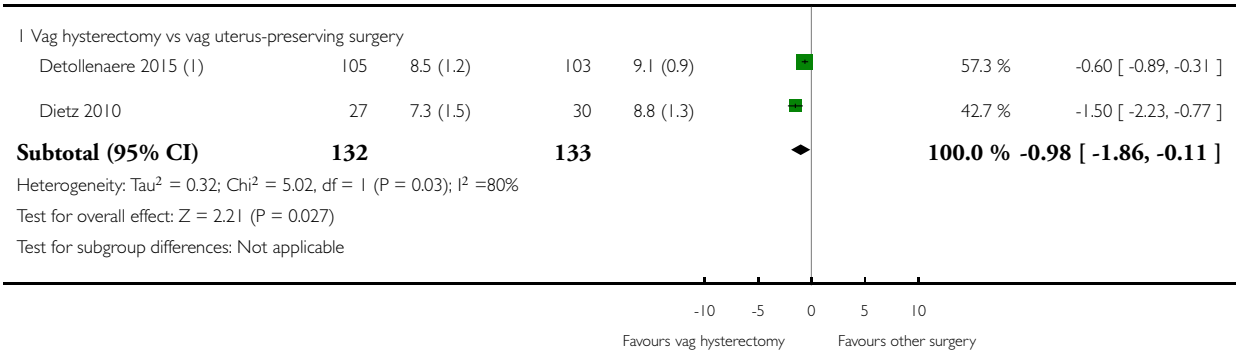
Analysis 4.15. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 15 POPQ assessment: Total vaginal length.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 15 POPQ assessment: Total vaginal length

Study or subgroup	Vaginal hysterectomy N	Mean(SD)	Other surgery N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Vag hysterectomy vs vag uterus-preserving surgery							
Detollenaere 2015 (1)	105	8.5 (1.2)	103	9.1 (0.9)		57.3 %	-0.60 [-0.89, -0.31]
Dietz 2010	27	7.3 (1.5)	30	8.8 (1.3)		42.7 %	-1.50 [-2.23, -0.77]
Subtotal (95% CI)	**132**		**133**			**100.0 %**	**-0.98 [-1.86, -0.11]**
Heterogeneity: $Tau^2 = 0.32$; $Chi^2 = 5.02$, df = 1 (P = 0.03); $I^2 = 80\%$							
Test for overall effect: Z = 2.21 (P = 0.027)							
Test for subgroup differences: Not applicable							



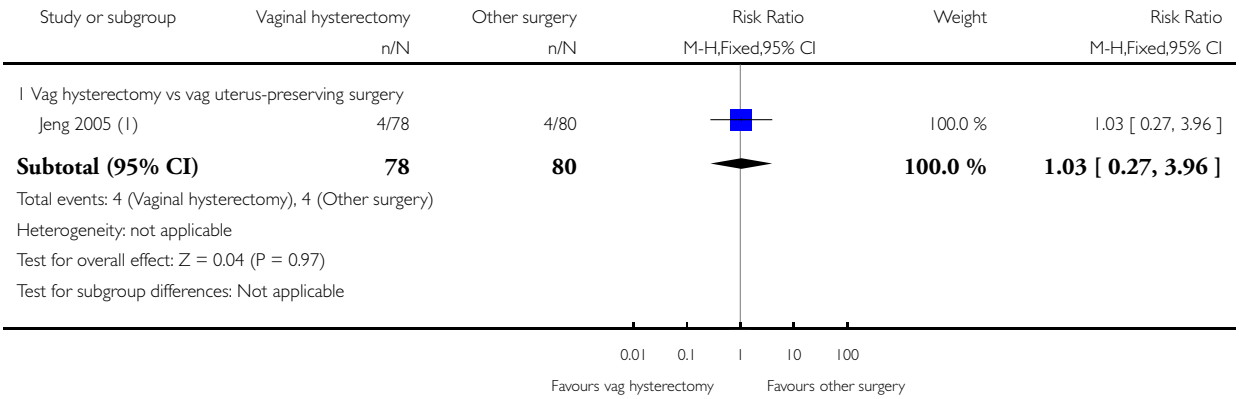
(1) vaginal hysterectomy with apical support versus sacrospinous hysteropexy

Analysis 4.16. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 16 Dyspareunia.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 16 Dyspareunia



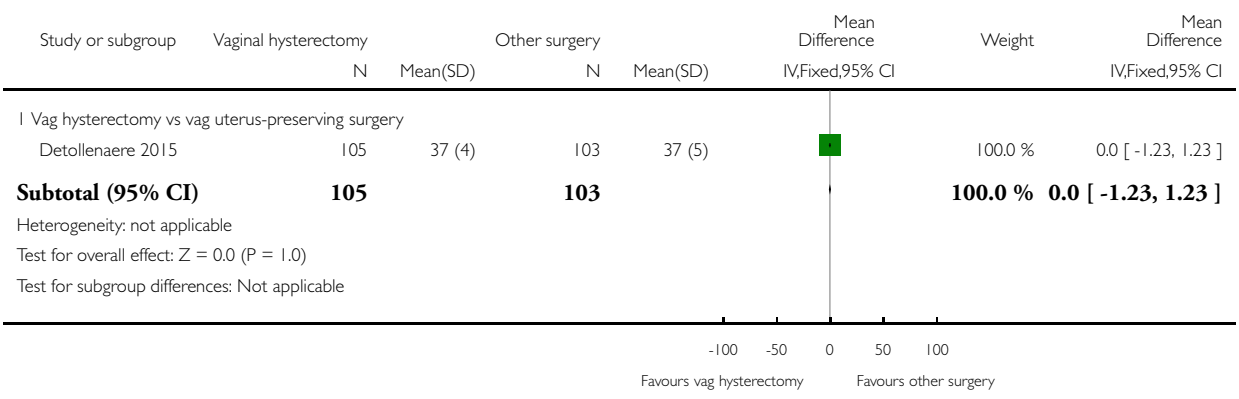
(1) Vaginal hysterectomy versus vaginal sacrospinous uterine suspension

Analysis 4.17. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 17 Quality of life:Pelvic organ prolapse/ urinary incontinence sexual questionnaire.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 17 Quality of life:Pelvic organ prolapse/ urinary incontinence sexual questionnaire

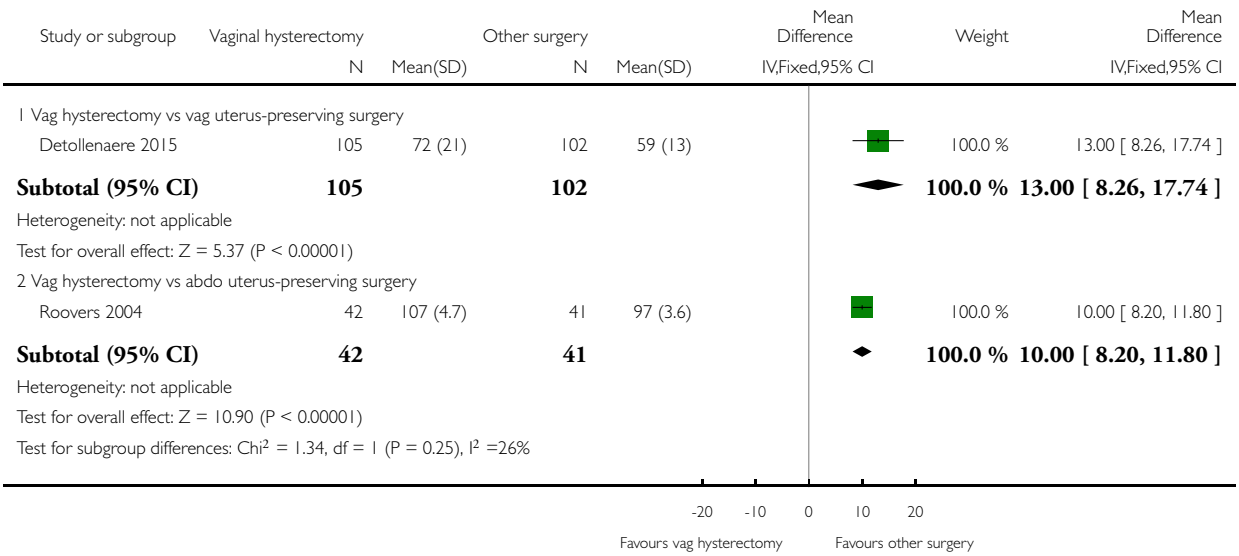


Analysis 4.18. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 18 Operating time (minutes).

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 18 Operating time (minutes)

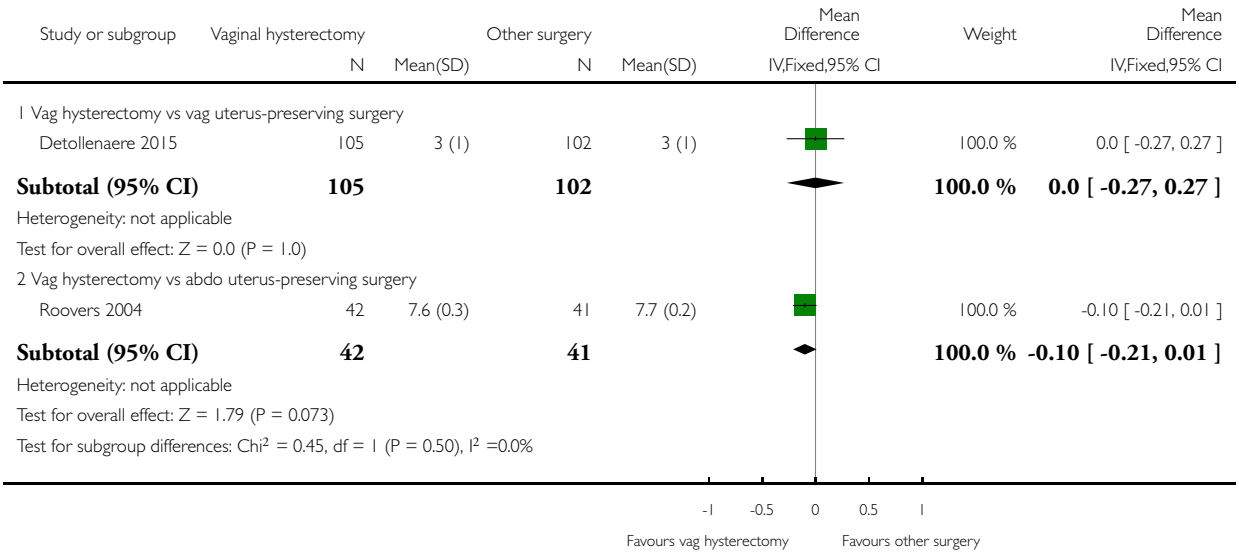


Analysis 4.19. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 19 Hospital stay.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 19 Hospital stay

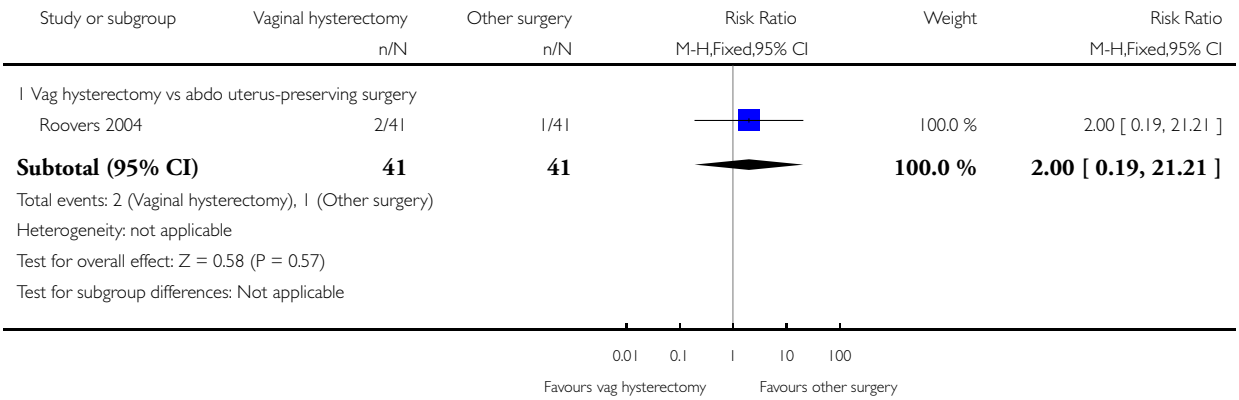


Analysis 4.20. Comparison 4 Vaginal hysterectomy vs alternatives for uterine prolapse, Outcome 20 Blood transfusion.

Review: Surgery for women with apical vaginal prolapse

Comparison: 4 Vaginal hysterectomy vs alternatives for uterine prolapse

Outcome: 20 Blood transfusion

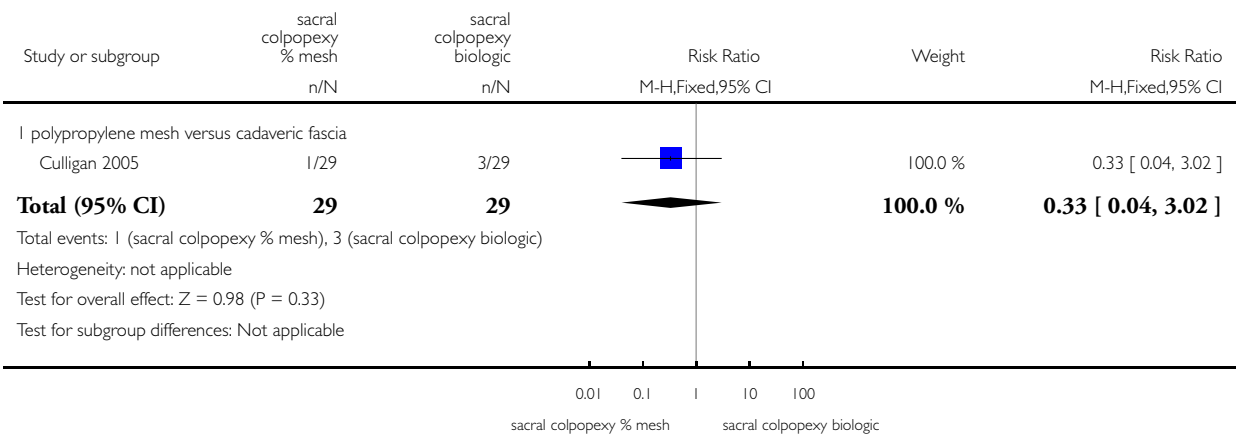


Analysis 5.1. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 1 Awareness of prolapse (1-5 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 1 Awareness of prolapse (1-5 years)

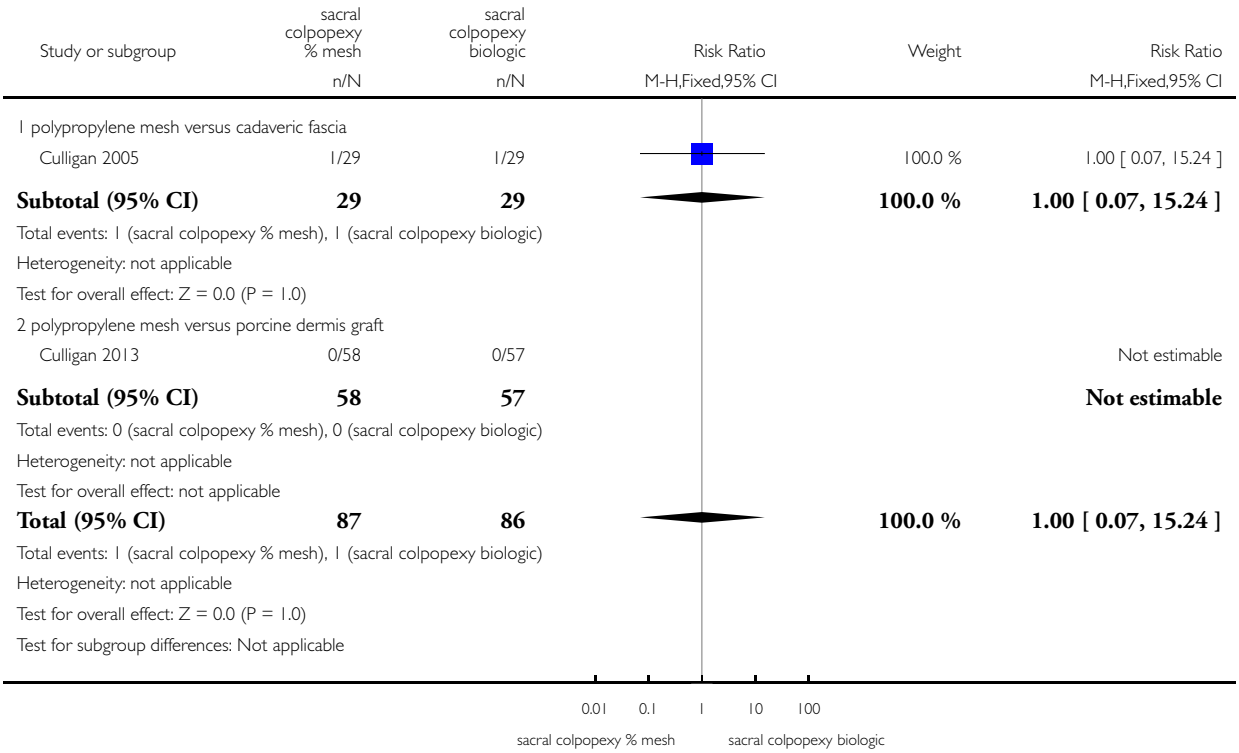


Analysis 5.2. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 2 Prolapse surgery (1-5 year).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 2 Prolapse surgery (1-5 year)

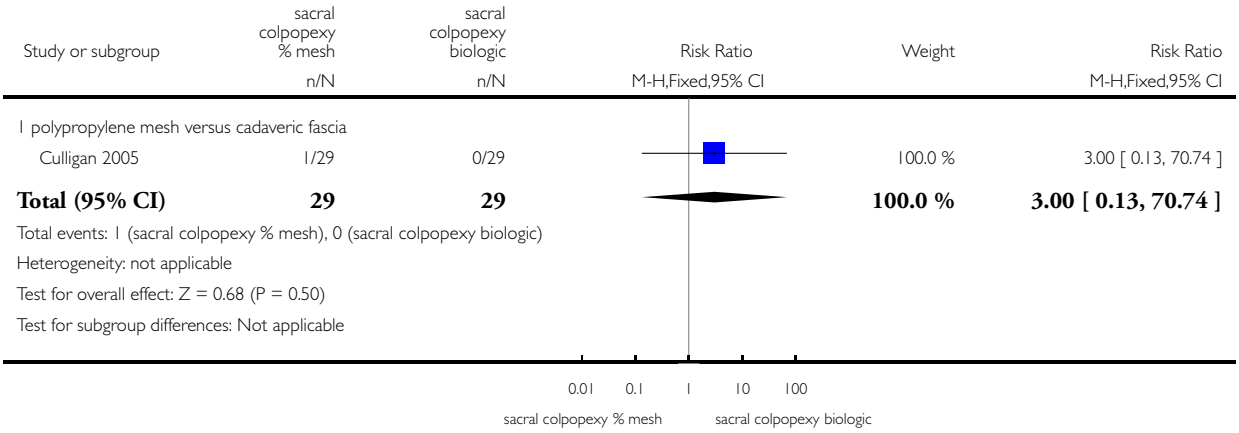


Analysis 5.3. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 3 Surgery stress urinary incontinence 5 years.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 3 Surgery stress urinary incontinence 5 years



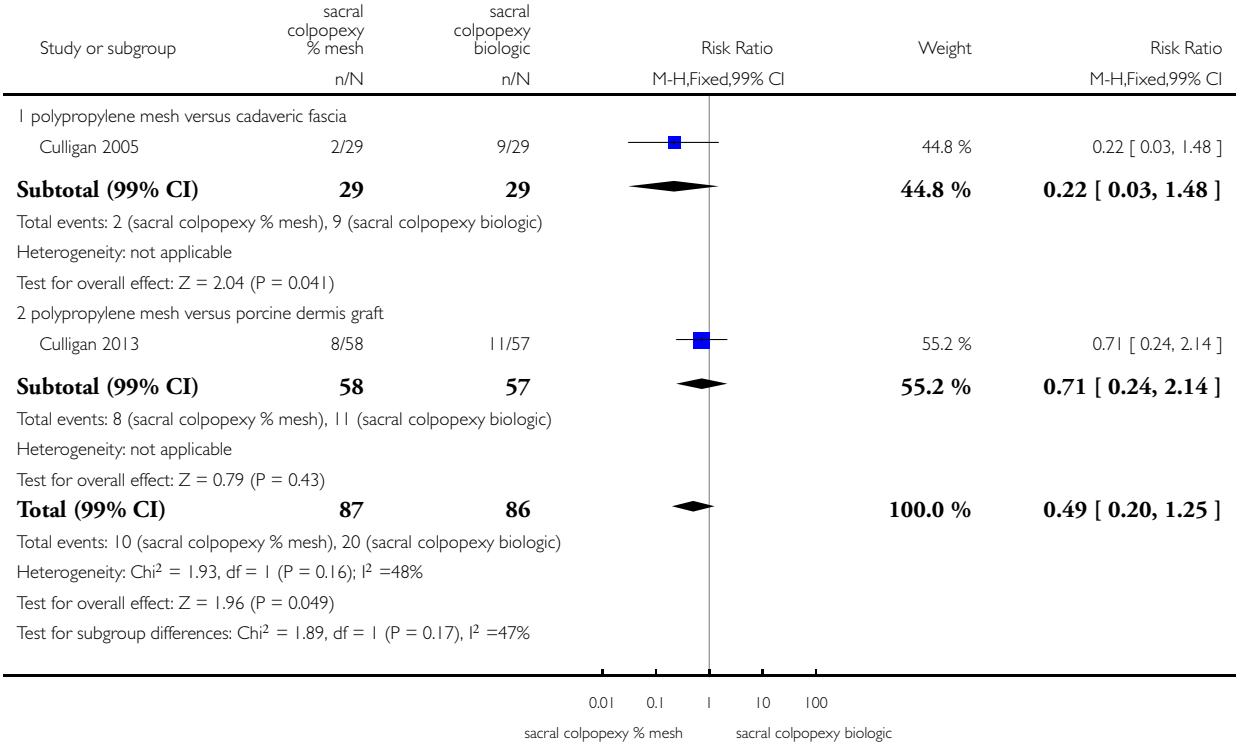
Analysis 5.4. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 4 Recurrent prolapse (any site on examination (1-5 year)).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 4 Recurrent prolapse (any site on examination (1-5 year))

Study or subgroup	sacral colpopexy % mesh n/N	sacral colpopexy biologic n/N	Risk Ratio M-H,Fixed,99% CI	Weight	Risk Ratio M-H,Fixed,99% CI
1 polypropylene mesh versus cadaveric fascia					
Culligan 2005	2/29	9/29		44.8 %	0.22 [0.03, 1.48]
Subtotal (99% CI)	**29**	**29**		**44.8 %**	**0.22 [0.03, 1.48]**
Total events: 2 (sacral colpopexy % mesh), 9 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 2.04 (P = 0.041)					
2 polypropylene mesh versus porcine dermis graft					
Culligan 2013	8/58	11/57		55.2 %	0.71 [0.24, 2.14]
Subtotal (99% CI)	**58**	**57**		**55.2 %**	**0.71 [0.24, 2.14]**
Total events: 8 (sacral colpopexy % mesh), 11 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.79 (P = 0.43)					
Total (99% CI)	**87**	**86**		**100.0 %**	**0.49 [0.20, 1.25]**
Total events: 10 (sacral colpopexy % mesh), 20 (sacral colpopexy biologic)					
Heterogeneity: Chi^2 = 1.93, df = 1 (P = 0.16); I^2 =48%					
Test for overall effect: Z = 1.96 (P = 0.049)					
Test for subgroup differences: Chi^2 = 1.89, df = 1 (P = 0.17), I^2 =47%					

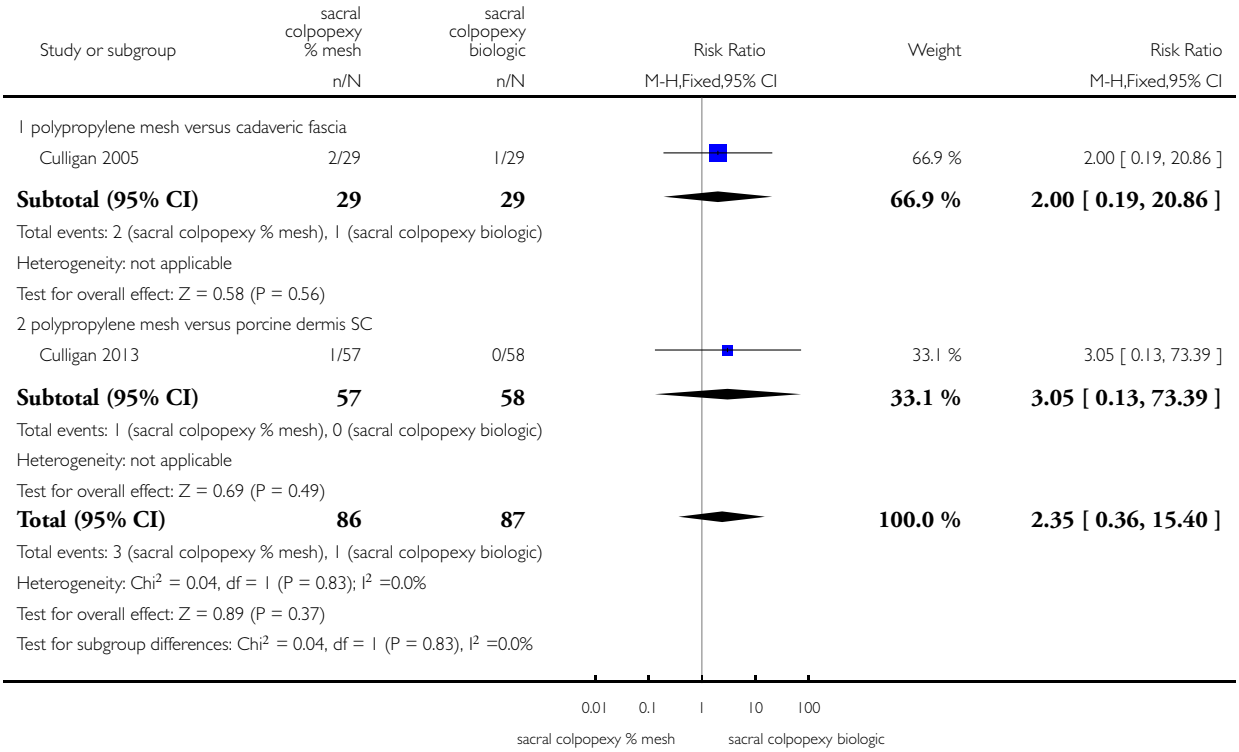


Analysis 5.5. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 5 Mesh exposure (1-5 year).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 5 Mesh exposure (1-5 year)

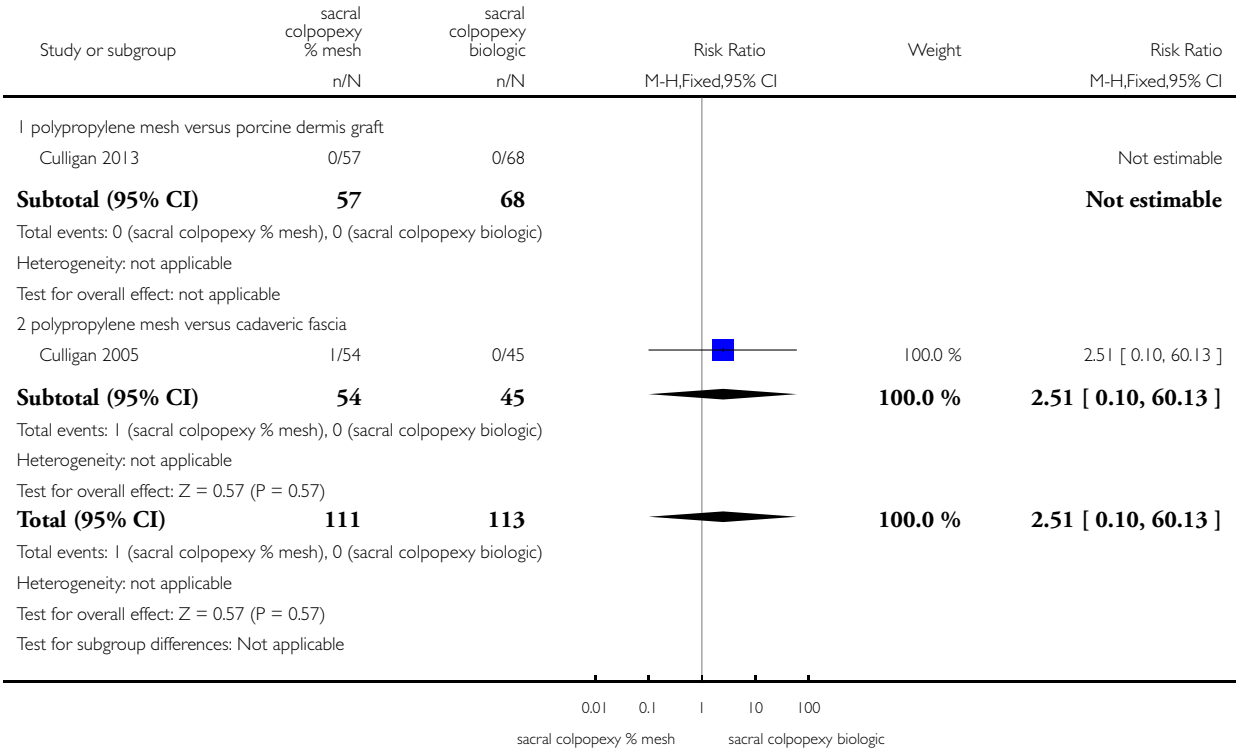


Analysis 5.6. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 6 Bladder injury.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 6 Bladder injury



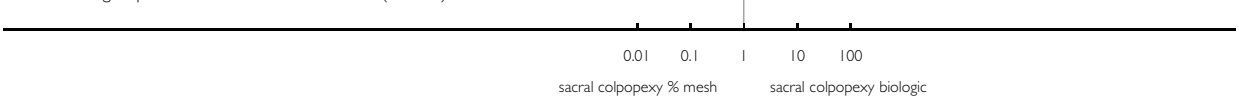
Analysis 5.7. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 7 Bowel injury.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 7 Bowel injury

Study or subgroup	sacral colpopexy % mesh n/N	sacral colpopexy biologic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 polypropylene mesh versus porcine dermis graft					
Culligan 2013	0/57	0/58			Not estimable
Subtotal (95% CI)	**57**	**58**			**Not estimable**
Total events: 0 (sacral colpopexy % mesh), 0 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
2 polypropylene mesh versus cadaveric fascia					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (sacral colpopexy % mesh), 0 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	**57**	**58**			**Not estimable**
Total events: 0 (sacral colpopexy % mesh), 0 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Chi^2 = 0.0, df = -1 (P = 0.0), I^2 =0.0%					

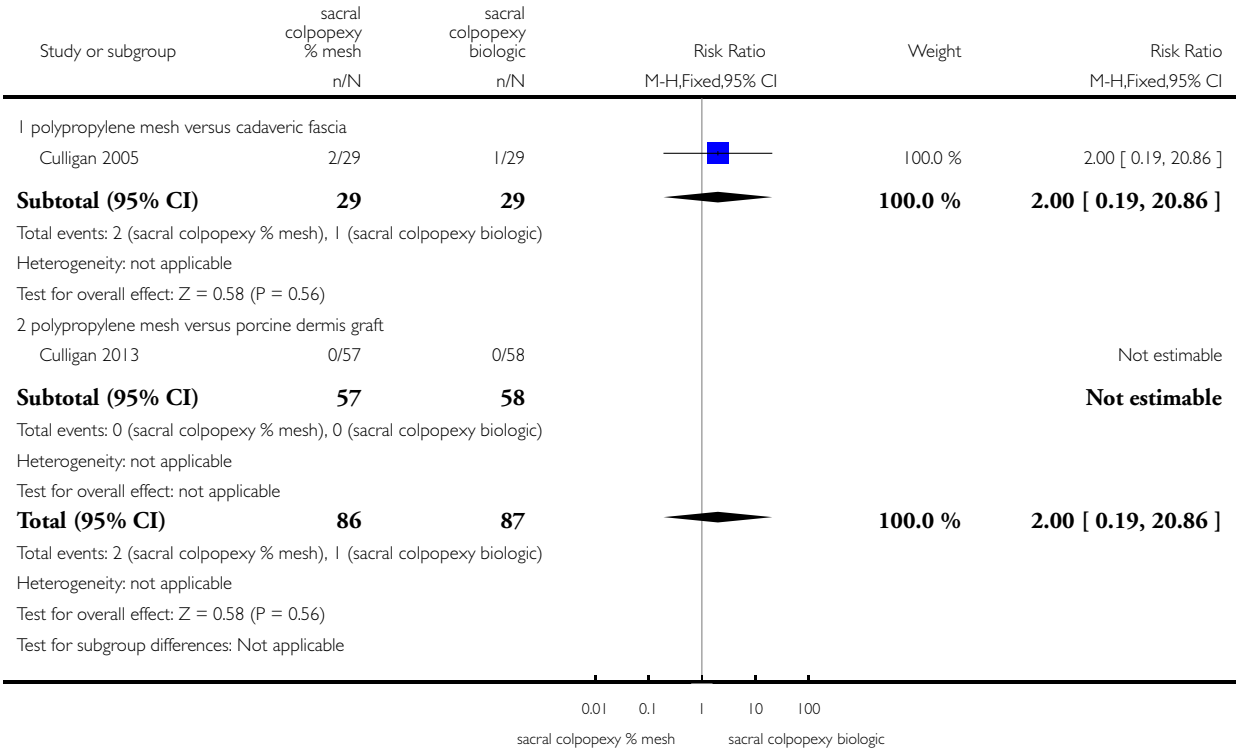


Analysis 5.8. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 8 Surgery mesh exposure 1-5 years.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 8 Surgery mesh exposure 1-5 years



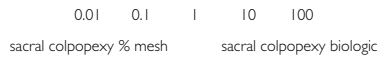
Analysis 5.9. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 9 apical prolapse.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 9 apical prolapse

Study or subgroup	sacral colpopexy % mesh n/N	sacral colpopexy biologic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Culligan 2005	0/44	0/45			Not estimable
Culligan 2013	0/57	0/58			Not estimable
Total (95% CI)	**101**	**103**			**Not estimable**
Total events: 0 (sacral colpopexy % mesh), 0 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Not applicable					



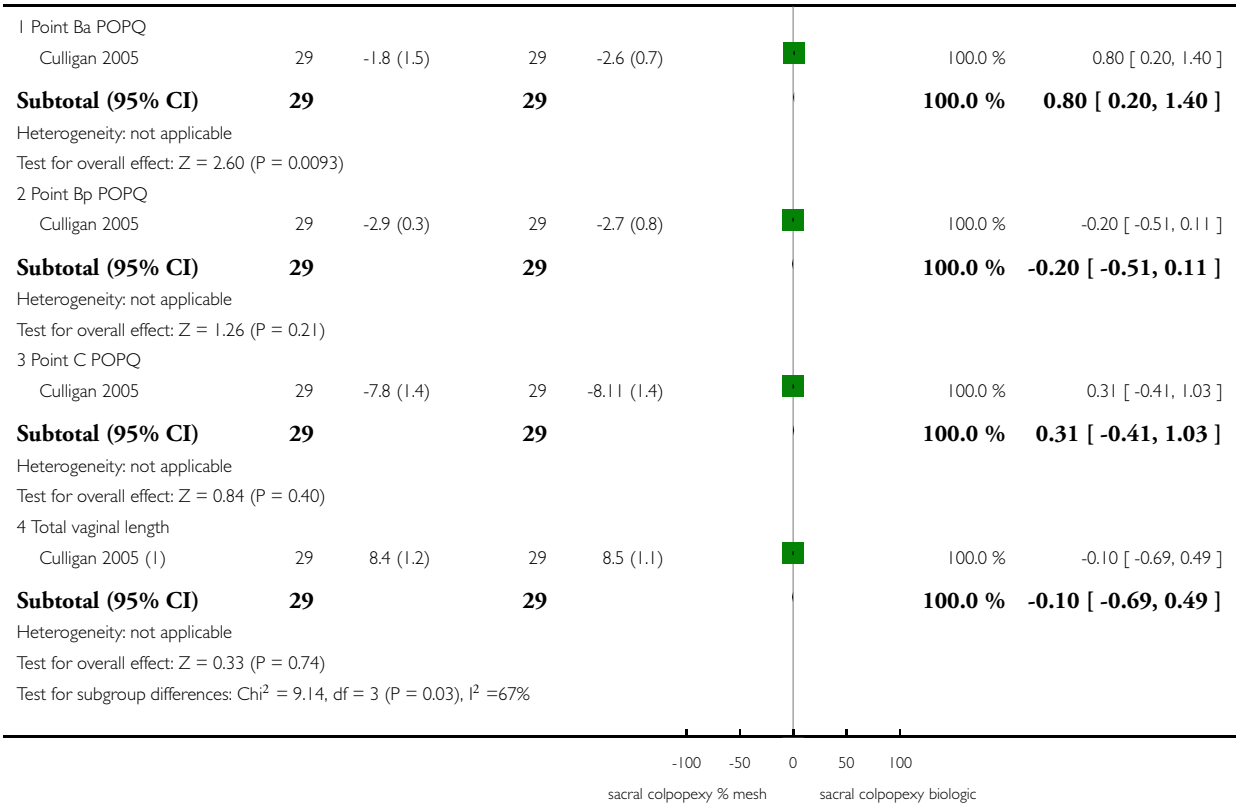
Analysis 5.10. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 10 POPQ assessment.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 10 POPQ assessment

Study or subgroup	sacral colpopexy % mesh N	Mean(SD)	sacral colpopexy biologic N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Point Ba POPQ							
Culligan 2005	29	-1.8 (1.5)	29	-2.6 (0.7)		100.0 %	0.80 [0.20, 1.40]
Subtotal (95% CI)	**29**		**29**			**100.0 %**	**0.80 [0.20, 1.40]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.60 (P = 0.0093)							
2 Point Bp POPQ							
Culligan 2005	29	-2.9 (0.3)	29	-2.7 (0.8)		100.0 %	-0.20 [-0.51, 0.11]
Subtotal (95% CI)	**29**		**29**			**100.0 %**	**-0.20 [-0.51, 0.11]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.26 (P = 0.21)							
3 Point C POPQ							
Culligan 2005	29	-7.8 (1.4)	29	-8.11 (1.4)		100.0 %	0.31 [-0.41, 1.03]
Subtotal (95% CI)	**29**		**29**			**100.0 %**	**0.31 [-0.41, 1.03]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.84 (P = 0.40)							
4 Total vaginal length							
Culligan 2005 (1)	29	8.4 (1.2)	29	8.5 (1.1)		100.0 %	-0.10 [-0.69, 0.49]
Subtotal (95% CI)	**29**		**29**			**100.0 %**	**-0.10 [-0.69, 0.49]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.33 (P = 0.74)							
Test for subgroup differences: Chi^2 = 9.14, df = 3 (P = 0.03), I^2 =67%							



(1) cadaveric fascia at sacral colpopexy versus monofilament polypropylene mesh at sacral co

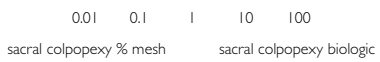
Analysis 5.11. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 11 Dyspareunia (de novo 1 year)).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 11 Dyspareunia (de novo 1 year))

Study or subgroup	sacral colpopexy % mesh n/N	sacral colpopexy biologic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 polypropylene mesh versus porcine graft SC					
Culligan 2013	3/58	2/57		100.0 %	1.47 [0.26, 8.50]
Subtotal (95% CI)	**58**	**57**		**100.0 %**	**1.47 [0.26, 8.50]**
Total events: 3 (sacral colpopexy % mesh), 2 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.43 (P = 0.66)					
2 polypropylene mesh versus cadaveric fascia					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (sacral colpopexy % mesh), 0 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	**58**	**57**		**100.0 %**	**1.47 [0.26, 8.50]**
Total events: 3 (sacral colpopexy % mesh), 2 (sacral colpopexy biologic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.43 (P = 0.66)					
Test for subgroup differences: Not applicable					



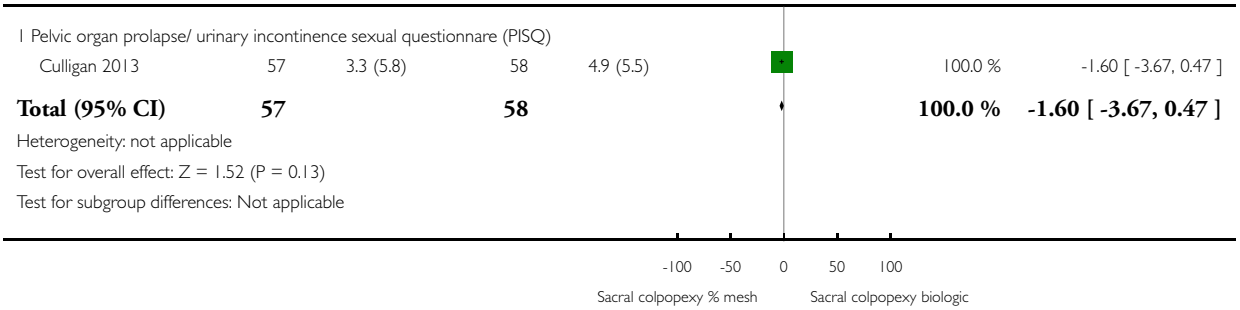
Analysis 5.12. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 12 Sexual function.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 12 Sexual function

Study or subgroup	sacral colpopexy % mesh N	Mean(SD)	sacral colpopexy biologic N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Pelvic organ prolapse/ urinary incontinence sexual questionnare (PISQ)							
Culligan 2013	57	3.3 (5.8)	58	4.9 (5.5)		100.0 %	-1.60 [-3.67, 0.47]
Total (95% CI)	**57**		**58**			**100.0 %**	**-1.60 [-3.67, 0.47]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.52 (P = 0.13)							
Test for subgroup differences: Not applicable							

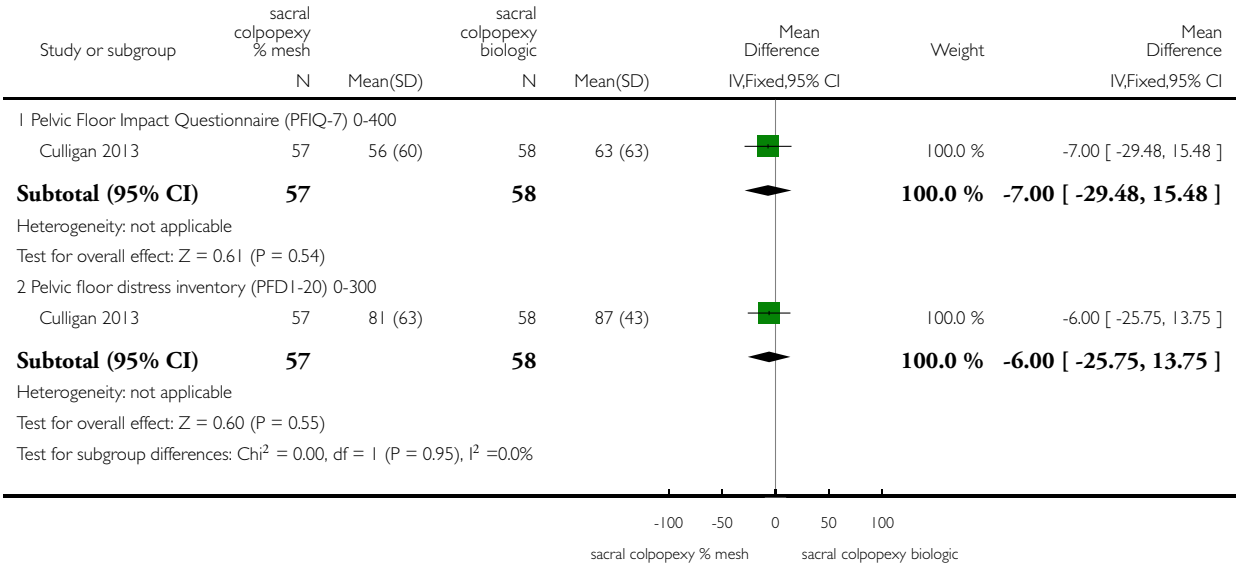


Analysis 5.13. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 13 Quality of life PROLAPSE (i year).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 13 Quality of life PROLAPSE (i year)

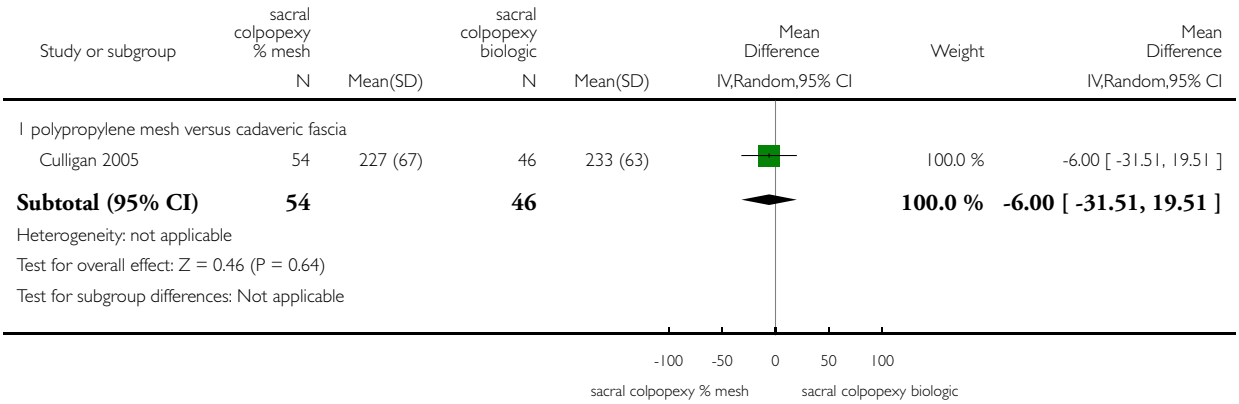


Analysis 5.14. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 14 Operating time (mins).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 14 Operating time (mins)

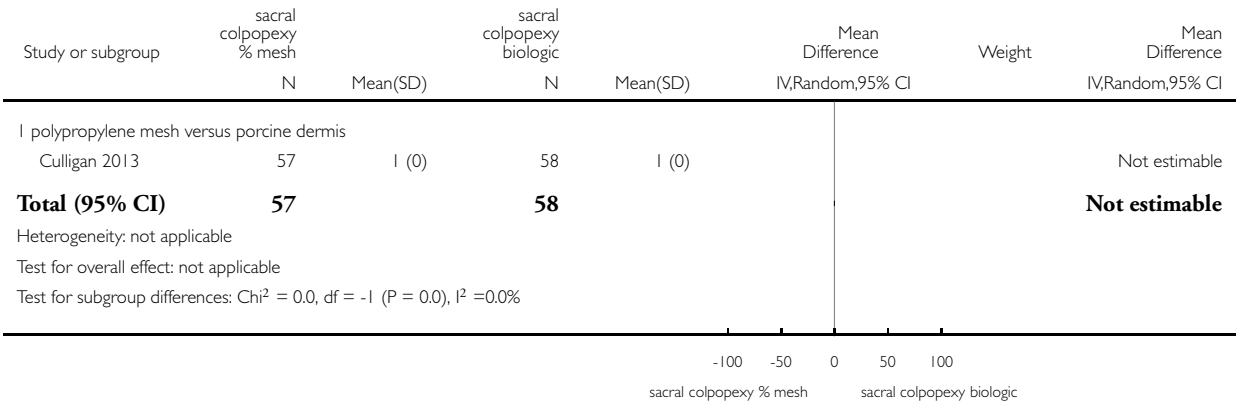


Analysis 5.15. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 15 Hospital stay.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 15 Hospital stay

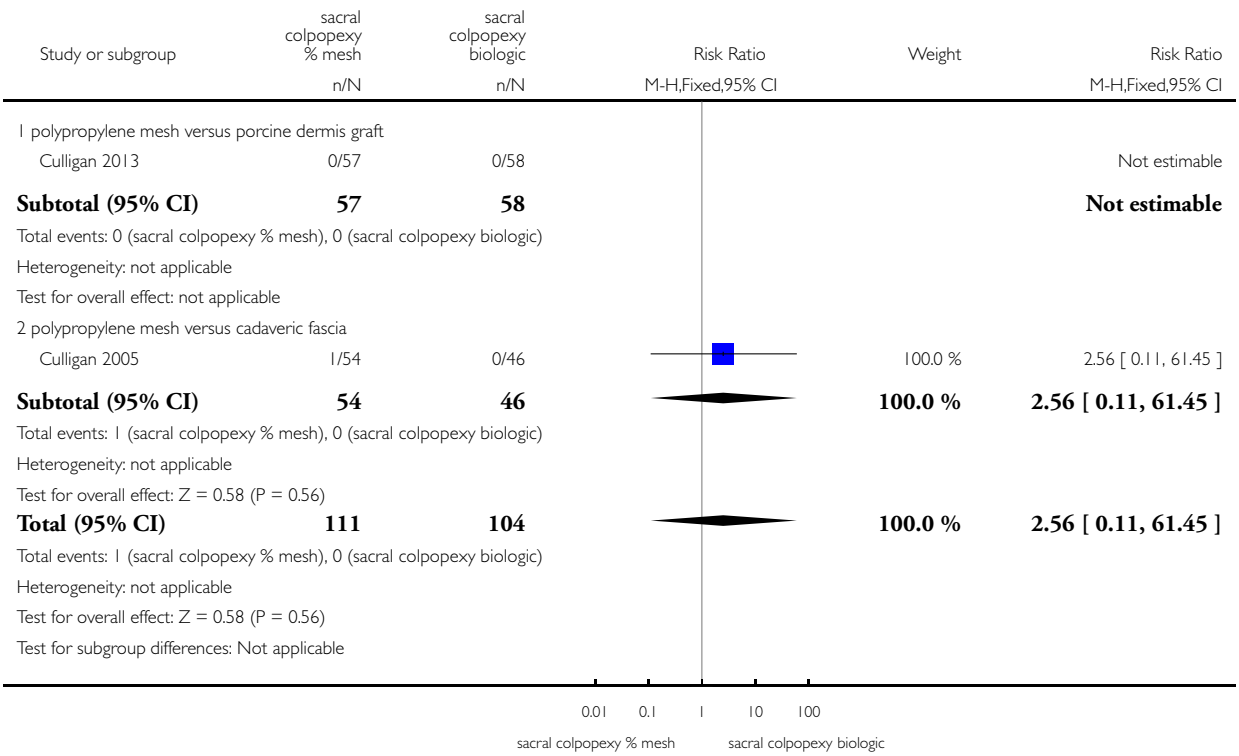


Analysis 5.16. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 16 Blood transfusion.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 16 Blood transfusion



Analysis 5.17. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 17 pain at normal acivities (week one).

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

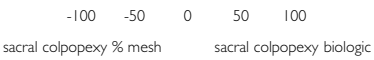
Outcome: 17 pain at normal acivities (week one)

Study or subgroup	sacral colpopexy % mesh N	Mean(SD)	sacral colpopexy biologic N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Anger 2014	38	2.7 (2.2)	40	3.6 (2.1)		100.0 %	-0.90 [-1.86, 0.06]
Total (95% CI)	**38**		**40**			**100.0 %**	**-0.90 [-1.86, 0.06]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.85 (P = 0.065)

Test for subgroup differences: Not applicable



Analysis 5.18. Comparison 5 Sacral colpopexy mesh versus biological, Outcome 18 Surgery or pessary for prolapse.

Review: Surgery for women with apical vaginal prolapse

Comparison: 5 Sacral colpopexy mesh versus biological

Outcome: 18 Surgery or pessary for prolapse

Study or subgroup	sacral colpopexy % mesh n/N	sacral colpopexy biologic n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Brubaker 2008	5/73	7/73		100.0 %	0.71 [0.24, 2.15]
Costantini 2007	0/31	0/32			Not estimable
Costantini 2008	0/24	0/23			Not estimable
Total (95% CI)	**128**	**128**		**100.0 %**	**0.71 [0.24, 2.15]**

Total events: 5 (sacral colpopexy % mesh), 7 (sacral colpopexy biologic)

Heterogeneity: not applicable

Test for overall effect: Z = 0.60 (P = 0.55)

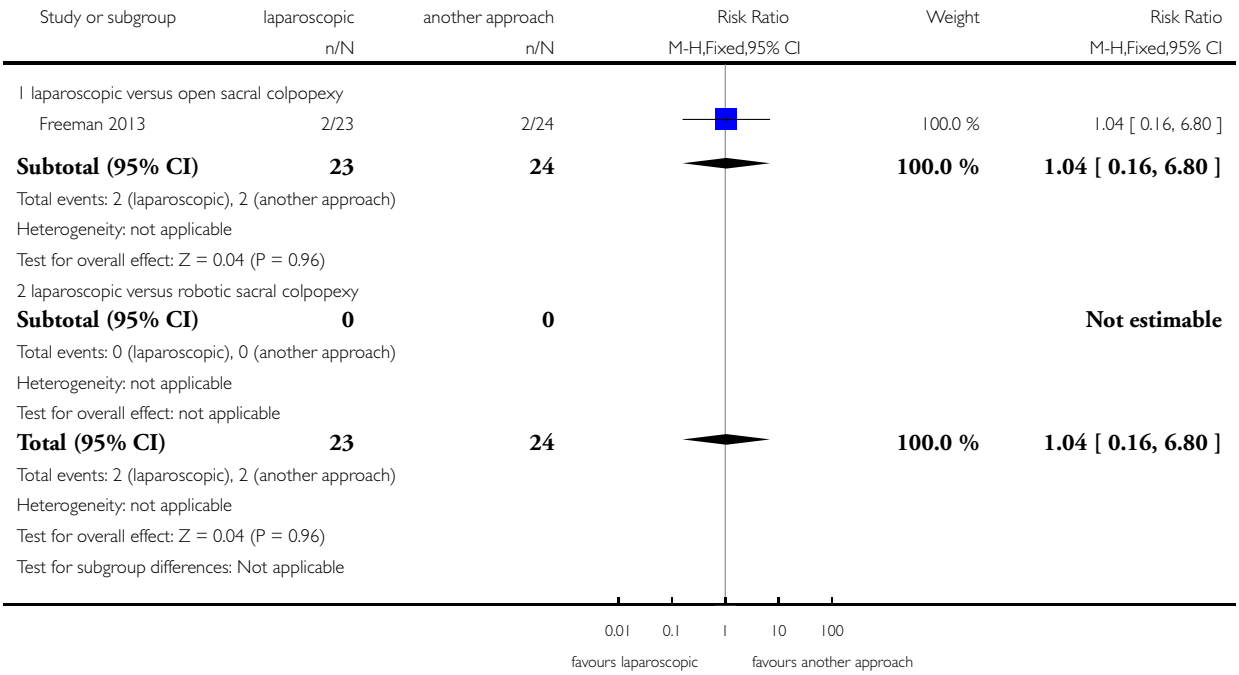
Test for subgroup differences: Not applicable

Analysis 6.1. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 1 Repeat Prolapse Surgery.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 1 Repeat Prolapse Surgery

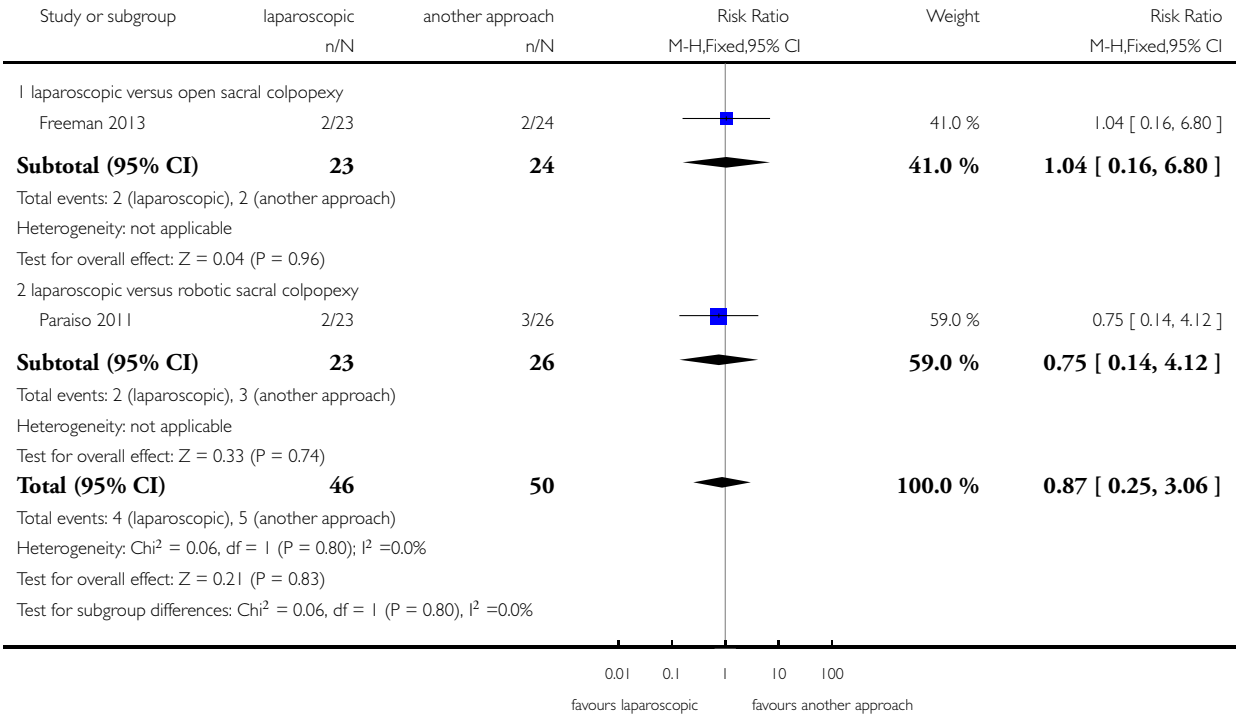


Analysis 6.2. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 2 Recurrent prolapse (any site on examination).

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 2 Recurrent prolapse (any site on examination)

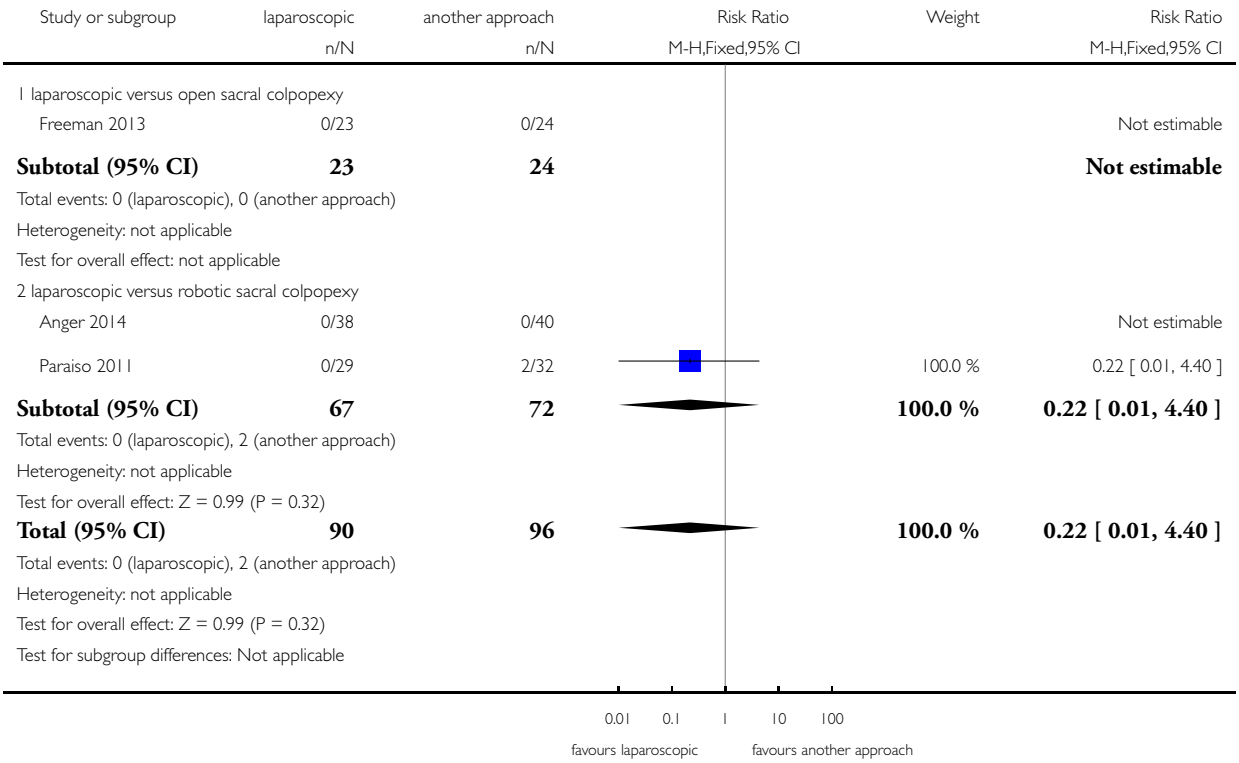


Analysis 6.3. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 3 Mesh exposure.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 3 Mesh exposure

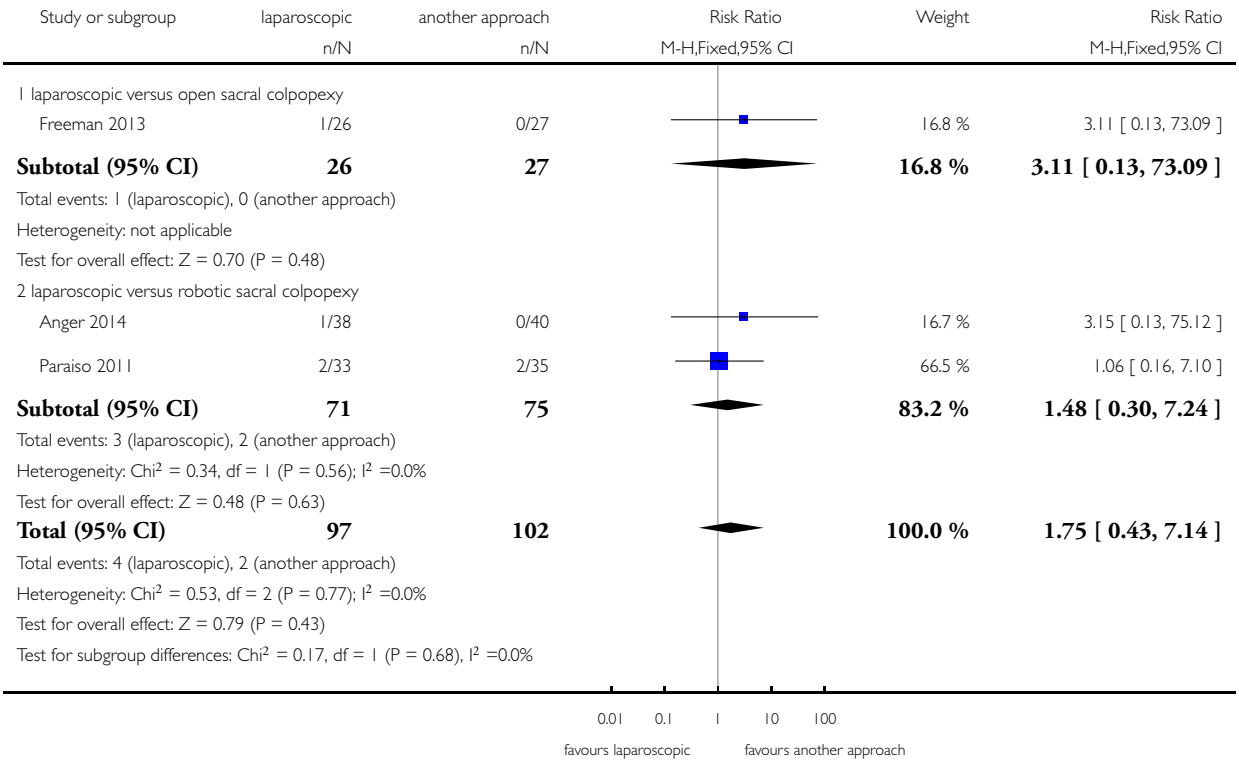


Analysis 6.4. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 4 Bladder injury.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 4 Bladder injury

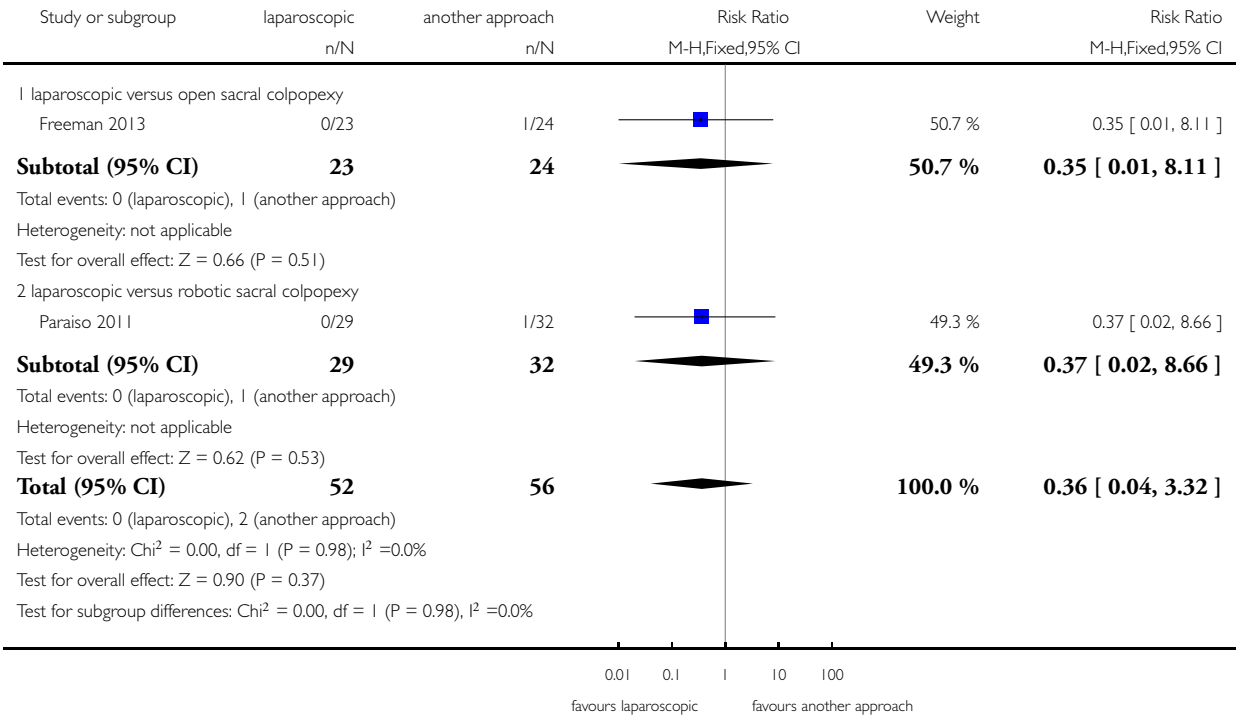


Analysis 6.5. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 5 Bowel injury.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 5 Bowel injury

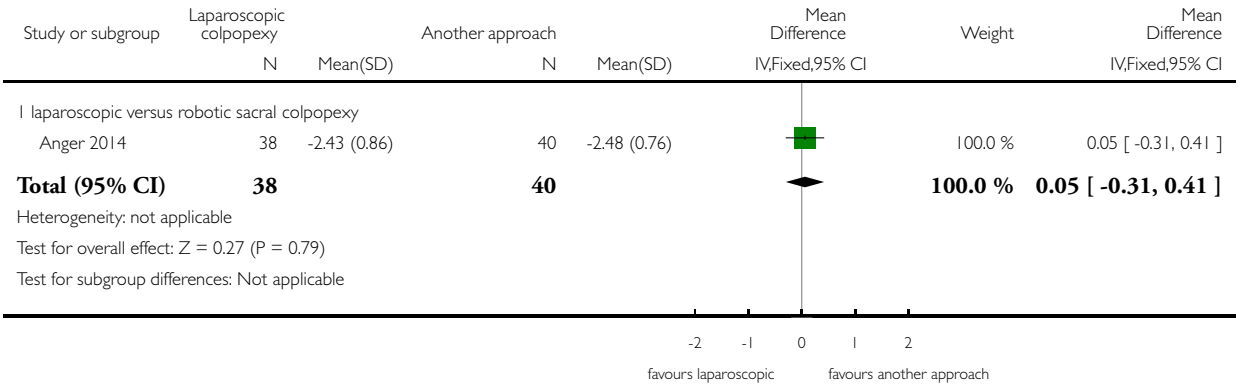


Analysis 6.6. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 6 Point Ba.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 6 Point Ba

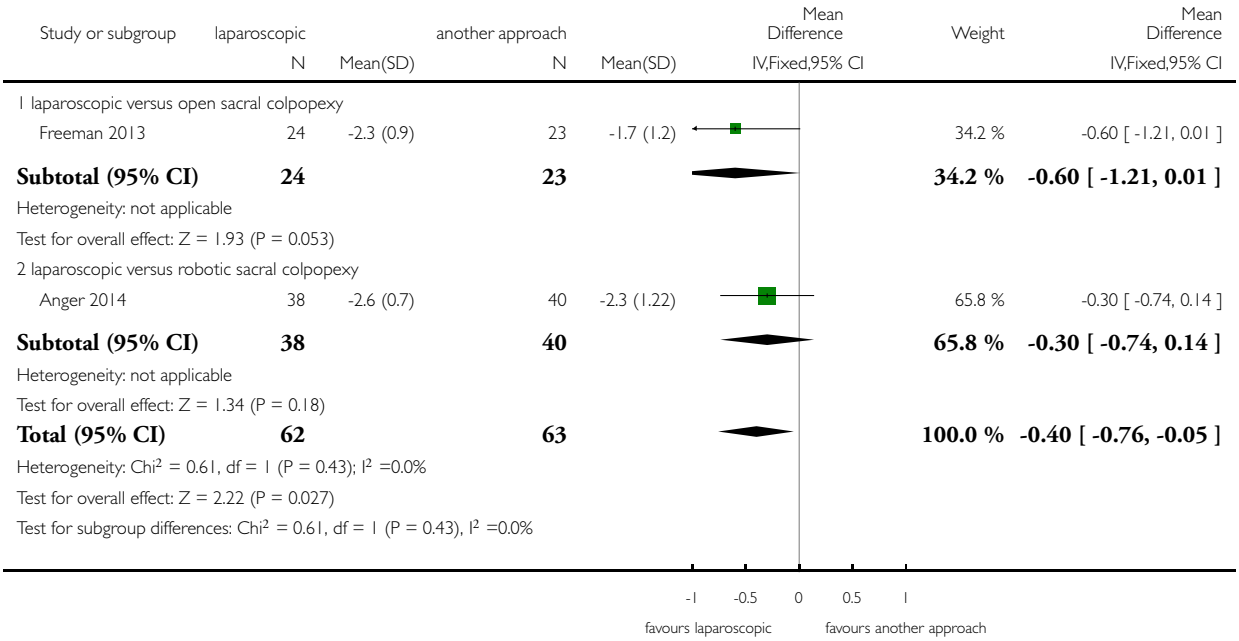


Analysis 6.7. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 7 Point Bp.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 7 Point Bp

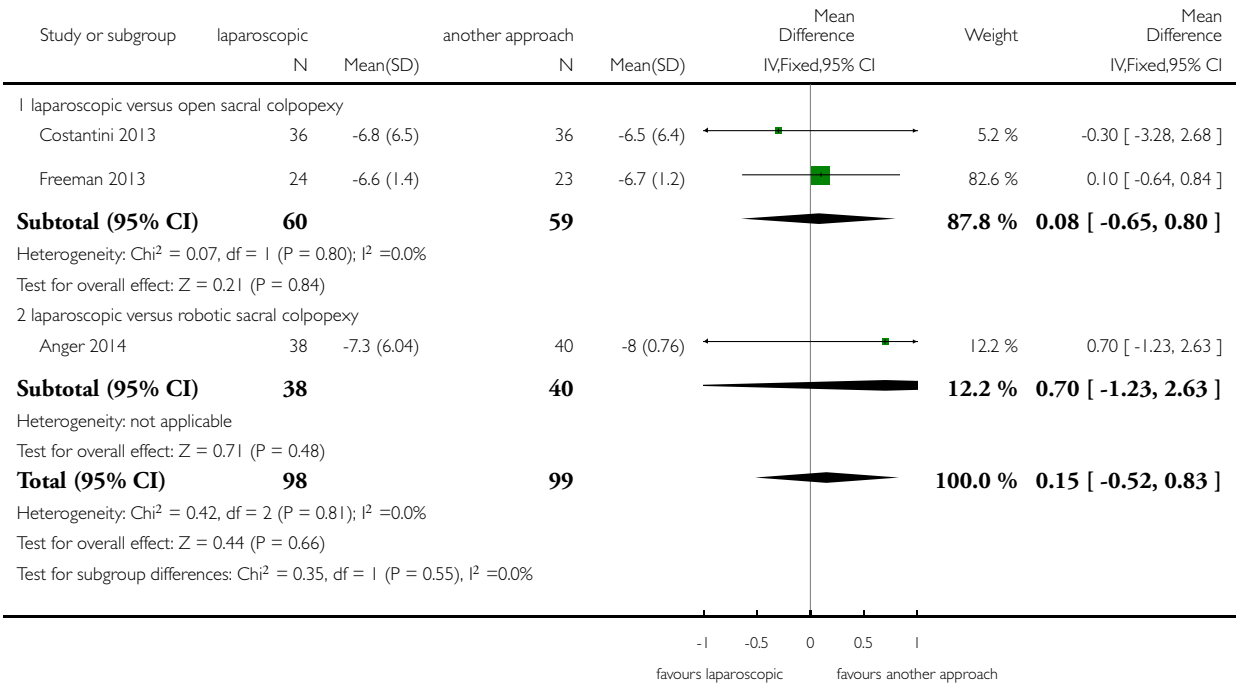


Analysis 6.8. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 8 Point C.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 8 Point C

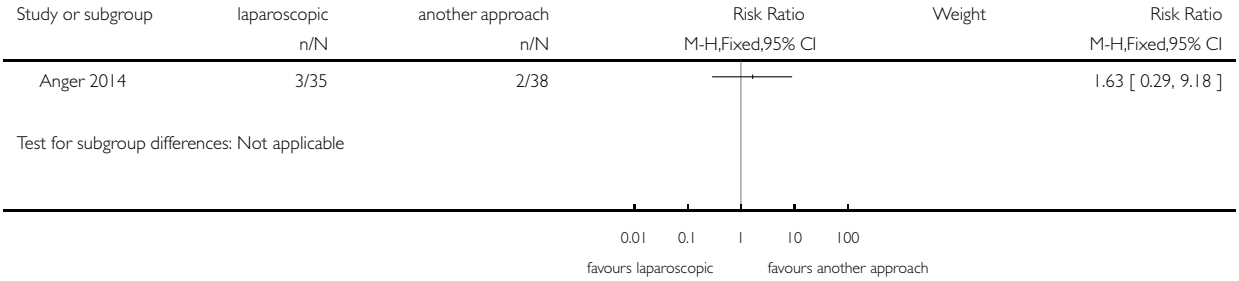


Analysis 6.9. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 9 Stress urinary incontinence (de novo and persistent).

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 9 Stress urinary incontinence (de novo and persistent)

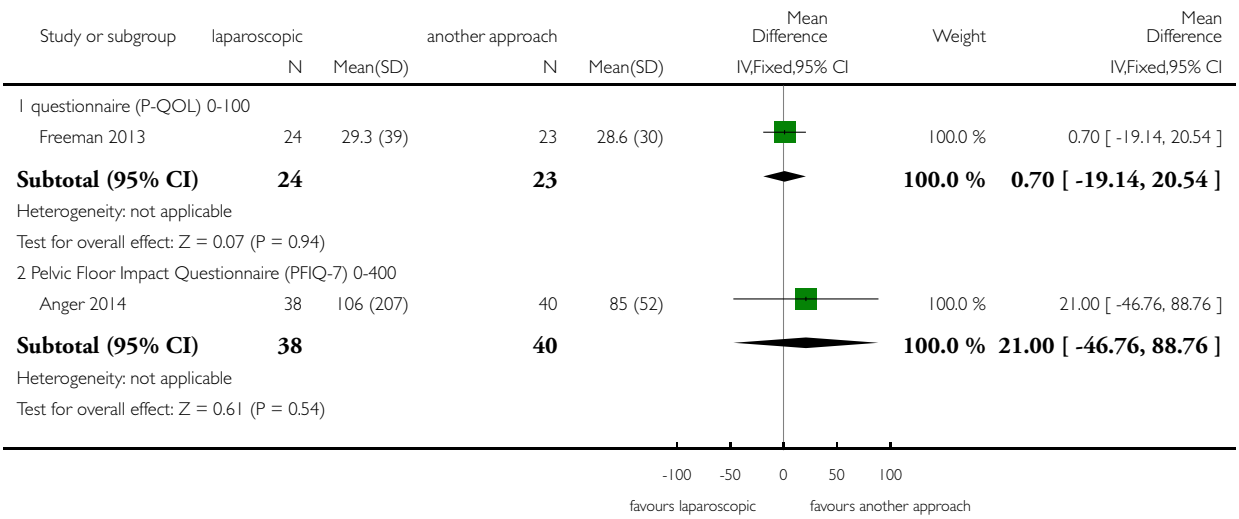


Analysis 6.10. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 10 Quality of life PROLAPSE.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 10 Quality of life PROLAPSE



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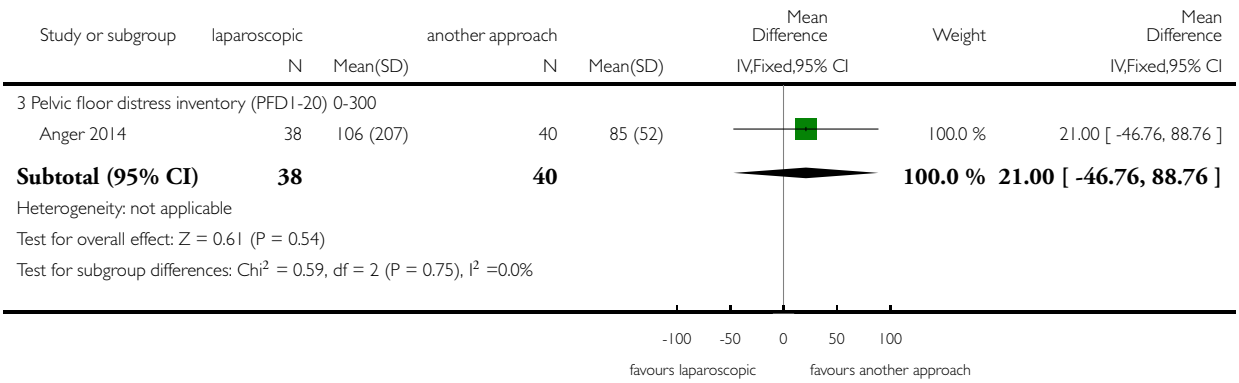
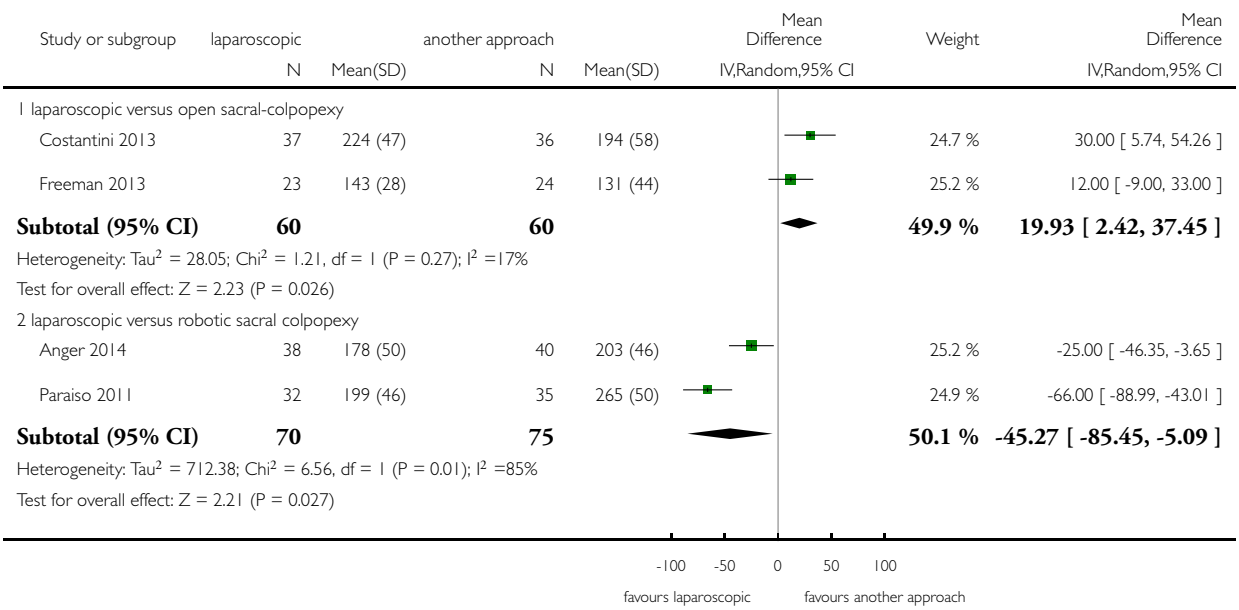


Analysis 6.11. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 11 Operating time (mins).

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 11 Operating time (mins)



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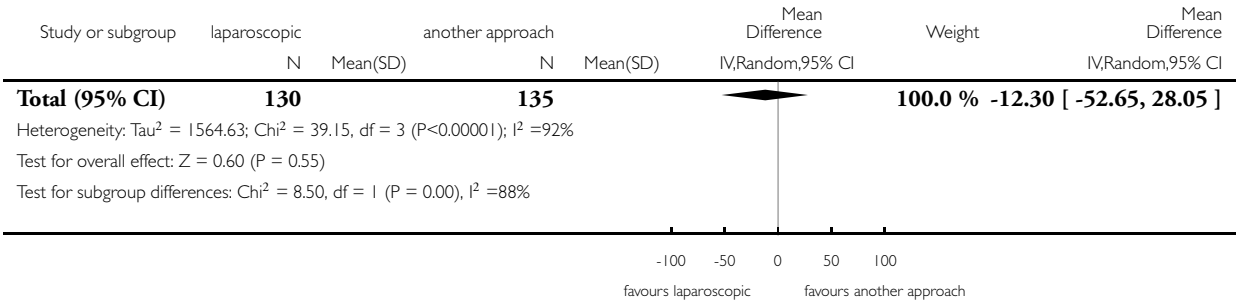
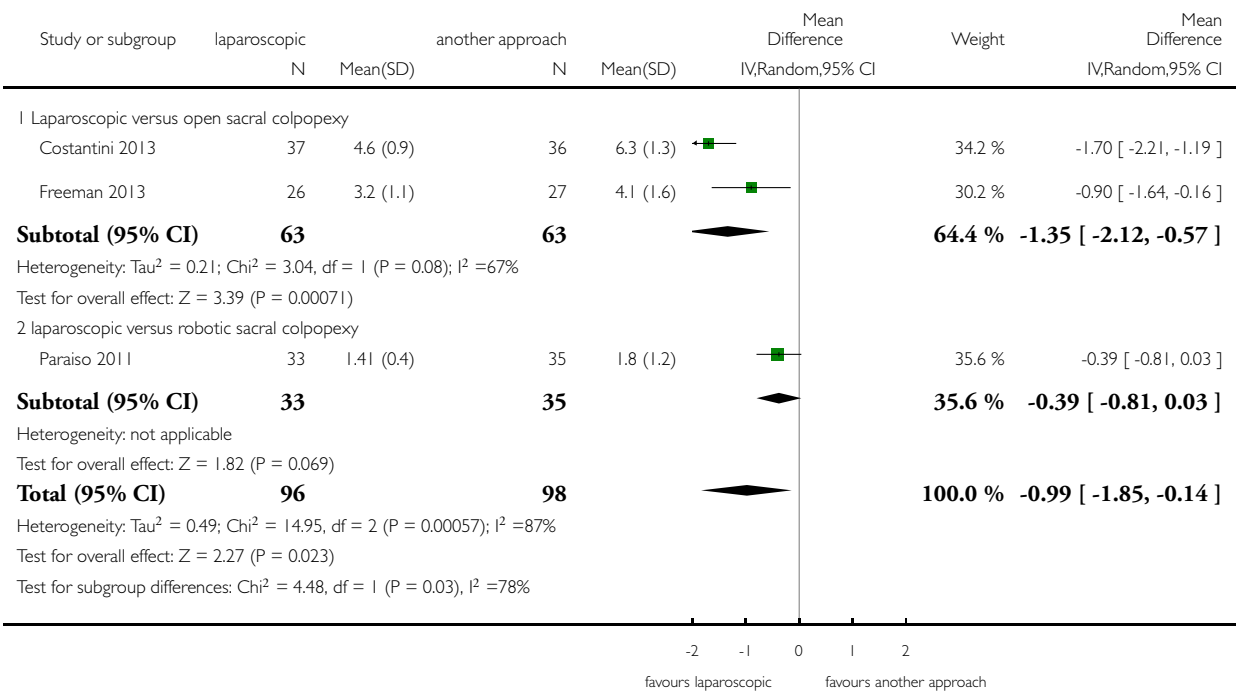


Analysis 6.12. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 12 Hospital stay.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 12 Hospital stay



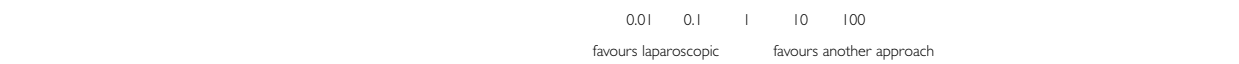
Analysis 6.13. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 13 Blood transfusion.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 13 Blood transfusion

Study or subgroup	laparoscopic n/N	another approach n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 laparoscopic versus robotic sacral colpopexy					
Anger 2014	0/38	0/40			Not estimable
Total (95% CI)	**38**	**40**			**Not estimable**
Total events: 0 (laparoscopic), 0 (another approach)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Chi^2 = 0.0, df = -1 (P = 0.0), I^2 =0.0%					

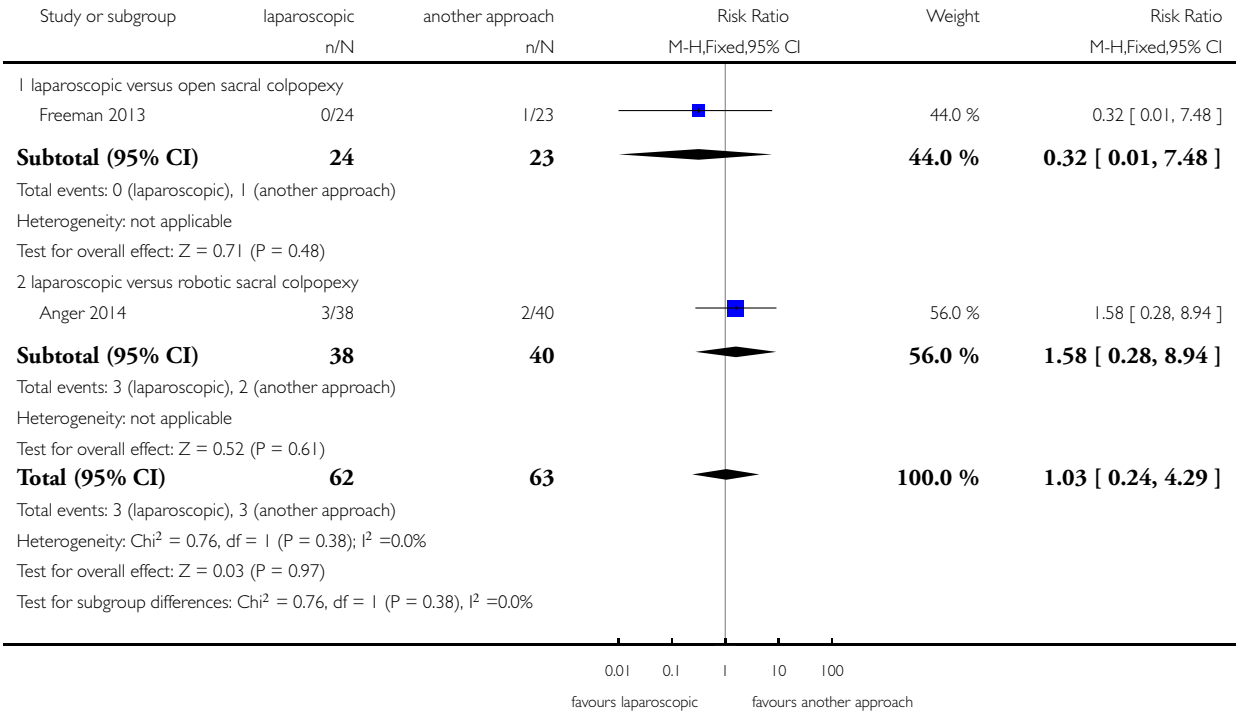


Analysis 6.14. Comparison 6 Sacral colpopexy: Laparoscopic versus other, Outcome 14 continence surgery.

Review: Surgery for women with apical vaginal prolapse

Comparison: 6 Sacral colpopexy: Laparoscopic versus other

Outcome: 14 continence surgery

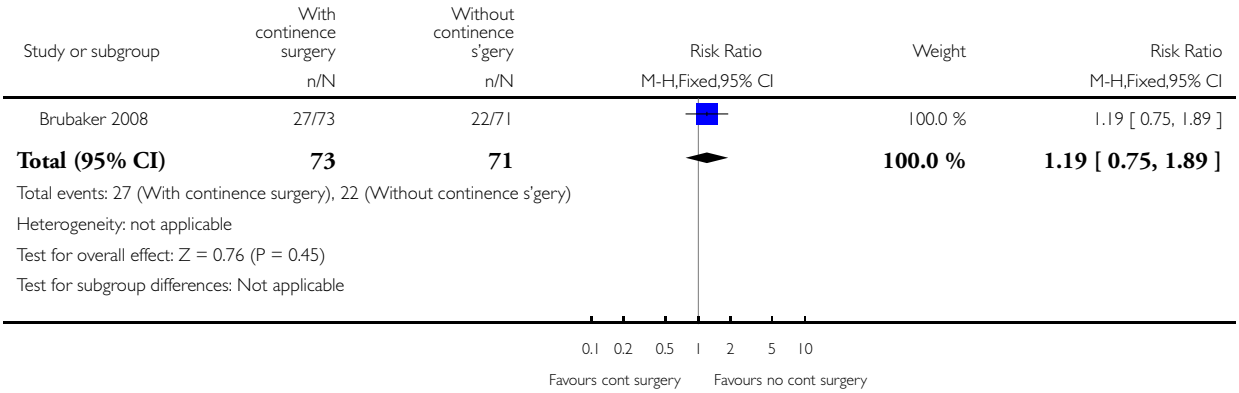


Analysis 7.1. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 1 Awareness of prolapse (7 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 1 Awareness of prolapse (7 years)

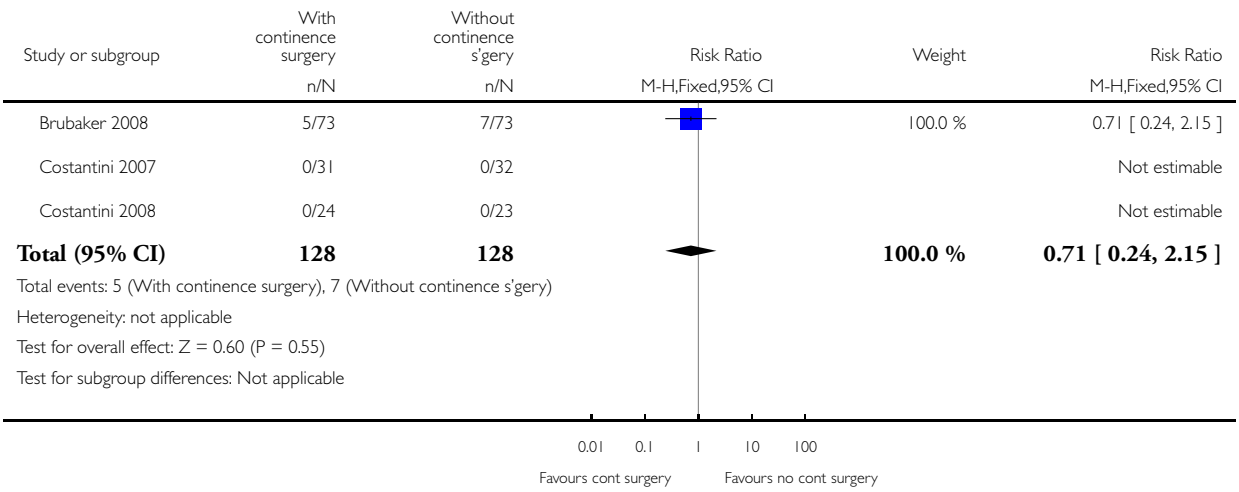


Analysis 7.2. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 2 Repeat prolapse surgery or pessary (2-7 years)).

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 2 Repeat prolapse surgery or pessary (2-7 years))



Analysis 7.3. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 3 Repeat surgery for incontinence (7 years)).

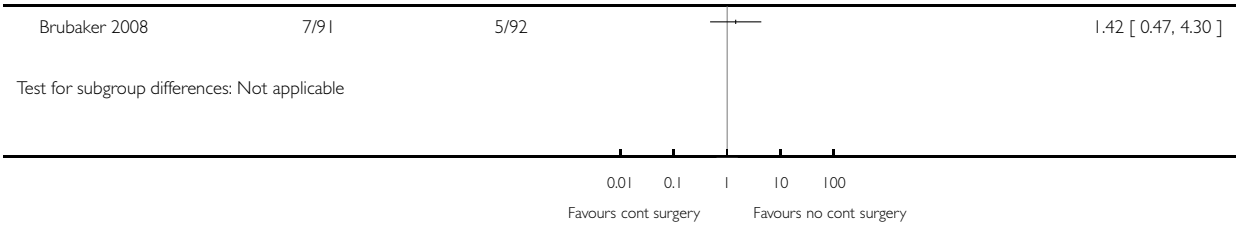
Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 3 Repeat surgery for incontinence (7 years))

Study or subgroup	With continence surgery n/N	Without continence s'gery n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Brubaker 2008	7/91	5/92			1.42 [0.47, 4.30]

Test for subgroup differences: Not applicable

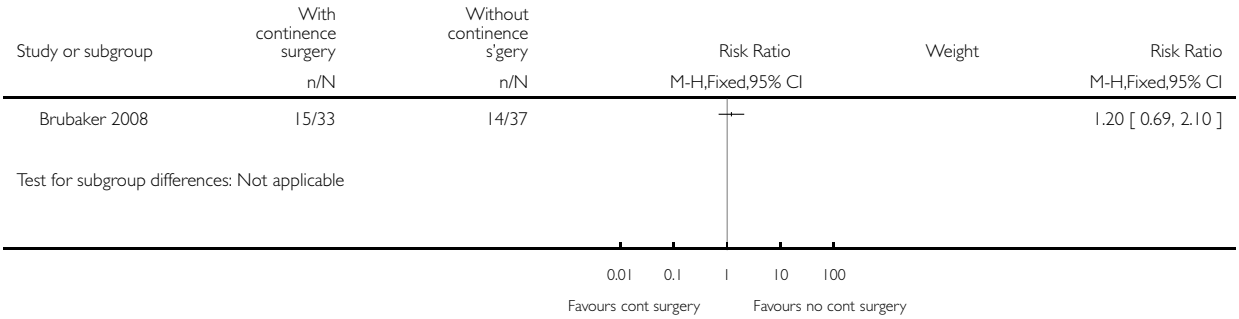


Analysis 7.4. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 4 Objective failure any site (POP 7 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 4 Objective failure any site (POP 7 years)

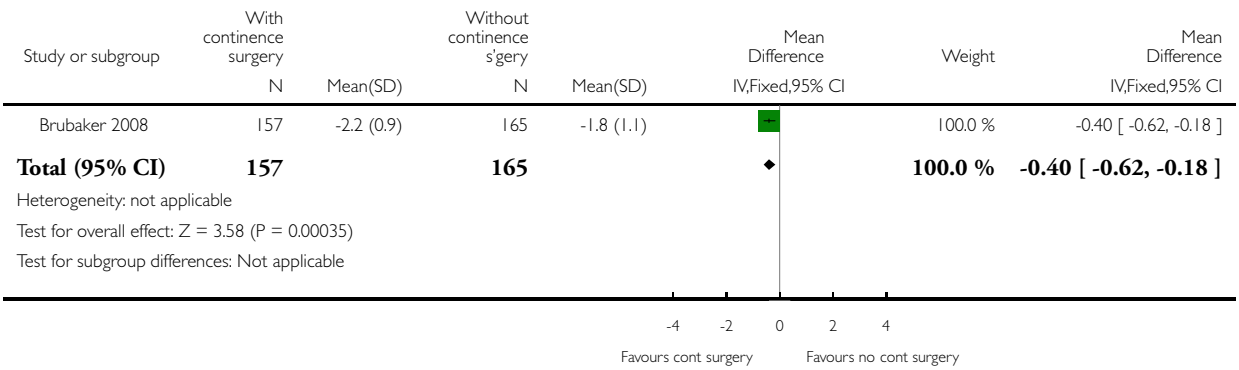


Analysis 7.5. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 5 POPQ assessment Point Ba.

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 5 POPQ assessment Point Ba



Analysis 7.6. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 6 POPQ assessment: Point Bp.

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 6 POPQ assessment: Point Bp

Study or subgroup	With continence surgery N	Mean(SD)	Without continence s'gery N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Brubaker 2008	157	-2 (0.9)	165	-2.3 (0.8)		100.0 %	0.30 [0.11, 0.49]
Total (95% CI)	**157**		**165**			**100.0 %**	**0.30 [0.11, 0.49]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.16 (P = 0.0016)

Test for subgroup differences: Not applicable

Analysis 7.7. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 7 POPQ assessment: Point C.

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

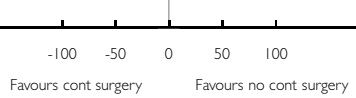
Outcome: 7 POPQ assessment: Point C

Study or subgroup	With continence surgery N	Mean(SD)	Without continence s'gery N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Brubaker 2008	157	-8 (1.5)	165	-8.2 (1.3)		100.0 %	0.20 [-0.11, 0.51]
Total (95% CI)	**157**		**165**			**100.0 %**	**0.20 [-0.11, 0.51]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.28 (P = 0.20)

Test for subgroup differences: Not applicable



Analysis 7.8. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 8 Stress urinary incontinence (4-7 years).

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 8 Stress urinary incontinence (4-7 years)

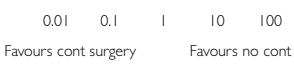
Study or subgroup	With continence surgery n/N	Without continence s'gery n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Brubaker 2008	57/89	79/96		47.3 %	0.78 [0.65, 0.93]
Costantini 2007	9/31	5/31		21.1 %	1.80 [0.68, 4.76]
Costantini 2008	13/24	9/24		31.5 %	1.44 [0.77, 2.72]
Total (95% CI)	**144**	**151**		**100.0 %**	**1.13 [0.63, 2.04]**

Total events: 79 (With continence surgery), 93 (Without continence s'gery)

Heterogeneity: $Tau^2 = 0.18$; $Chi^2 = 6.59$, df = 2 (P = 0.04); $I^2 = 70\%$

Test for overall effect: Z = 0.40 (P = 0.69)

Test for subgroup differences: Not applicable

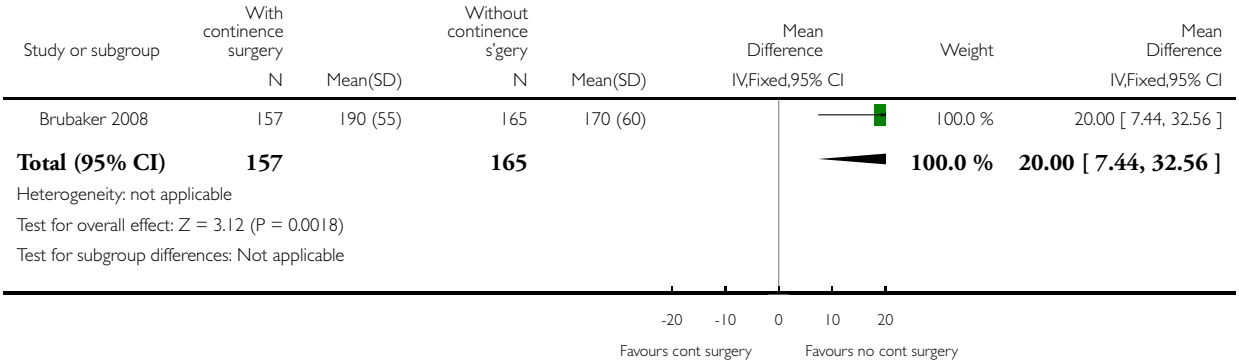


Analysis 7.9. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 9 Operating time (minutes).

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 9 Operating time (minutes)

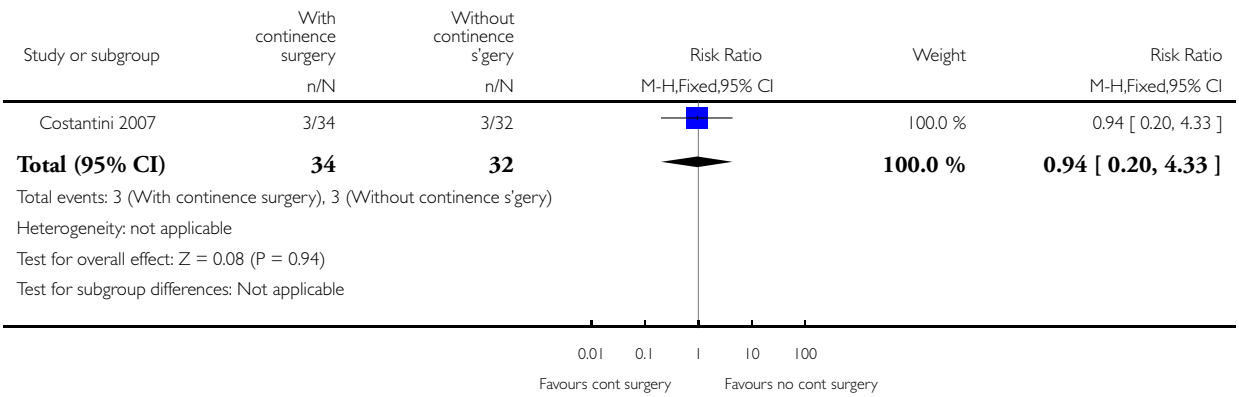


Analysis 7.10. Comparison 7 Sacral colpopexy with continence surgery vs without, Outcome 10 Blood transfusion.

Review: Surgery for women with apical vaginal prolapse

Comparison: 7 Sacral colpopexy with continence surgery vs without

Outcome: 10 Blood transfusion



ADDITIONAL TABLES

Table 1. Mesh exposure: vaginal colpopexy versus transvaginal polypropylene mesh

Study ID	mesh exposure	total cases
da Silviera 2015	18	88
Halaska 2012	16	79
Iglesia 2010	5	32
Svabik 2014	3	36

Table 2. Repeat surgery: Mesh exposure

Study ID	Surgery mesh Exposure	total cases
da Silviera 2015	7	88
Halaska 2012	10	79
Iglesia 2010	3	32
Svabik 2014	2	36

APPENDICES

Appendix 1. Types of operations

Sacral colpopexy

Aim

To correct upper genital tract prolapse.

Indication

Usually reserved for recurrent prolapse of the upper vagina (recurrent cystocele, vault or enterocele) or massive vaginal eversion.

Surgical technique

1. Usually performed under general anaesthesia
2. Performed through an incision on the lower abdomen or keyhole
3. The bladder and rectum are freed from the vagina and permanent mesh supports the front and back wall of the vagina
4. This mesh is secured to the sacrum (upper tailbone)
5. Peritoneum (lining of the abdominal cavity) is closed over the mesh
6. Other repairs are performed as required at the same time including paravaginal repair, perineoplasty, colposuspension or rectopexy
7. Bowel preparation is required prior to the surgery

McCaul culdoplasty

Indications

1. Vault prolapse or an enterocele

2. Often performed at the time of vaginal hysterectomy to prevent future prolapse

Surgical technique

1. After the uterus is removed at the time of hysterectomy the uterosacral ligaments are identified and incorporated into the closure of the peritoneum and upper vagina using 1 to 2 sutures
2. An anterior or posterior vaginal repair is often performed at the same time

Sacrospinous fixation

Aim

This surgery offers support to the upper vagina minimising risk of recurrent prolapse at this site. The advantage of this surgery is that vaginal length is maintained.

Indication

Upper vaginal prolapse (uterine or vault prolapse, enteroceles).

This procedure can be used in reconstructive vaginal surgery where increased vaginal length is required.

Procedure

1. The procedure can be performed under regional or general anaesthesia
2. A routine posterior vaginal incision is made and extended to the top of the vagina
3. Using sharp dissection the vagina is freed from the underlying rectovaginal fascia and rectum until the pelvic floor (puborectalis) muscle is seen
4. Using sharp and blunt dissection the sacrospinous ligament running from the ischial spine to the sacral bone is palpated and identified
5. Two sutures are placed through the strong ligament and secured to the top of the vagina. This results in increased support to the upper vagina. There is no shortening of the vagina
6. Other fascial defects in the vagina are repaired and the vaginal skin is closed

Anterior vaginal repair (colporrhaphy)

Indication

1. Prolapse of the bladder or urethra
2. Sometimes used to treat urinary stress incontinence

Surgical technique

1. The procedure can be performed under regional or general anaesthesia
2. The vagina overlying the bladder and urethra is incised in the midline
3. Dissection in a plane directly below the vagina allows the damaged fascia supporting the bladder and urethra to be exposed
4. The fascia is plicated in the midline using delayed absorbable or permanent sutures
5. Sometimes excessive vaginal skin is removed
6. The vaginal skin is then closed
7. Other sites of prolapse are then repaired as required

Posterior vaginal repair and perineoplasty

Indications

Treatment of rectocele (rectum bulges or herniates forward into the vagina) and defects of the perineum (area separating entrance of the vagina and anus).

Aim

correct defects in the rectovaginal fascia separating rectum and vagina while allowing bowel function to be maintained or corrected without interfering with sexual function.

Surgical technique

1. An incision is made on the posterior wall of the vagina starting at the entrance and finishing at the top of the vagina
2. Dissecting the vagina and rectovaginal fascia from the vagina until the pelvic floor muscles (puborectalis) are located
3. Defects in the fascia are corrected by centrally plicating the fascia using delayed absorption sutures
4. The perineal defects are repaired by placing deep sutures into the perineal muscles to build up the perineal body
5. The overlying vaginal and vulval skin is then closed
6. A pack is usually placed into the vagina and a catheter into the bladder at the end of surgery

Appendix 2. Search strategy

Search strategy:

The Incontinence Group Specialised Register was searched using the Group's own keyword system (all searches were of the keyword field of Reference Manager 2012). The search terms used were:
({design.cct*} OR {design.rct*})
AND
({topic.prolapse*})
AND
({intvent.surg*})
Date of the most recent search of the register for this review: 6 July 2015.

WHAT'S NEW

Last assessed as up-to-date: 6 July 2015.

Date	Event	Description
6 July 2016	New search has been performed	The comparison of any surgical intervention with another intervention for apical vaginal prolapse was formerly part of the 2013 Cochrane review "Surgical management of pelvic organ prolapse in women". We now present this as a separate review. Eleven new trials are included that were not in the previous review: Anger 2014; Barber 2014; Costantini 2013; Culligan 2013; da Silviera 2015; Detollenaere 2015; Freeman 2013; Halaska 2012; Rahmanou 2015; Rondini 2015; Svabik 2014. New reviewers include Dr Nir Haya (Israel) and Julie Brown (Auckland) New trials evaluated the following topics: Transvaginal mesh versus native tissue repairs for apical prolapse Different routs of sacral colpopexy Sacral colpopexy versus uterosacral colopoexy Sacrospinous colpopexy versus uterosacral colpopexy Uterine preservation versus hysterectomy
6 July 2016	New citation required but conclusions have not changed	The inclusion of 11 new trials did not change the conclusions for this comparison

HISTORY

Protocol first published: Issue 1, 2003

Review first published: Issue 10, 2016

Date	Event	Description
14 April 2010	Amended	changed citation, added conflicts
17 November 2009	New citation required but conclusions have not changed	Full reports of 59 potentially eligible studies were assessed; for this update, 23 new eligible studies were assessed (Al-Nazer 2007a; Ali 2006a; Allahdin 2008; Barber 2006; Biller 2008; Borstad 2008; Braun 2007a; Carramao 2008a; Constantini 2008; de Tayrac 2008; Dietz 2008a; Glavind 2007; Guerette 2006a; Lim 2007a; Meschia 2007a; Natale 2007; Natale 2009; Nguyen 2008; Nieminen 2008; Pantazis 2008a; Schierlitz 2007a; Segal 2007; Sivaslioglu 2008). Overall, 17 studies were excluded from the review, six during this update (Barber 2006; Biller 2008; Carramao 2008a; Glavind 2007; Meschia 2007a; Segal 2007): full details are given in the Characteristics of Excluded Studies In this the second update, 18 new trials were added (Al-Nazer 2007; Ali 2006; Allahdin 2008; Borstad 2008; Braun 2007a; Constantini 2007; Constantini 2008; de Tayrac 2008; Dietz 2008a; Guerette 2006; Lim 2007; Natale 2007; Natale 2009; Nguyen 2008; Nieminen 2008; Pantazis 2008; Schierlitz 2007; Sivaslioglu 2008) and three previously included studies were updated (Brubaker 2008; Meschia 2007; Roovers 2004)
9 February 2009	New search has been performed	new search feb 2009
10 October 2008	Amended	Converted to new review format.
17 April 2007	New citation required and conclusions have changed	Substantive Update Issue 3 2007. 22 RCTs (8 new included trials). The findings are still insufficient to provide robust evidence to support current and new practice (such as whether to perform a concurrent continence operation, or to use mesh or grafts)

CONTRIBUTIONS OF AUTHORS

All review authors contributed to writing the protocol. Four review authors (C Maher, C Schmid, B Feiner, K Baessler) assessed the relevance and eligibility of studies for inclusion in the review. They then assessed the quality of included studies; four authors (C Maher, C Schmid, K Baessler, and B Feiner) independently extracted data from trial reports, interpreted the results and contributed to the writing of the draft version of the review. Julie Brown checked the draft and edited the review.

DECLARATIONS OF INTEREST

The lead review author, Christopher Maher, is an author of two of the included trials (Maher 2004; Maher 2011). No authors have any conflict of interest to declare.

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- No sources of support supplied

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- NIHR, UK.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

This review is the result of updating the review '*Surgery for pelvic organ prolapse in women*'. As a result of the update, we decided to split the review into six reviews.

This review should be read as part of a series of six Cochrane reviews relating to the surgical management of prolapse.

1. Surgery for women with anterior compartment prolapse.

2. Surgery for women with posterior compartment prolapse.

3. Surgery for women with apical vaginal prolapse.

4. Continence outcomes in pelvic organ prolapse surgery.

5. Transvaginal mesh or grafts compared with native tissue repair for vaginal prolapse.

6. Perioperative interventions at prolapse surgery.

Differences from the published review methods were a reduction in the number of outcomes and limiting this review to studies that compared any surgical intervention with another intervention for apical vaginal prolapse.