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[Intervention Review]

Bladder neck needle suspension for urinary incontinence in women

Cathryn MA Glazener¹, Kevin Cooper², Atefeh Mashayekhi³

¹Health Services Research Unit, University of Aberdeen, Aberdeen, UK. ²Department of Gynaecology, Grampian University Hospitals NHS Trust, Aberdeen, UK. ³Institute of Health & Society, Newcastle University, Newcastle Upon Tyne, UK

Contact: Cathryn MA Glazener, Health Services Research Unit, University of Aberdeen, 3rd Floor, Health Sciences Building, Foresterhill, Aberdeen, Scotland, AB25 2ZD, UK. c.glazener@abdn.ac.uk.

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ABSTRACT

Background

Bladder neck needle suspension is an operation traditionally used for moderate or severe stress urinary incontinence in women. About a third of adult women experience some urinary incontinence, and about a third of these have moderate or severe symptoms. Stress urinary incontinence (SUI) imposes significant health and economic burdens on society and the women affected.

Objectives

To determine the effects of needle suspension on stress or mixed urinary incontinence in comparison with other management options.

Search methods

We searched the Cochrane Incontinence Group Specialised Register, which 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 (searched 12 November 2014), and the reference lists of relevant articles.

Selection criteria

Randomised or quasi-randomised trials that included needle suspension for the treatment of urinary incontinence.

Data collection and analysis

At least two authors assessed trials and extracted data independently. Two trial investigators provided additional information.

Main results

We identified 10 trials, which included 375 women having six different types of needle suspension procedures and 489 who received comparison interventions. Needle suspensions were more likely to fail than open abdominal retropubic suspension. There was a higher subjective failure rate after the first year (91/313 (29%) failed versus 47/297 (16%) failed after open abdominal retropubic suspension). The risk ratio (RR) was 2.00 (95% confidence interval (CI) 1.47 to 2.72), although the difference in peri-operative complications was not significant (17/75 (23%) versus 12/77 (16%); RR 1.44, 95% CI 0.73 to 2.83). There were no significant differences for the other outcome measures. This effect was seen in both women with primary incontinence and women with recurrent incontinence after failed primary operations. Needle suspensions may be as effective as anterior vaginal repair (50/156 (32%) failed after needle suspension versus 64/181 (35%) after anterior repair; RR 0.86, 95% CI 0.64 to 1.16), but there was little information about morbidity. Data for comparison with suburethral slings were inconclusive because they came from a small and atypical population.

No trials compared needle suspensions with conservative management, peri-urethral injections, or sham or laparoscopic surgery.

Authors' conclusions

Bladder neck needle suspension surgery is probably not as good as open abdominal retropubic suspension for the treatment of primary and secondary urodynamic stress incontinence because the cure rates were lower in the trials reviewed. However, the reliability of the evidence was limited by poor quality and small trials. There was not enough information to comment on comparisons with suburethral sling operations. Although cure rates were similar after needle suspension compared with after anterior vaginal repair, the data were insufficient to be reliable and inadequate to compare morbidity. A Brief Economic Commentary (BEC) identified no cost-effectiveness studies comparing bladder neck needle suspension with other surgeries.

PLAIN LANGUAGE SUMMARY

Needle suspension surgery for urinary incontinence in women

Background

Stress urinary incontinence is loss of urine when coughing, laughing, sneezing or exercising. Damage to the muscles that hold up the bladder may cause it. About a third of adult women may have urine leakage, and about a third of these may have problems bad enough to require surgery. A significant amount of a woman's and their family's income can be spent on management of stress urinary incontinence.

When non-surgical methods, such as exercising the muscles in the pelvic floor (the base of the abdomen) or drugs, have not worked surgery is sometimes used to lift and support the neck of the bladder to help stop urine leaking. Needle suspension involves tying sutures between the vagina and the abdominal wall.

Study characteristics

The review found 10 trials, which studied 375 women having six different types of needle suspension operations and compared them with 489 women who received other treatments. Most of the trials were small or of poor quality, making their results less reliable.

Key results

More women were cured after abdominal operations such as colposuspension (84%) than after needle suspension (71%): both women who had and had not had a previous operation for incontinence. There was not enough evidence about complications, or how needle suspension compares with other operations. Needle suspension operations were not compared with conservative treatments such as pelvic floor exercises or drugs. In summary, needle suspension surgery appears to be less effective for urinary incontinence than abdominal surgery, and there is not enough evidence to compare it to other treatments.

BACKGROUND

This is one of a series of inter-related Cochrane reviews of surgical approaches to the management of urinary incontinence: anterior vaginal repair ([Glazener 2001](#)); suburethral slings ([Rehman 2011](#)); laparoscopic retropubic suspension ([Dean 2006](#)); open abdominal retropubic suspension ([Lapitan 2012](#)); peri-urethral injections ([Kirchin 2012](#)); and artificial sphincters. The reader is referred to one review in this series for a background description of urinary incontinence in women, the principal categories of incontinence and the broad approaches to management ([Glazener 2001](#)). As well as surgery, these include medical (drug) and conservative (physical) approaches.

Stress Urinary Incontinence (SUI) constitutes a huge financial economic burden to the society. In the USA the annual total direct costs of urinary incontinence in both men and women is over USD 16 billion (1995 USD) ([Chong 2011](#)), with a societal costs of USD 26.2 billion ([Wagner 1998](#)). Approximately, USD 13.12 billion of the total direct costs of urinary incontinence are spent on SUI ([Chong 2011](#); [Kunkle 2015](#)).

About 70% of this USD 13.12 billion is borne by the patients, mainly through routine care (purchasing pads and disposable underwear (diapers), laundry and dry cleaning). This constitutes a significant individual financial burden. Of the remaining 30% of costs, 14% is spent on nursing home admission, 9% on treatment, 6% on addressing complications and 1% on diagnosis ([Chong 2011](#)).

A study in the USA reported that about 1% of the median annual household income (USD 50,000 to USD 59,999 in 2006) was spent by women on incontinence management. This study estimated that women spent an annual mean cost of USD 751 to USD 1277 (2006 USD) on incontinence. This cost increases with the severity of the symptoms ([Subak 2008](#)). The indirect cost associated exerts a social and psychological burden which is unquantifiable. ([Chong 2011](#); [Kilonzo 2004](#)). Nevertheless, [Birnbaum 2004](#) estimated that the annual average direct medical costs of SUI for one year (1998 USD) was USD 5642 and USD 4208 for indirect workplace costs. The cost of management and treatment of SUI appears to have increased over time due to increasing prevalence and increased desire for improved quality of life (QOL). This in turn has resulted from improved recognition of the condition, as well as increased use of surgical and non-surgical managements.

Surgical procedures to remedy urinary incontinence generally aim to lift and support the urethrovesical junction between the urethra and the bladder in order to increase bladder outlet resistance. There is disagreement, however, regarding the precise mechanism by which continence is achieved after surgery. The choice of procedures is often influenced by co-existent problems, a surgeon's specialty and preference, and the physical features of the person affected. Numerous surgical methods have been described, but essentially they fall into seven categories:

- open abdominal retropubic suspension (e.g. Burch colposuspension, Marshall-Marchetti-Krantz);
- laparoscopic retropubic suspension;
- anterior vaginal repair (anterior colporrhaphy) (e.g. Pacey, Kelly);
- suburethral sling procedures;
- bladder neck needle suspensions (e.g. Pereyra, Stamey, Raz);

- peri-urethral injections;
- artificial sphincters.

This review concentrated on needle suspensions of the bladder neck (referred to as 'needle suspension' in this review).

Needle suspension may be performed from a vaginal or abdominal approach. A long needle is used to thread sutures from the vagina to the anterior abdominal fascia. The sutures are looped through to the para-urethral tissue on each side of the bladder neck, thereby supporting it. There are three principal types (Pereyra, Stamey, Raz) and several modifications of each, such as site of initial approach (abdominal or vaginal), type of suture, site of attachment of the sutures, and the use of silastic spacers or Dacron sheaths to protect the suture from cutting through ([Downs 1996](#)). Cystoscopy (endoscopy), during or after the placement of the sutures, is used to check that the bladder has not been injured. The salient features are that the passage of the needle through the retropubic space is done blindly, and the support to the urethra is derived indirectly from the vaginal walls rather than directly to the urethra.

The wide variety of surgical treatments for urinary incontinence indicates the lack of consensus as to which procedure is the best. Guidelines using the available literature have been published, but were based on studies of mixed quality and type ([Black 1996](#); [Downs 1996](#); [Fantl 1996](#); [Jarvis 1994](#); [Leach 1997](#)). Provided that a sufficient number of adequate quality have been conducted, the most reliable evidence is likely to come from consideration of all well-designed randomised controlled trials. Hence, there is a need for an easily accessible, periodically updated, comprehensive systematic review of such studies, which will not only help to identify optimal practice, but also highlight gaps in the evidence base.

OBJECTIVES

To determine the effects of needle suspension on stress or mixed urinary incontinence in comparison with other management options.

METHODS

Criteria for considering studies for this review

Types of studies

All randomised or quasi-randomised trials studying the effects of treatment for stress or mixed urinary incontinence in women, in which at least one management arm involved bladder neck needle suspension.

Types of participants

Adult women with urinary incontinence, diagnosed as having:

- urodynamic stress incontinence (USI, urodynamic diagnosis of stress incontinence in the absence of detrusor contractions); or
- stress urinary incontinence (SUI, clinical diagnosis); or
- mixed incontinence (MUI, any stress incontinence plus other urinary symptoms such as: detrusor overactivity (urodynamic diagnosis); urge incontinence (clinical diagnosis); other types of incontinence; urgency; or frequency.

We accepted the classification of diagnoses as defined by the trialists.

Types of interventions

At least one arm of a trial must have involved needle suspension to treat urinary incontinence.

We made the following comparisons:

1. Needle suspension compared with no treatment or sham operation.
2. Needle suspension compared with conservative interventions (e.g. pelvic floor muscle training, electrical stimulation, cones, biofeedback).
3. Needle suspension compared with open abdominal retropubic suspension (abdominal surgery).
4. Needle suspension compared with suburethral sling procedures (abdominal and vaginal surgery).
5. Needle suspension compared with anterior vaginal repair (anterior colporrhaphy, vaginal surgery).
6. Needle suspension compared with laparoscopic retropubic suspension.
7. Needle suspension compared with peri-urethral injections.
8. Needle suspension compared with drug treatment (e.g. adrenergic agonists).
9. One method of needle suspension compared with another.
10. One suture type compared with another for carrying out needle suspension operations.

Types of outcome measures

We selected the outcome measures used in this review on the basis of their relevance to the subjective cure or improvement of incontinence. We regard the principal measures of effectiveness as the proportion of women cured (continent or dry) following surgery, and the proportion of women whose symptoms are improved.

We adopted the recommendations made by the Standardisation Committee of the International Continence Society for outcomes of research investigating the effect of therapeutic interventions for women with urinary incontinence. These outcome categories include: women's observations (symptoms), quantification of symptoms, the clinician's observations (anatomical and functional) and quality of life. (Lose 1998).

Relevant data could come from both history and questionnaire assessment, supplemented by the use of urinary diaries (including time and type of incontinence, frequency of micturition and voided volumes) and pad tests (quantitative estimate of weight of urine lost under standard conditions). This review also included other surgical information and adverse events as outcome measures.

A. Women's observations

- Perception of cure and improvement in the short term (< 12 months) and longer term (> 12 months) (expressed as failure to cure or improve)
- Urge symptoms or urge incontinence (clinical diagnosis without urodynamics)

B. Quantification of symptoms

- Pad changes over 24 hours (from self reported number of pads used)
- Incontinent episodes over 24 hours (from self completed bladder chart)
- Pad tests of quantified leakage (mean volume or weight of urine loss)

C. Clinician's observations

- Objective assessment of incontinence at urodynamics
- Detrusor overactivity (urodynamic diagnosis)
- New or recurrent prolapse

D. Quality of life

- General health status measures (physical, psychological, other)
- Condition-specific health measures (specific instruments designed to assess incontinence)

E. Surgical outcome measures

- Voiding dysfunction/difficulty after three months (with or without urodynamic confirmation)
- Peri-operative surgical complications (e.g. vascular or visceral injury, haemorrhage, infection, bacteriuria, death associated with surgery)
- Length of inpatient stay
- Time to return to normal activity level
- Dyspareunia (pain with intercourse)
- Repeat incontinence surgery
- Later prolapse surgery
- Death

F. Other outcomes

- Non-prespecified outcomes judged important when performing the review

Search methods for identification of studies

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

Electronic searches

This review has drawn on the search strategy developed for the Cochrane Incontinence Review Group. We identified relevant trials from the Group's Specialised Register of controlled trials, which is described, along with the group search strategy, under the Incontinence 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, the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) and handsearching of journals and conference proceedings. We searched the Incontinence Group Specialised Register using the Group's own keyword system. The search terms used were:

```
{(design.cct*) OR (design.rct*)}
AND
{[invent.surg.bladnecusp.*] OR [invent.surg.needle.*]}
```


(All searches were of the keyword field of [Reference Manager 2012](#)).

The date of the most recent search of the Register for this review was 12 November 2014.

Most of the trials in the Incontinence Group Specialised Register are also contained in CENTRAL.

We performed additional searches for the Brief Economic Commentary (BEC). We conducted them in MEDLINE(1 January 1946 to March 2017), Embase (1 January 1980 to 2017 Week 12) and NHS EED (1st Quarter 2016). We ran all searches on 6 April 2017. Details of the searches run and the search terms used can be found in [Appendix 1](#).

Searching other resources

We searched the reference lists of relevant articles.

Data collection and analysis

Selection of studies

We identified randomised and quasi-randomised trials using the above search strategy. We excluded studies if they were not randomised or quasi-randomised trials for incontinent women. Excluded studies are listed with reasons for their exclusion. We resolved any differences of opinion related to study inclusion, methodological quality or data extraction by discussion with a third party.

Quality of trials

The review authors evaluated the reports of all possibly eligible trials for methodological quality and appropriateness for inclusion, without prior consideration of the results. Each review author independently assessed methodological quality using the Cochrane Incontinence Group's assessment criteria, which include quality of random allocation and concealment, description of drop-outs and withdrawals, analysis by intention-to-treat, and blinding during treatment and at outcome assessment. We resolved any differences of opinion by discussion with a third party.

Data extraction and management

Two review authors independently extracted data from the included trials and cross-checked the data. We sought clarification from the trialists for data that may have been collected but not reported. We subgrouped trial data by type of incontinence - either urodynamic stress incontinence (USI) based on a urodynamic diagnosis, or stress urinary incontinence (SUI) based upon a symptom classification. Mixed urinary incontinence (MUI) was defined when either type of stress incontinence co-existed with detrusor overactivity, urge urinary incontinence or other urinary symptoms. We used the International Continence Society terminology ([Abrams 2002](#)). In the event, however, all the included trials were limited to women with urodynamic stress incontinence.

Data synthesis

We processed the included trial data as described in the *Cochrane Handbook for Systematic Reviews of Interventions* ([Higgins 2011](#)). When appropriate, we undertook meta-analysis. We expressed outcomes as negative (i.e. failed rather than cured). For categorical outcomes we related the numbers reporting an outcome to the numbers at risk in each group to derive a risk ratio (RR). For

continuous variables we used means and standard deviations to derive a mean difference (MD). We used a fixed-effect model to calculate pooled estimates and their 95% confidence intervals. We only combined trials if the interventions were similar enough based on clinical criteria. When we suspected important heterogeneity from visual inspection of the results, we used the Chi² test for heterogeneity (at 10%) or the I² statistic ([Higgins 2003](#)). If concern about heterogeneity persisted, we planned to use a random-effects model.

Subgroup analyses included different diagnostic groups (i.e. USI, SUI or MUI), types of operations and groups with and without previous incontinence surgery. We would have carried out sensitivity analysis for individual methodological criteria if the data allowed (e.g. quality of concealment of randomisation), but the data were insufficient. For the purpose of the analysis, we considered the Burch colposuspension and Marshall-Marchetti-Krantz operations together.

RESULTS

Description of studies

We updated the first version of this review for Issue 2, 2004. We excluded a further four studies and included one new trial ([Palma 1985](#)). In a subsequent update (Issue 2, 2006), we included another trial ([Di Palumbo 2003](#)). We have identified no further trials since then.

Thus, we have now identified 10 randomised or quasi-randomised trials of surgery for urinary incontinence, which included needle suspension in one arm. They were conducted in six countries (UK, USA, Brazil, Greece, Italy and Croatia) and included a total of 864 women, of whom 375 had a needle suspension. Sample sizes ranged from nine to 289. We excluded a total of 11 studies because they were not randomised controlled trials, the women were not all incontinent or the surgical arms included other types of operations ([Bump 1995](#); [Bump 1996](#); [Colombo 1997](#); [Corcos 2001](#); [Ishenko 1999](#); [Koonings 1988](#); [Morley 1995](#); [Ramon 1991](#); [Salinas 1994](#); [Vordermark 1979](#)). We excluded one more study because no information was available from the authors to allow a decision to be made about eligibility ([Morley 1995](#)), and another because it was a trial of prolapse treatment rather than needle suspension ([Goldberg 2001](#)). Details are given in the table of [Characteristics of excluded studies](#).

Nine trials included only women with urodynamic stress incontinence (USI). In one trial women had mixed incontinence ([Di Palumbo 2003](#)); three specifically included women with prolapse ([Athanassopoulos 1996](#); [Bergman 1989b](#); [Di Palumbo 2003](#)), and only four were restricted to women who had not had previous incontinence surgery ([Bergman 1989a](#); [Bergman 1989b](#); [Gilja 1998](#); [Stein 1991](#)). The other six included a mixed population of women, some of whom had previous failed continence surgery. All trials included pre- and post-menopausal women. Long-term follow-up was reported in two trials ([Bergman 1989a](#); [Di Palumbo 2003](#)).

Types of needle operations

Six different types or modifications of needle suspension were described in the trials:

- Stamey ([Athanassopoulos 1996](#); [German 1992](#); [Hilton 1989](#); [Mundy 1983](#); [Palma 1985](#));

- Pereyra (Bergman 1989a; Bergman 1989b);
- Raz urethropepy (Gilja 1998; Stein 1991);
- Raz four-corner repair (Di Palumbo 2003; Stein 1991);
- Gittes urethropepy (Stein 1991); and
- a modified Raz (termed as 'transvaginal Burch (Gilja) operation' by the authors), where the needle sutures were placed under direct (open) vision (Gilja 1998).

We classed the Gilja operation as a needle suspension rather than an open retropubic colposuspension for this review. In one trial using three different operations, it was the suture used rather than the operation that was randomised: the authors stated that the type of operation did not affect randomisation or outcomes (Stein 1991). The open abdominal retropubic suspensions were all described as 'Burch colposuspension' except in one trial (German 1992), in which a vagina/obturator shelf repair was used and another where the comparison was with Marshall-Marchetti-Krantz (Palma 1985): we classed both as open abdominal retropubic suspensions for this review.

Further details of the trials are reported in the table of [Characteristics of included studies](#).

Risk of bias in included studies

One study used a secure method of concealment of randomisation (sealed envelopes, Di Palumbo 2003), and three studies used a quasi-randomised method of allocation (birth date (Athanasopoulos 1996); open randomisation list (Gilja 1998); and alternation (Mundy 1983)). The others used 'randomisation lists or tables' without explaining how they were actually used. Women could not be blinded when abdominal operations were compared with vaginal operations. Blinding of outcome assessors was only reported in one trial (Palma 1985).

Baseline comparability of the groups was not mentioned in two studies (Athanasopoulos 1996; Mundy 1983). The others reported that the groups were 'comparable' in terms of age, parity and menopausal status, but four failed to provide specific data (Bergman 1989a; Bergman 1989b; Di Palumbo 2003; Gilja 1998). Only three studies reported drop-outs: 20 women could not be traced at five years in one trial (Bergman 1989a); in another trial, 58 were lost to follow-up at three years due to war (Gilja 1998) and four were excluded because they were not followed up in another trial (Stein 1991).

Four studies reported follow-up of a year or less (Bergman 1989b; Mundy 1983; Stein 1991), one presented data at five years (Bergman 1989a), and some women were followed to six years in another trial (Di Palumbo 2003).

Effects of interventions

1. Needle suspension versus mock procedure

We identified no studies in which needle suspension was compared with a sham or mock procedure, or no alternative intervention.

2. Needle suspension versus conservative interventions

We identified no studies in which needle suspension was compared with a conservative or physical intervention.

3. Needle suspension versus open abdominal retropubic suspension

Needle suspension was compared with open abdominal retropubic suspension in seven trials (Athanasopoulos 1996; Bergman 1989a; Bergman 1989b; German 1992; Gilja 1998; Mundy 1983; Palma 1985). Five compared a needle suspension with a Burch type of colposuspension; one was described as a vagina/obturator shelf repair (German 1992), and the other used a Marshall-Marchetti-Krantz (Palma 1985). Two methods of needle suspension were combined for comparison with colposuspension in one trial (Gilja 1998), although one of them could be regarded as a hybrid of a needle suspension and a colposuspension (termed as 'transvaginal Burch (Gilja) operation' by the authors).

Needle suspension was less effective than colposuspension, based on subjective outcome within one year of surgery (risk ratio (RR) for failure 1.70, 95% confidence interval (CI) 1.11 to 2.60, [Analysis 1.1](#)); and after the first year (91/313 (29%) failed after needle suspension versus 47/297 (16%) after open abdominal retropubic suspension; RR 2.00, 95% CI 1.47 to 2.72, [Analysis 1.2](#)) (Athanasopoulos 1996; Bergman 1989a; Bergman 1989b; German 1992; Gilja 1998; Mundy 1983; Palma 1985).

Overall, there was no statistically significant difference in peri-operative complications (haematoma, abscess, infection, pain, urinary tract infection, stitch removal for pain and Dacron sheath removal for infection) after needle procedures (17/75 (23%) versus 12/77 (16%); RR 1.44, 95% CI 0.73 to 2.83, [Analysis 1.9](#)), which were reported in three trials (Athanasopoulos 1996; German 1992; Mundy 1983). However, there was significant heterogeneity for this outcome (P value = 0.02, I^2 = 75%), which may have been due to an unusually low rate of complications after colposuspension in one trial (Mundy 1983).

There were no clear differences between the procedures for any of the other outcome measures, but the confidence intervals around these estimates were wide.

See [Analysis 1.1](#) to [Analysis 1.10](#).

Effect of previous incontinence surgery

Three of the trials included only women who had primary incontinence (i.e. they had not had previous surgery for incontinence) (Bergman 1989a; Bergman 1989b; Gilja 1998). In these trials, women who had an open operation did better after at least one year (57/218 (26%) failed after needle suspension versus 23/190 (12%) after open abdominal retropubic suspension; RR 2.37, 95% CI 1.54 to 3.66, [Analysis 2.2](#)). However, none of these trials reported peri-operative morbidity rates.

Results from the four smaller trials, which included some women who had had previous incontinence surgery, showed the same trend (34/95 (36%) failed after needle suspension versus 24/107 (22%) after open abdominal retropubic suspension; RR 1.61, 95% CI 1.04 to 2.49, [Analysis 3.2](#)).

The peri-operative morbidity data were the same as when all trials were considered together (17/75 (23%) versus 12/77 (16%); RR 1.44, 95% CI 0.73 to 2.83, [Analysis 3.8](#)) (Athanasopoulos 1996; German 1992; Mundy 1983; Palma 1985).

4. Needle suspension versus suburethral sling operations

One trial compared Stamey needle suspension with porcine dermis sling ([Hilton 1989](#)). This was a small trial with only 10 women in each arm. The women were unsuitable for open abdominal retropubic suspension (the author's preferred procedure) because they had vaginal narrowing secondary to either previous interventions or atrophic vaginitis. Although the trial was too small to address differences in cure rates, sling operations were associated with higher complication rates (9/10 versus 2/10) ([Analysis 4.6](#)). These included pyrexia, blood loss, wound infection and pulmonary embolus, need for a permanent suprapubic catheter and more adjuvant therapy, and resulted in a longer stay in hospital ([Analysis 4.7](#)).

5. Needle suspension versus anterior vaginal repair

Needle suspension was compared with anterior repair in three trials ([Bergman 1989a](#); [Bergman 1989b](#); [Di Palumbo 2003](#)). The performance of the two operations appeared similar in terms of subjective cure rates after 12 months (50/156 versus 64/181; RR 0.86, 95% CI 0.64 to 1.16, [Analysis 5.2](#)) and voiding dysfunction, whether the women had prolapse in addition to stress incontinence ([Bergman 1989b](#); [Di Palumbo 2003](#)), or not ([Bergman 1989a](#)). The numbers were not large, however, and only one objective clinical outcome was reported (no women had long-term problems with voiding dysfunction after any of the operations, [Analysis 5.4](#)).

6. Needle suspension versus laparoscopic colposuspension

We identified no eligible studies in which needle suspension was compared with laparoscopic colposuspension.

7. Needle suspension versus peri-urethral injections

We identified no eligible studies in which needle suspension was compared with peri-urethral injections.

8. Needle suspension versus drug treatment (e.g. adrenergic agonists)

We identified no eligible studies in which needle suspension was compared with a drug.

9. One type of needle suspension versus another

One trial involved a comparison between a standard Raz needle suspension and a modified operation involving direct attachment of the sutures to the ileopectineal ligament (termed 'transvaginal Burch (Gilja) operation' by the authors) ([Gilja 1998](#)). However, while there were no significant differences in outcomes, the confidence intervals were wide, reflecting the small number of women in the trial (See [Analysis 6.1](#) to [Analysis 6.3](#)).

10. Different types of sutures

In one small trial postoperative pain was significantly less at three months in women whose needle suspension was carried out using polytetrafluoroethylene sutures (Gore-Tex™) compared with polypropylene (difference in pain score -0.92, 95% CI -1.77 to -0.07, [Analysis 7.4](#)) ([Stein 1991](#)). The numbers were too small to provide useful information about effectiveness.

Surgical outcomes

Some trials reported length of stay ([Athanasopoulos 1996](#); [Hilton 1989](#); [Palma 1985](#)), duration to return to normal function

([German 1992](#)), or operating time ([Palma 1985](#)). However, with the exception of the Hilton trial (where women stayed longer after sling operations, [Hilton 1989](#)), we could make no formal statistical comparisons or draw any conclusions.

DISCUSSION

This review is one of a series of reviews of surgical operations for urinary incontinence and it should be viewed in that context ([Dean 2006](#); [Glazener 2001](#); [Kirchin 2012](#); [Lapitan 2012](#); [Rehman 2011](#)). Amongst the trials that addressed the effects of needle suspension procedures for stress incontinence, the quality of the trials was poor (three of nine used quasi-randomised methods and all but one of the remainder did not provide details of the process of randomisation) and the numbers of women who participated were low. Long-term follow-up (five years) was only available in two trials ([Bergman 1989a](#); [Di Palumbo 2003](#)). Five of the trials included some women who had previous surgery for incontinence, and three included women with prolapse; however, data were not reported separately according to these subgroups.

Outcome measures were generally subjective and limited, with little evidence of reliability and validity. Only one of the trials reported that assessment of outcome was carried out by blinded observers. Patient satisfaction with, and acceptability of, the treatment were not addressed but are important factors in choice of management. No quality of life and mental health outcomes were reported ([Black 1997](#); [Kelleher 1997](#)). The cost-effectiveness of bladder neck needle suspension would be important to determine, given the health and financial burden of SUI. Nevertheless, searches for economics evaluations in this area have failed to identify any relevant studies. Should this procedure be considered for more than very occasional use it would be important that this deficit in the evidence based be rectified.

All trials included women with urodynamic stress incontinence only, therefore the effect in women with co-existing detrusor overactivity or urge incontinence (mixed incontinence) could not be assessed.

Needle suspension versus open abdominal retropubic suspension

Needle suspensions were less successful than open abdominal retropubic suspensions in terms of higher failure rates, although there were no significant differences in other outcome measures. This effect was seen in women with both primary and secondary (after failed primary continence surgery) incontinence.

Needle suspension versus suburethral sling operations

The one small trial that compared needle operations with slings included an atypical population who were unsuitable for more radical surgery ([Hilton 1989](#)). There were too few women to provide reliable data about cure rates. Although the sling operations were associated with more postoperative morbidity, the results cannot be generalised to the whole population having surgery because of the atypical nature of the women involved in the trial.

Needle suspension versus anterior vaginal repair

Needle suspension appeared to provide similar cure rates to anterior vaginal repair in women with ([Bergman 1989b](#)) and without prolapse ([Bergman 1989a](#)), both in the short term and

long term, but the numbers were small and clinically important differences could not be ruled out. However, the effects were of the order expected from a review of anterior repair (132/322 (41%) failed after the first year) (Glazener 2001). In the current review, 50/129 (39%) failed after anterior repair versus 46/128 (36%) after needle suspension. This suggests that needle suspension is as effective as anterior repair (but both are less effective than open abdominal retropubic suspension).

One type of needle suspension versus another

In one trial, using direct vision to attach the needle sutures did not significantly improve outcomes, but the numbers were too small to be reliable (Gilja 1998).

Types of sutures

Polytetrafluoroethylene sutures (Gore-Tex™) seemed to result in less postoperative pain in the medium term than polypropylene sutures, but the single study was too small to assess continence (Stein 1991).

Outcomes

The primary outcome of effectiveness used in this review was subjective report of failure to cure incontinence. Objective urodynamic outcome measures, for example change in functional urethral length or maximal urethral pressure (Bump 1988; Hilton 1983) were reported in four of the trials (Athanasopoulos 1996; Bergman 1989a; Bergman 1989b; Hilton 1989). These are measurable continuous variables, which allow trials with smaller numbers of participants to obtain relatively precise statistical estimates of any differences. However, they are of limited help in determining optimal treatment because they have no proven correlation with clinical outcome (Meyer 1994; Swift 1995). Until accepted normal values, which correlate with clinical signs and symptoms, are available for these tests, they will not be included in this review.

Morbidity outcomes relevant to surgical complications (such as pain, voiding dysfunction, detrusor overactivity, entero-rectocele, wound and urinary infections, length of stay and time to return to normal function) were not consistently reported. Such morbidity is of particular importance in decision-making when treating benign disease. Data describing treatment failure in terms of need for alternative interventions, or for repeat surgery for incontinence and prolapse, would be particularly useful.

AUTHORS' CONCLUSIONS

Implications for practice

The limited evidence indicates that bladder neck needle suspension operations are worse than the open abdominal approach (retropubic suspension) for the treatment of primary or secondary urodynamic stress incontinence. However, data were inadequate for comparing morbidity. Although cure rates appeared to be similar after needle suspension when compared with anterior vaginal repair, the data were insufficient to be reliable. Comparison with suburethral sling operations was inconclusive because of the small and atypical population studied. There were no trials that compared needle suspension with conservative or other physical therapy or with self fixing slings or with laparoscopic retropubic suspensions or with peri-urethral injections.

Postoperative surgical morbidity was poorly reported, and quality of life measures and economic outcomes inadequately reported, therefore the alternative treatments could not be compared in other ways. In treating benign disease, morbidity must be balanced against the chance of cure or improvement in quality of life, and the cost-effectiveness of the options should also be considered.

Implications for research

Future research in incontinence should incorporate standardised, validated, preferably objective and simple outcome measures that are relevant to women who have incontinence, in order to allow comparison between studies. In particular, long-term morbidity, quality of life, and psychological and economic outcomes should be incorporated.

Surgical trials related to stress incontinence should systematically address surgical morbidity outcomes such as adverse peri-operative events, length of hospital stay, time to return to normal activities, de novo development of urge symptoms or detrusor overactivity, and especially the need for repeat surgery or alternative interventions. Long-term follow-up (at least one year, preferably five years or more) is essential for the proper evaluation of incontinence treatments.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Athanassopoulos 1996

Methods	Quasi-randomised RCT (by birth date) Blinding not mentioned No power calculation ITT analysis Follow-up 8 to 27 months
Participants	n = 51. No withdrawals mentioned Inclusion criteria: GSI (urodynamic diagnosis); combined primary and recurrent. Includes those with previous surgery and with prolapse Mean age: 50 years (20 to 78), 50.9% menopausal, 14% with previous pelvic operations No baseline comparison of treatment groups Single-centre, university-based hospital, Greece
Interventions	(I) Burch (27) (II) Stamey (24) Description of both procedures referenced. All performed by 1 surgeon
Outcomes	Cure = complete freedom from SUI at 8 to 27 months Failure = persistent or recurrent SUI at 8 to 27 months Urinary retention not defined Failure rate: (I) 7/27; (II) 7/24 Number not improved: (I) 3/27; (I): 4/24 Length of stay: (I) 5.8 days (range 4 to 11); (I): 3 (6 to 12) Complications (haematoma, abscess): (I) 6/27; (II) 4/24 Urinary retention: (I) 2/27; (II) 3/24 Urgency: (I) 3/27; (II) 1/24 Urodynamic data also given

Athanassopoulos 1996 (Continued)

Notes —

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Date of birth
Allocation concealment (selection bias)	High risk	C - Inadequate
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	Low risk	No drop-outs reported

Bergman 1989a

Methods	RCT Patients and surgeons randomly allocated (using randomisation tables) to 1 of 3 operations. Follow-up at 3 and 12 months, and 5 years 20 women lost to follow-up at 12 months were not reported
Participants	127 women recruited, results reported for 107 at 12 months. Results for 64 at 5 years out of 78 cured at 1 year Groups stated to be comparable in mean age, parity and menopausal status but data not given 53 pre-menopausal, 74 post-menopausal Inclusion: GSI (urodynamic diagnosis); minor cystocele only; postmenopausal women given oestrogens before and after surgery Exclusion criteria: significant prolapse, other gynaecological disease or operations; previously failed incontinence surgery Single-centre, university-based hospital, urogynaecology unit, USA
Interventions	(I) Anterior vaginal repair (colporrhaphy) (35) (n = 30 at 5 years) (II) Needle (modified Pereyra procedure) (34) (n = 30 at 5 years) (III) Colposuspension (Burch urethropexy) (38) (n = 33 at 5 years)
Outcomes	Cure defined as no loss of urine in history or on urodynamic investigation Failure rate: (I) at 3 months 7/35, at 12 months 13/35, at 5 years 19/30 (II) at 3 months 6/34, at 12 months 12/34, at 5 years 17/30 (III) at 3 months 3/38, at 12 months 4/38, at 5 years 6/33 Failure rate (sensitivity analysis): (I) 24/35; (II) 21/34; (III) 11/38 No subsequent voiding problems in any patient Postoperative bacteriuria equally frequent in all groups 3 developed detrusor instability (groups not specified); 6 developed prolapse ((I) 3; (II) 2; (III) 1) Urodynamic measurements reported before and 12 months and 5 years after operation
Notes	Sensitivity analysis at 5 years for 107 assuming missing 14 were failures and including 29 already failed at 1 year

Risk of bias

Bergman 1989a (Continued)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation tables
Allocation concealment (selection bias)	Unclear risk	B - Unclear
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	High risk	20 women lost to follow-up at 1 year, 43 at 5 years

Bergman 1989b

Methods	RCT Follow-up at 3 and 12 months Patients and surgeons randomly allocated (using randomisation tables) to 1 of 3 operations 3 women excluded for technical reasons, 41 lost to follow-up; 298 women reported in the study	
Participants	342 women (298 reported) Mean age 57 years (range 31 to 80); parity 3 (1 to 13); 191 postmenopausal, 151 premenopausal. Groups comparable at baseline but data not given Postmenopausal women given oestrogens before and after surgery Inclusion criteria: urodynamic diagnosis of primary GSI, stable bladder and pelvic relaxation (prolapse) Exclusion criteria: previous incontinence surgery, detrusor instability, gynaecological complications other than prolapse Single-centre, university-based hospital, urogynaecology unit, USA	
Interventions	(I) Anterior vaginal repair (99) (II) Needle (revised Pereyra procedure) (98) (III) Colposuspension (Burch retropubic urethropexy) (101)	
Outcomes	Failure rate: (I) at 3 months 20/99, at 12 months 31/99 (II) at 3 months 19/98, at 12 months 29/98 (III) at 3 months 11/101, at 12 months 13/101 No postoperative voiding problems Urodynamic measurements reported before and 12 months after operation	
Notes	Tertiary referral centre. No power calculation	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation tables
Allocation concealment (selection bias)	Unclear risk	B - Unclear
Blinding (performance bias and detection bias)	Unclear risk	Not mentioned

Bladder neck needle suspension for urinary incontinence in women (Review)

Bergman 1989b (Continued)

All outcomes

Incomplete outcome data (attrition bias)	High risk	44 women lost to follow-up
All outcomes		

Di Palumbo 2003

Methods	RCT 2:1 randomisation using sealed envelopes Follow-up: 280 to 1670 days (at 1, 3, 6, 12, 18 and 24 months, then yearly)
Participants	80 women with SUI + urethrocytocele (anterior prolapse) grade 3 or 4 Age: (I) mean 59.8 years (range 41 to 79), (II) 60.6 (39 to 78) Concomitant vaginal hysterectomy: (I) 47/52, (II) 26/28 Inclusion criteria: prolapse defect assessed (apical, central, lateral), SUI, UUI, mixed incontinence and overactive bladder diagnosed with Q tip test, stress test, 1-hour pad test and urodynamics. If urgency, bladder training and anticholinergic treatment before surgery.
Interventions	(I) Anterior repair (Nicholls) (52) (II) 4-corner bladder and urethral retropubic suspension (Raz) with thin polypropylene mesh in the spiral suture (28)
Outcomes	SUI (failed): (I) 14/52, (II) 4/28 (assumed to be after first year) New rectocele at 6 months: (I) 3/52, (II) 5/28 Urge incontinence: (I) 12/52, (II) 5/28 Frequency of urination: (I) 10/52, (II) 2/28 Urinary retention in first 10 days: (I) 1/52, (II) 1/28 Long-term retention: (I) 0/52, (II) 0/28 Time to spontaneous voiding: (I) 3.62 days (range 2 to 9), (II) 4.78 (3 to 9) Postoperative hospital stay: (I) mean 6 days (range 4 to 20), (II) 5 (4 to 34) (NS) Adverse effects: (I) 0/52, (II) 1/28 (sepsis, removal of stitches and prolonged hospital stay)
Notes	Women comparable at baseline for age, diabetes, respiratory problems, obstetric history, concomitant vaginal hysterectomy

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	RCT
Allocation concealment (selection bias)	Low risk	A - Adequate (sealed envelopes)
Incomplete outcome data (attrition bias) All outcomes	Low risk	No drop-outs reported

German 1992

Methods	RCT. Method not described. 2 arms Blinding not mentioned
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German 1992 (Continued)

ITT analysis
Follow-up mean 2 years (12 to 44 months)

Participants	n = 50. No withdrawals Inclusion criteria: GSI (urodynamic diagnosis); both primary and recurrent UI. No mixed UI Mean age: 50/53; mean weight: 68.4/70.9 kg Baseline comparison of groups matched to age and weight Previous surgery: (I) 11; (II) 10 Single-centre, Department of Urology, UK
Interventions	(I) Colposuspension (vagina/obturator shelf repair) (24) (II) Needle suspension, modified Stamey (26) Both techniques described Surgeon not mentioned
Outcomes	Success = complete dryness or occasional incontinence Failure rate at 12 to 44 months: (I) 7/24; (II) 11/26 Length of stay: (I) 8.3 days; (II) 7 days Peri-operative infection: I: 6/24; II: 3/26 Postoperative pain: (I) 11/24; (II) 19/26 Voiding problems (short-term): (I) 4/24; (II) 0/26 Voiding problems (long-term): (I) 0/24; (II) 0/26 Time to normal activity: (I) 10.4 weeks; (II) 7.9 weeks New urgency: (I) 1/24; (II) 2/26
Notes	Separate analysis of primary and recurrent cases possible

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	RCT
Allocation concealment (selection bias)	Unclear risk	B - Unclear
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	Low risk	No drop-outs reported

Gilja 1998

Methods	RCT by open randomisation list (3 arms) Blinding not mentioned Not ITT Follow-up 3 years
Participants	n = 204, 58 lost to follow-up due to war Inclusion criteria: GSI (urodynamic diagnosis) Exclusion criteria: previous urological or gynaecological operations for incontinence Mean age 36 years (28 to 48); mean parity 3.1 (1 to 8) Number premenopausal: 63

Gilja 1998 (Continued)

Baseline comparison of groups similar in age and parity
Single-centre, general hospital, Department of Urology, Croatia

Interventions	(I) Colposuspension (Burch) (56) (II) Needle (transvaginal Burch/Gilja) (44) (III) Needle (Raz) (46) Burch and Raz described and referenced. Gilja = combination of open abdominal suspension and needle but classed as a needle suspension Single surgeon for all
Outcomes	Subjective UI in 1st year: (I) 2/56; (II) 1/44; (III) 3/46 Subjective UI at 3 years: (I) 4/56; (II) 4/44; (III) 7/46 Objective UI in 1st year: (I) 3/56; (II) 5/44; (III) 6/46 Objective UI in 3rd year: (I) 6/56; (II) 6/44; (III) 9/46 Urge incontinence at 3 years: (I) 2/56; (II) 3/44; (III) 5/46
Notes	With additional information from author Author emphasised strict evaluation of results for cure

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Open randomisation list
Allocation concealment (selection bias)	High risk	C - Inadequate (open list)
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	High risk	58 drop-outs (due to war)

Hilton 1989

Methods	RCT. Follow-up at 2, 3, 12 and 24 months. Women allocated to 1 of 2 interventions by random tables. All women available at follow-up
Participants	20 women recruited, 10 in each arm of the study Inclusion criteria: GSI (urodynamic diagnosis), vaginal narrowing, postsurgical scar, unsuitable for colposuspension Exclusion criteria: not stated Groups comparable for age, parity and number of previous surgical incontinence procedures Age: mean 57 to 54 years (range 42 to 75) Menopausal status not reported Single-centre, Department of Obstetrics and Gynaecology, UK
Interventions	(I) Needle suspension (Stamey) (10) (II) Sling (porcine dermis) (10)
Outcomes	Cure = objective (urodynamic diagnosis, pad test) at 3 months and subjective at 24 months

Bladder neck needle suspension for urinary incontinence in women (Review)

Hilton 1989 (Continued)

Failure rate (objective) at 3 months: (I) 2/10; (II) 1/10
 Failure rate (subjective) at 24 months: (I) 3/10; (II) 1/10
 Postoperative complications: (I) 2/10; (II) 9/10 (operative blood loss, pyrexia, infective complications, permanent suprapubic catheter)
 Hospital stay: (I) 7 days (0.3); (II) 20 (12.9)
 Voiding problems at 3 months: (I) 2/10; (II) 4/10
 Urge incontinence: (I) 3/10; (II) 5/10
 Detrusor instability: (I) 1/10; (II) 2/10
 Late complications not reported

 Urodynamic data also given

Notes Pad test at 12 and 24 months stated but not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random tables
Allocation concealment (selection bias)	Unclear risk	B - Unclear
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	Low risk	No drop-outs

Mundy 1983

Methods	Quasi-randomised RCT (alternate allocation) Stratification between primary and recurrent GSI. 2 arms Blinding not mentioned No power calculation ITT analysis Follow-up minimum 1 year
Participants	n = 51. No withdrawals Inclusion criteria: GSI (urodynamic diagnosis), combined primary and recurrent UI. No mixed UI Mean age 48 years (29 to 70). No baseline comparison of groups Single-centre, Department of Urology, UK
Interventions	(I) Colposuspension (Burch) (26) (II) Needle (modified Stamey) (25) Colposuspension referenced; modified Stamey described Single surgeon for all cases
Outcomes	Subjective cure = not defined Objective cure = negative nappy test and video UDS Failure rate (subjective) at 12 months: (I) 3/26; (II) 6/25 Failure rate (objective) at 12 months: (I) 6/26; (II) 15/25 DI: (I) 2/26; (II) 5/25

Bladder neck needle suspension for urinary incontinence in women (Review)

Mundy 1983 (Continued)

Voiding difficulty: (I) 3/26; (II) 6/25
 Peri-operative complications (UTI, stitch removal, Dacron sheath removal): (I) 0/26; (II) 10/25
 (II) 3 of the 10 needed removal of suprapubic Dacron buffer

Notes
 Colposuspension described as Burch
 Cannot do separate analysis for recurrent GSI alone

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Alternation
Allocation concealment (selection bias)	High risk	C - Inadequate
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	Low risk	No withdrawals

Palma 1985

Methods	RCT, method not described Author replied patients, care givers and assessors were blinded Not mentioned if ITT analysis Follow-up: (I) mean 34 months, (range 19 to 56); (II) 21 (2 to 44)
Participants	n = 70. No withdrawals mentioned Previous surgery (Kelly or MMK): (I) 3/30, (II) 10/40 Urodynamics used to confirm SUI if in doubt Age: (I) mean 46 years (range 28 to 69); (II) 44 (26 to 67) Inclusion/exclusion not mentioned No statistical baseline comparisons of groups Single-centre. Department of Obstetrics and Gynaecology, university-based hospital, Campinas, Brazil
Interventions	(I) MMK (30) (II) Needle suspension (Stamey) (40) Procedures described Surgeon not mentioned
Outcomes	Not cured in first year: (I) 4/30, (II) 1/20 Not cured after first year: (I) 7/30, (II) 10/20 Not improved in first year: (I) 2/30, (II) 1/20 New urge or urge incontinence: (I) 0/30, (II) 2/20 New detrusor overactivity: (I) 0/30, (II) 1/20 Operating time: (I) 30 minutes, (II) 35 minutes Length of stay: (I) 3 days, (II) 2 days Voiding dysfunction: (I) 0/30, (II) 1/20
Notes	Abstract Correspondence from author to clarify if randomised. Extra data also obtained

Palma 1985 (Continued)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	RCT
Allocation concealment (selection bias)	Unclear risk	B - Unclear
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	High risk	20 participants not reported

Stein 1991

Methods	RCT of 2 different suture materials. Method of randomisation not described 2 arms, blinding not mentioned, no power calculation Follow-up 6 months
Participants	24 women, 4 excluded because not followed up Inclusion criteria: GSI (urodynamic diagnosis), no urinary tract infection, undergoing needle suspension Exclusion criteria: previous incontinence surgery, pelvic pain Groups stated to be comparable (socioeconomic, race, age) Age (I) 46 years (range 30 to 59); (II) 49 (35 to 67)
Interventions	(I) CV-0 polytetrafluoro-ethylene (Gore-Tex™) suture (9) (II) #1 polypropylene suture (11)
Outcomes	Pain and continence. Cure defined as no incontinence, no use of pads or medication, good = slight incontinence, improved = occasional pad or drug use, failed = unimproved or worse Pain (n, mean score, SD) at 1 month: I: 9, 1 (SD 1.5); II: 10, 1.6 (1.31) Pain (n, mean score, SD) at 3 months: I: 9, 0.33 (0.71); II: 11, 1.25 (1.2) Failed at 3 months: (I) 0/9; (II) 3/11 Not improved at 3 months: (I) 0/9; (II) 1/11 Urge incontinence: (I) 0/9; (II) 2/11
Notes	Type of operation stated not to have affected randomisation or outcomes but data not given to assess this. Raz urethropexy, Raz 4-corner repair or Gittes urethropexy

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	RCT
Allocation concealment (selection bias)	Unclear risk	B - Unclear

Stein 1991 (Continued)

Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	High risk	4 excluded because not followed up

BMI = body mass index; DI = detrusor instability (now DO = detrusor overactivity); GSI = genuine stress incontinence (now USI = urodynamic stress incontinence); ITT = intention-to-treat; kg = kilograms; MMK = Marshall-Marchetti-Krantz; NS = not significant; PFMT = pelvic floor muscle training; RCT = randomised controlled trial; SUI = stress urinary incontinence (symptom diagnosis); TVT = tension-free vaginal tape; w = week(s); SD = standard deviation; UDS = urodynamics; UI = urinary incontinence; UUI = Urgency Urinary Incontinence; UTI = urinary tract infection; VAS = visual analogue score

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Bump 1995	RCT, but women had prolapse and NO incontinence Interventions: anterior repair versus needle suspension
Bump 1996	RCT, but women were not incontinent Interventions: needle versus endopelvic fascia plication
Colombo 1997	RCT, but women did not all have incontinence Interventions: needle (Pereyra) versus posterior pubourethral ligament plication
Corcos 2001	RCT, but data not presented separately for each type of surgery Interventions: injectables versus surgery (6 needle bladder neck suspensions, 24 sling, 24 Burch)
Goldberg 2001	RCT, but of mesh versus no mesh for prolapse. This paper reports outcomes of women who had concomitant incontinence procedures, but were not randomised to these operations
Ishenko 1999	Randomisation and groups unclear ("randomised by age"). Excluded as attempts to contact authors unsuccessful and insufficient information given in abstract Interventions: vaginal hysterectomy, modified Pereyra procedure, anterior and posterior repair versus vaginal hysterectomy, sling procedure with Mersilene mesh, anterior and posterior repair
Jongen 1999	Not RCT Interventions: colposuspension (Burch) versus needle suspension (Pereyra) for stress incontinence
Koonings 1988	RCT, but trial not focused on needle suspension alone Intervention: surgery (mixed types, including needle suspensions) plus drugs versus surgery (mixed) alone
Morley 1995	RCT of 54 women with urodynamic stress urinary incontinence Interventions: Stamey endoscopic bladder neck suspension (needle) versus staple colpopexiation, described as a new technique Excluded as attempts to obtain more information from authors unsuccessful, and insufficient data given in abstract
Ramon 1991	Not RCT Interventions: Stamey, Raz. Operation chosen by surgeon's preference
Salinas 1994	Not RCT Interventions: Kelly, Raz, Marshall-Marchetti-Krantz, Burch, simplified Ramirez

Study	Reason for exclusion
Vordermark 1979	Not RCT Interventions: needle (Pereyra/Stamey/Mason) versus open abdominal retropubic suspension (Marshall-Marchetti-Krantz)
Zivkovic 1994	Not RCT Interventions: anterior vaginal repair with or without needle suspension

RCT = randomised controlled trial

DATA AND ANALYSES

Comparison 1. Needle suspension versus open abdominal retropubic suspension

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number not cured (worse, unchanged or improved) within first year	5	517	Risk Ratio (M-H, Fixed, 95% CI)	1.70 [1.11, 2.60]
1.1 Objective/genuine stress incontinence (only)	5	517	Risk Ratio (M-H, Fixed, 95% CI)	1.70 [1.11, 2.60]
1.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Number not cured (worse, unchanged or improved) after first year	7	610	Risk Ratio (M-H, Fixed, 95% CI)	2.00 [1.47, 2.72]
2.1 Objective/genuine stress incontinence (only)	7	610	Risk Ratio (M-H, Fixed, 95% CI)	2.00 [1.47, 2.72]
2.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Number not improved (worse or unchanged) within first year	1	50	Risk Ratio (M-H, Fixed, 95% CI)	0.75 [0.07, 7.73]
3.1 Objective/genuine stress incontinence (only)	1	50	Risk Ratio (M-H, Fixed, 95% CI)	0.75 [0.07, 7.73]
3.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4 Number not improved (worse or unchanged) after first year	1	51	Risk Ratio (M-H, Fixed, 95% CI)	1.5 [0.37, 6.04]
4.1 Objective/genuine stress incontinence (only)	1	51	Risk Ratio (M-H, Fixed, 95% CI)	1.5 [0.37, 6.04]
4.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Urge symptoms or urge incontinence	4	297	Risk Ratio (M-H, Fixed, 95% CI)	1.80 [0.71, 4.56]
5.1 Objective/genuine stress incontinence (only)	4	297	Risk Ratio (M-H, Fixed, 95% CI)	1.80 [0.71, 4.56]
5.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 Voiding dysfunction after 3 months	4	202	Risk Ratio (M-H, Fixed, 95% CI)	2.12 [0.81, 5.55]
6.1 Objective/genuine stress incontinence (only)	4	202	Risk Ratio (M-H, Fixed, 95% CI)	2.12 [0.81, 5.55]
6.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
7 Detrusor overactivity (objective diagnosis by urodynamics)	2	101	Risk Ratio (M-H, Fixed, 95% CI)	2.91 [0.73, 11.58]
7.1 Objective/genuine stress incontinence (only)	2	101	Risk Ratio (M-H, Fixed, 95% CI)	2.91 [0.73, 11.58]
7.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
7.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
8 New or persistent prolapse	1	72	Risk Ratio (M-H, Fixed, 95% CI)	2.24 [0.21, 23.57]
8.1 Objective/genuine stress incontinence (only)	1	72	Risk Ratio (M-H, Fixed, 95% CI)	2.24 [0.21, 23.57]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
8.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
8.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
9 Peri-operative surgical complications	3	152	Risk Ratio (M-H, Fixed, 95% CI)	1.44 [0.73, 2.83]
9.1 Objective/genuine stress incontinence (only)	3	152	Risk Ratio (M-H, Fixed, 95% CI)	1.44 [0.73, 2.83]
9.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
9.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
10 Length of stay/time to return to normal function			Other data	No numeric data

Analysis 1.1. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 1 Number not cured (worse, unchanged or improved) within first year.

Analysis 1.2. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 2 Number not cured (worse, unchanged or improved) after first year.

Analysis 1.3. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 3 Number not improved (worse or unchanged) within first year.

Analysis 1.4. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 4 Number not improved (worse or unchanged) after first year.

Analysis 1.5. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 5 Urge symptoms or urge incontinence.

Analysis 1.6. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 6 Voiding dysfunction after 3 months.

Analysis 1.7. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 7 Detrusor overactivity (objective diagnosis by urodynamics).

Analysis 1.8. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 8 New or persistent prolapse.

Analysis 1.9. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 9 Peri-operative surgical complications.

Analysis 1.10. Comparison 1 Needle suspension versus open abdominal retropubic suspension, Outcome 10 Length of stay/time to return to normal function.

Study	Length of stay/time to return to normal function	
	Needle suspension	Abdominal suspension
Athanassopoulos 1996	Mean length of stay: 3 days (range 6 to 12)	Mean length of stay: 5.8 days (range 4 to 11)
German 1992	Mean length of stay: 7 days Time to return to normal activity: 7 weeks	Mean length of stay: 8.3 days Time to return to normal activity: 10.4 weeks

Comparison 2. Needle suspension versus open abdominal retropubic suspension (no previous surgery)

Outcome or subgroup title	No. of studies	No. of partici- pants	Statistical method	Effect size
1 Number not cured (worse, un- changed or improved) within first year	3	417	Risk Ratio (M-H, Fixed, 95% CI)	2.05 [1.20, 3.50]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Objective/genuine stress incontinence (only)	3	417	Risk Ratio (M-H, Fixed, 95% CI)	2.05 [1.20, 3.50]
1.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Number not cured (worse, unchanged or improved) after first year	3	408	Risk Ratio (M-H, Fixed, 95% CI)	2.37 [1.54, 3.66]
2.1 Objective/genuine stress incontinence (only)	3	408	Risk Ratio (M-H, Fixed, 95% CI)	2.37 [1.54, 3.66]
2.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Urge symptoms or urge incontinence	1	146	Risk Ratio (M-H, Fixed, 95% CI)	2.49 [0.55, 11.30]
3.1 Objective/genuine stress incontinence (only)	1	146	Risk Ratio (M-H, Fixed, 95% CI)	2.49 [0.55, 11.30]
3.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 New or persistent prolapse	1	72	Risk Ratio (M-H, Fixed, 95% CI)	2.24 [0.21, 23.57]
4.1 Objective/genuine stress incontinence (only)	1	72	Risk Ratio (M-H, Fixed, 95% CI)	2.24 [0.21, 23.57]
4.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 2.1. Comparison 2 Needle suspension versus open abdominal retropubic suspension (no previous surgery), Outcome 1 Number not cured (worse, unchanged or improved) within first year.

Analysis 2.2. Comparison 2 Needle suspension versus open abdominal retropubic suspension (no previous surgery), Outcome 2 Number not cured (worse, unchanged or improved) after first year.

Analysis 2.3. Comparison 2 Needle suspension versus open abdominal retropubic suspension (no previous surgery), Outcome 3 Urge symptoms or urge incontinence.

Analysis 2.4. Comparison 2 Needle suspension versus open abdominal retropubic suspension (no previous surgery), Outcome 4 New or persistent prolapse.

Comparison 3. Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery)

Outcome or subgroup title	No. of studies	No. of partici- pants	Statistical method	Effect size
1 Number not cured (worse, un- changed or improved) within first year	2	100	Risk Ratio (M-H, Fixed, 95% CI)	1.12 [0.55, 2.29]
1.1 Objective/genuine stress inconti- nence (only)	2	100	Risk Ratio (M-H, Fixed, 95% CI)	1.12 [0.55, 2.29]
1.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Number not cured (worse, un- changed or improved) after first year	4	202	Risk Ratio (M-H, Fixed, 95% CI)	1.61 [1.04, 2.49]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Objective/genuine stress incontinence (only)	4	202	Risk Ratio (M-H, Fixed, 95% CI)	1.61 [1.04, 2.49]
2.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Number not improved (worse or unchanged) within first year	1	50	Risk Ratio (M-H, Fixed, 95% CI)	0.75 [0.07, 7.73]
3.1 Objective/genuine stress incontinence (only)	1	50	Risk Ratio (M-H, Fixed, 95% CI)	0.75 [0.07, 7.73]
3.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Number not improved (worse or unchanged) after first year	1	51	Risk Ratio (M-H, Fixed, 95% CI)	1.5 [0.37, 6.04]
4.1 Objective/genuine stress incontinence (only)	1	51	Risk Ratio (M-H, Fixed, 95% CI)	1.5 [0.37, 6.04]
4.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Urge symptoms or urge incontinence	3	151	Risk Ratio (M-H, Fixed, 95% CI)	1.40 [0.42, 4.59]
5.1 Objective/genuine stress incontinence (only)	3	151	Risk Ratio (M-H, Fixed, 95% CI)	1.40 [0.42, 4.59]
5.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 Voiding dysfunction after 3 months	4	202	Risk Ratio (M-H, Fixed, 95% CI)	2.12 [0.81, 5.55]
6.1 Objective/genuine stress incontinence (only)	4	202	Risk Ratio (M-H, Fixed, 95% CI)	2.12 [0.81, 5.55]
6.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
6.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
7 Detrusor overactivity (objective diagnosis by urodynamics)	2	101	Risk Ratio (M-H, Fixed, 95% CI)	2.91 [0.73, 11.58]
7.1 Objective/genuine stress incontinence (only)	2	101	Risk Ratio (M-H, Fixed, 95% CI)	2.91 [0.73, 11.58]
7.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
7.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
8 Peri-operative surgical complications	3	152	Risk Ratio (M-H, Fixed, 95% CI)	1.44 [0.73, 2.83]
8.1 Objective/genuine stress incontinence (only)	3	152	Risk Ratio (M-H, Fixed, 95% CI)	1.44 [0.73, 2.83]
8.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
8.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 3.1. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 1 Number not cured (worse, unchanged or improved) within first year.

Analysis 3.2. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 2 Number not cured (worse, unchanged or improved) after first year.

Analysis 3.3. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 3 Number not improved (worse or unchanged) within first year.

Analysis 3.4. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 4 Number not improved (worse or unchanged) after first year.

Analysis 3.5. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 5 Urge symptoms or urge incontinence.

Analysis 3.6. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 6 Voiding dysfunction after 3 months.

Analysis 3.7. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 7 Detrusor overactivity (objective diagnosis by urodynamics).

Analysis 3.8. Comparison 3 Needle suspension versus open abdominal retropubic suspension (mixed population, some after previous surgery), Outcome 8 Peri-operative surgical complications.

Comparison 4. Needle suspension versus suburethral sling operations

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number not cured (worse, unchanged or improved) within first year	1	20	Risk Ratio (M-H, Fixed, 95% CI)	2.0 [0.21, 18.69]
1.1 Objective/genuine stress incontinence (only)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	2.0 [0.21, 18.69]
1.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Number not cured (worse, unchanged or improved) after first year	1	20	Risk Ratio (M-H, Fixed, 95% CI)	3.0 [0.37, 24.17]
2.1 Objective/genuine stress incontinence (only)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	3.0 [0.37, 24.17]
2.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Urge symptoms or urge incontinence	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.6 [0.19, 1.86]
3.1 Objective/genuine stress incontinence (only)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.6 [0.19, 1.86]
3.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Voiding dysfunction after 3 months	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.5 [0.12, 2.14]
4.1 Objective/genuine stress incontinence (only)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.5 [0.12, 2.14]
4.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Detrusor overactivity (objective diagnosis by urodynamics)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.5 [0.05, 4.67]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.1 Objective/genuine stress incontinence (only)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.5 [0.05, 4.67]
5.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 Peri-operative surgical complications	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.22 [0.06, 0.78]
6.1 Objective/genuine stress incontinence (only)	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.22 [0.06, 0.78]
6.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
7 Length of inpatient stay	1	20	Mean Difference (IV, Fixed, 95% CI)	-13.0 [-19.00, -5.00]
7.1 Objective/genuine stress incontinence (only)	1	20	Mean Difference (IV, Fixed, 95% CI)	-13.0 [-19.00, -5.00]
7.2 Subjective stress incontinence (only)	0	0	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
7.3 Mixed incontinence	0	0	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 4.1. Comparison 4 Needle suspension versus suburethral sling operations, Outcome 1 Number not cured (worse, unchanged or improved) within first year.

Analysis 4.2. Comparison 4 Needle suspension versus suburethral sling operations, Outcome 2 Number not cured (worse, unchanged or improved) after first year.

Analysis 4.3. Comparison 4 Needle suspension versus suburethral sling operations, Outcome 3 Urge symptoms or urge incontinence.

Analysis 4.4. Comparison 4 Needle suspension versus suburethral sling operations, Outcome 4 Voiding dysfunction after 3 months.

Analysis 4.5. Comparison 4 Needle suspension versus suburethral sling operations, Outcome 5 Detrusor overactivity (objective diagnosis by urodynamics).

Analysis 4.6. Comparison 4 Needle suspension versus suburethral sling operations, Outcome 6 Peri-operative surgical complications.

Analysis 4.7. Comparison 4 Needle suspension versus suburethral sling operations, Outcome 7 Length of inpatient stay.

Comparison 5. Needle suspension versus anterior vaginal repair

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number not cured (worse, unchanged or improved) within first year	2	266	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.63, 1.46]
1.1 Objective/genuine stress incontinence (only)	2	266	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.63, 1.46]
1.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.3 Mixed incontinence	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Number not cured (worse, unchanged or improved) after first year	3	337	Risk Ratio (M-H, Fixed, 95% CI)	0.86 [0.64, 1.16]
2.1 Objective/genuine stress incontinence (only)	2	257	Risk Ratio (M-H, Fixed, 95% CI)	0.93 [0.68, 1.26]
2.2 Subjective stress incontinence (only)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Mixed incontinence	1	80	Risk Ratio (M-H, Fixed, 95% CI)	0.53 [0.19, 1.46]
3 Urge symptoms or urge incontinence	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Objective/genuine stress incontinence (only)	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.2 Subjective stress incontinence (only)	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.3 Mixed incontinence	1		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Voiding dysfunction after 3 months	3		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
4.1 Objective/genuine stress incontinence (only)	2		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.2 Subjective stress incontinence (only)	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.3 Mixed incontinence	1		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Peri-operative surgical complications	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
5.1 Objective/genuine stress incontinence (only)	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.2 Subjective stress incontinence (only)	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.3 Mixed incontinence	1		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 New or persistent prolapse	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
6.1 Objective/genuine stress incontinence (only)	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.2 Subjective stress incontinence (only)	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.3 Mixed incontinence	1		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 5.1. Comparison 5 Needle suspension versus anterior vaginal repair, Outcome 1 Number not cured (worse, unchanged or improved) within first year.

Analysis 5.2. Comparison 5 Needle suspension versus anterior vaginal repair, Outcome 2 Number not cured (worse, unchanged or improved) after first year.

Analysis 5.3. Comparison 5 Needle suspension versus anterior vaginal repair, Outcome 3 Urge symptoms or urge incontinence.

Analysis 5.4. Comparison 5 Needle suspension versus anterior vaginal repair, Outcome 4 Voiding dysfunction after 3 months.

Analysis 5.5. Comparison 5 Needle suspension versus anterior vaginal repair, Outcome 5 Peri-operative surgical complications.

Analysis 5.6. Comparison 5 Needle suspension versus anterior vaginal repair, Outcome 6 New or persistent prolapse.

Comparison 6. One type of needle suspension versus another type of needle suspension

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number not cured (worse, unchanged or improved) within first year	1	90	Risk Ratio (M-H, Fixed, 95% CI)	2.87 [0.31, 26.56]
1.1 Raz versus transvaginal Burch (Gilja)	1	90	Risk Ratio (M-H, Fixed, 95% CI)	2.87 [0.31, 26.56]
2 Number not cured (worse, unchanged or improved) after first year	1	90	Risk Ratio (M-H, Fixed, 95% CI)	1.67 [0.53, 5.32]
2.1 Raz versus transvaginal Burch (Gilja)	1	90	Risk Ratio (M-H, Fixed, 95% CI)	1.67 [0.53, 5.32]
3 Urge symptoms or urge incontinence	1	90	Risk Ratio (M-H, Fixed, 95% CI)	1.59 [0.40, 6.28]
3.1 Raz versus transvaginal Burch (Gilja)	1	90	Risk Ratio (M-H, Fixed, 95% CI)	1.59 [0.40, 6.28]

Analysis 6.1. Comparison 6 One type of needle suspension versus another type of needle suspension, Outcome 1 Number not cured (worse, unchanged or improved) within first year.

Analysis 6.2. Comparison 6 One type of needle suspension versus another type of needle suspension, Outcome 2 Number not cured (worse, unchanged or improved) after first year. **Analysis 6.3. Comparison 6 One type of needle suspension versus another type of needle suspension, Outcome 3 Urge symptoms or urge incontinence.** **Comparison 7. One type of suture versus another type of suture**

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number not cured (worse, unchanged or improved) within first year	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.17 [0.01, 2.94]
2 Number not improved (worse or unchanged) within first year	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.4 [0.02, 8.78]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3 Urge symptoms or urge incontinence	1	20	Risk Ratio (M-H, Fixed, 95% CI)	0.24 [0.01, 4.44]
4 Pain score	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
4.1 At one month	1	19	Mean Difference (IV, Fixed, 95% CI)	-0.60 [-1.87, 0.67]
4.2 At three months	1	20	Mean Difference (IV, Fixed, 95% CI)	-0.92 [-1.77, -0.07]

Analysis 7.1. Comparison 7 One type of suture versus another type of suture, Outcome 1 Number not cured (worse, unchanged or improved) within first year.

Analysis 7.2. Comparison 7 One type of suture versus another type of suture, Outcome 2 Number not improved (worse or unchanged) within first year.

Analysis 7.3. Comparison 7 One type of suture versus another type of suture, Outcome 3 Urge symptoms or urge incontinence.

Analysis 7.4. Comparison 7 One type of suture versus another type of suture, Outcome 4 Pain score.

APPENDICES

Appendix 1. Search strategies for brief economic commentary

We performed additional searches for the Brief Economic Commentary (BECs). These were conducted in MEDLINE(1 January 1946 to March 2017), Embase (1 January 1980 to 2017 Week 12) and NHS EED (1st Quarter 2016). We ran all searches on 6 April 2017. We used two different search strategies on MEDLINE and Embase (OvidSP) and one on NHS EED (OVID). Details of the searches run and the search terms used can be found below.

NHS EED (Ovid) (1st Quarter 2016)

NHS EED was searched using the following search strategy:

1. Urinary incontinence/
2. Urinary incontinence, stress/
3. ((stress\$ or mix\$ or urg\$ or urin\$) adj3 incontinen\$).tw.
4. Colporrhaphy.tw.
5. Colpoperineoplast\$.tw.

6. Sling procedure\$.tw.
7. Sling\$ procedure\$.tw.
8. Bladder neck needle suspension\$.tw.
9. Anterior vaginal repair\$.tw.
10. Or/1-9

MEDLINE (1 January 1946 to March 2017) and Embase (1 January 1980 to 2017 Week 12)

We used two different search strategies on MEDLINE and Embase (OvidSP) - these are given below.

Search strategy 1:

1. Economics, Pharmaceutical/ or Economics, Medical/ or Economics/ or Economics, Hospital/ or economics.mp. or Economics, Nursing/
2. exp "costs and cost analysis"/
3. "Value of Life"/
4. exp "fees and charges"/
5. exp budgets/
6. budget*.ti,ab.
7. cost*.ti.
8. (economic* or pharmaco?economic*).ti.
9. (price* or pricing*).ti,ab.
10. (cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
11. (financ* or fee or fees).ti,ab.
12. (value adj2 (money or monetary)).ti,ab.
13. ((energy or oxygen) adj cost).ti,ab.
14. (metabolic adj cost).ti,ab.
15. ((energy or oxygen) adj expenditure).ti,ab.
16. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
17. exp Urinary Incontinence/
18. ((stress* or mix* or urg* or urin*) adj3 incontinen*).tw.
19. Urodynamics/ or Urinary Incontinence, Stress/ or Urinary Incontinence/ or Suburethral Slings/ or mixed incontinence.mp. or Urinary Bladder/ or Urinary Incontinence, Urge/
20. 17 or 18 or 19
21. anterior vaginal repair*.tw.
22. 16 and 20 and 21
23. anterior colporrhaphy*.tw.
24. 21 or 23
25. 16 and 20 and 23
26. bladder neck needle suspension\$.tw.

27. 16 and 20
28. 26 and 27
29. open abdominal retropubic colposuspension*.tw.
30. retropubic colposuspension*.tw.
31. burch colposuspension*.tw.
32. 29 or 30 or 31
33. 27 and 32
34. laparoscopic retropubic colposuspension*.tw.
35. laparoscopic colposuspension*.tw.
36. 34 or 35
37. 27 and 36
38. traditional suburethral retropubic sling procedure\$.tw.
39. traditional sling procedure\$.tw.
40. suburethral retropubic sling procedure\$.tw.
41. retropubic sling procedure\$.tw.
42. traditional suburethral sling*.tw.
43. Suburethral Slings/ or Urinary Incontinence, Stress/ or Urologic Surgical Procedures/
44. 27 and 43
45. remove duplicates from 44

Search strategy 2:

1. economics.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
2. value of life.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
3. exp "costs and cost analysis"/
4. exp economics, hospital/
5. exp economics, medical/
6. economics, nursing.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
7. economics, pharmaceutical.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
8. exp "fees and charges"/
9. exp budgets/
10. budget*.ti,ab.
11. cost*.ti.
12. (economic* or pharmaco?economic*).ti.
13. (price* or pricing*).ti,ab.
14. (cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
15. (financ* or fee or fees).ti,ab.

16. (value adj2 (money or monetary)).ti,ab.
17. or/1-16
18. economics.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
19. value of life.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
20. exp "costs and cost analysis"/
21. exp economics, hospital/
22. exp economics, medical/
23. economics, nursing.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
24. economics, pharmaceutical.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, sy, tn, dm, mf, dv, kw, fs]
25. exp "fees and charges"/
26. exp budgets/
27. budget*.ti,ab.
28. cost*.ti.
29. (economic* or pharmaco?economic*).ti.
30. (price* or pricing*).ti,ab.
31. (cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
32. (financ* or fee or fees).ti,ab.
33. (value adj2 (money or monetary)).ti,ab.
34. 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33
35. ((energy or oxygen) adj cost).ti,ab.
36. (metabolic adj cost).ti,ab.
37. ((energy or oxygen) adj expenditure).ti,ab.
38. 34 or 35 or 36 or 37
39. urinary incontinence.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
40. ((stress\$ or mix\$ or urg\$ or urin\$) adj3 incontinen\$).tw.
41. URINARY INCONTINENCE, STRESS.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
42. stress urinary incontinence*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
43. 39 or 40 or 41 or 42
44. intervention surgery*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
45. colporrhaphy.tw.
46. Bologna procedure*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
47. Kelly-Kennedy.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
48. Marion Kelly.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
49. Diaphragmplasty.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
50. Vaginal urethrocystopexy.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]

51. Cystocele repair.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
52. Kelly plication.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
53. anterior vaginal repair\$.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
54. anterior colporrhaphy.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
55. 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54
56. 38 and 43 and 55
57. remove duplicates from 56
58. Bladder neck needle suspension\$.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
59. 38 and 43 and 58
60. burch colposuspension.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
61. open abdominal retropubic colposuspension.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
62. Paravaginal defect repair.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
63. Marshall-Marchetti-Krantz.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
64. abdominal burch.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
65. abdominal colposuspension.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
66. endopelvic Fascia Plication.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
67. 60 or 61 or 62 or 63 or 64 or 65 or 66
68. 38 and 43
69. 67 and 68
70. laparoscopic retropubic colposuspension.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
71. laparoscopic colposuspension.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
72. retropubic colposuspension.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
73. 70 or 71 or 72
74. 68 and 73
75. remove duplicates from 74
76. suburethral sling.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
77. abdominal sling.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
78. traditional sling procedure\$.tw.
79. suburethral sling procedure.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
80. 76 or 77 or 78 or 79
81. 68 and 80
82. remove duplicates from 81
83. mid\$urethral sling.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
84. retropubic sling procedure\$.tw.
85. transobturator sling procedure\$.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]

86. 83 or 84 or 85
87. remove duplicates from 86
88. 68 and 87
89. TVT-Secur.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
90. mini-arc.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
91. ajust.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
92. needleless.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
93. solyx.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
94. single\$incision sling\$.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
95. miniarc.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
96. mini\$slings.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
97. Ophira.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
98. Tissue Fixation System.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
99. 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97 or 98
100. 68 and 99
101. remove duplicates from 100
102. ((urethra\$ or periurethra\$ or transurethra\$) adj3 (agent\$ or bulk\$ or injection\$ or injectable\$)).tw.
103. injection therapy.tw.
104. injectable\$.tw.
105. (injectable\$ adj2 agent\$).tw.
106. (bulk\$ adj3 agent\$).tw.
107. Peri\$urethral injection\$.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
108. Autologous fat.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
109. Macroplastique.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
110. Calcium hydroxylapatite.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
111. Hyaluronic acid with dextranomer.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
112. Porcine dermal implant.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
113. Ethylene vinyl alcohol copolymer.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
114. Silicon particles.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, eu, pm, sy, tn, dm, mf, dv, kw, fs]
115. 102 or 103 or 104 or 105 or 106 or 107 or 108 or 109 or 110 or 111 or 112 or 113 or 114
116. 68 and 115
117. remove duplicates from 116

WHAT'S NEW

Date	Event	Description
10 July 2017	New citation required but conclusions have not changed	Brief economic commentary (BEC) added. Economics-related sections revised.
10 July 2017	Amended	Brief economic commentary (BEC) added. Economics-related sections revised: the Abstract, Plain language summary, Background, Methods (outcomes, search methods), and Discussion were amended. Appendix added with details of search strategies for BECs.

HISTORY

Protocol first published: Issue 2, 2002

Review first published: Issue 2, 2002

Date	Event	Description
16 December 2014	New search has been performed	New search performed.
16 December 2014	New citation required but conclusions have not changed	We did not identify any new reports of trials. Bladder neck needle suspension is an old procedure. The review is classified as a stable review.
7 September 2009	Review declared as stable	Old procedure, no new trials.
12 May 2008	New search has been performed	Minor update, no new studies found to add.
26 March 2008	Amended	Converted to new review format.
16 December 2005	New search has been performed	Minor update, Issue 2 2006.
19 February 2004	New citation required and conclusions have changed	Substantive amendment, Issue 2 2004.

CONTRIBUTIONS OF AUTHORS

CG and KC wrote the original protocol, selected trials, extracted data separately, interpreted the results and wrote the review.

For the July 2017 addition of the BEC to this review: Atefeh Mashayekhi was responsible for the entire BEC-related work on this review, i.e. she ran the search for studies, screened the search results, extracted data from relevant studies, revised any existing economics-related text, added the BECs-related text, and responded to any peer referee comments. All authors had the opportunity to comment on the revised review.

DECLARATIONS OF INTEREST

Cathryn MA Glazener: None known

Kevin Cooper: None known

Atefeh Mashayekhi: This project, to add Brief Economic Commentaries to our 'Surgery for UI in women' reviews, was supported by the National Institute for Health Research (NIHR), via the Cochrane Review Incentive Scheme 2016, to the Cochrane Incontinence Group. The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Systematic Reviews Programme, NIHR, NHS or the Department of Health.

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Internal sources

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- National Institute for Health Research, UK.

This project, to add Brief Economic Commentaries to our surgery for UI in women reviews, was supported by the National Institute for Health Research (NIHR), via the Cochrane Review Incentive Scheme 2016, to the Cochrane Incontinence Group. The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Systematic Reviews Programme, NIHR, NHS or the Department of Health.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

July 2017 update: We have added Brief Economic Commentaries (BECs) to all of our 'Surgery for UI in women' Cochrane Reviews. We have revised the economic elements throughout the review; if incorrect, we have stripped them out. The previously used surrogate economic outcomes such as operation time and length of stay have been redefined as 'Surgical outcomes'. We have added new economics-related text. This involved revisions to the Background section, Methods section, e.g. search section referring to added Appendix, Discussion section, Abstract and Plain Language Summary. We have added an appendix with details of the economics searches. The Conclusions section of the review has not changed. The rest of the review has not changed.

NOTES

Old procedure; no new trials.

INDEX TERMS

Medical Subject Headings (MeSH)

*Needles; *Suture Techniques; Randomized Controlled Trials as Topic; Recurrence; Urethra [*surgery]; Urinary Bladder [*surgery]; Urinary Incontinence, Stress [*surgery]; Urologic Surgical Procedures [methods]; Vagina [surgery]

MeSH check words

Female; Humans