Surgical approach to hysterectomy for benign gynaecological disease (Review)

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[Intervention Review]

Surgical approach to hysterectomy for benign gynaecological disease

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ABSTRACT

Background

There are three approaches to hysterectomy for benign disease - abdominal hysterectomy (AH), vaginal hysterectomy (VH) and laparoscopic hysterectomy (LH). Laparoscopic hysterectomy has three further subdivisions - laparoscopic assisted vaginal hysterectomy (LAVH) where a vaginal hysterectomy is assisted by laparoscopic procedures that do not include uterine artery ligation, laparoscopic hysterectomy (which we will abbreviate to LH(a)) where the laparoscopic procedures include uterine artery ligation, and total laparoscopic hysterectomy (TLH) where there is no vaginal component and the vaginal vault is sutured laparoscopically.

Objectives

To assess the most appropriate surgical approach to hysterectomy.

Search strategy

We searched the Cochrane Menstrual Disorders & Subfertility Group's Specialised Register of controlled trials (searched 23 March 2004), CENTRAL (*The Cochrane Library* Issue 1, 2004), MEDLINE (1966 to Mar 2004), EMBASE (1985 to Mar 2004), Biological Abstracts (1968 to Mar 2004), the National Research Register and relevant citation lists.

Selection criteria

Only randomised trials comparing one surgical approach to hysterectomy with another were included.

Data collection and analysis

Twenty-seven trials that included 3643 participants were included. Independent selection of trials and data extraction were employed following Cochrane guidelines.

Main results

The benefits of VH versus AH were shorter duration of hospital stay (WMD 1.0 day, 95%CI 0.7 to 1.2 days), speedier return to normal activities (WMD 9.5 days, 95%CI 6.4 to 12.6 days), fewer unspecified infections or febrile episodes (OR 0.42, 95%CI 0.21 to 0.83). The benefits of LH versus AH were lower intraoperative bloodloss (WMD 45.3 mls, 95%CI 17.9 to 72.7 mls) and a smaller drop in haemoglobin level (WMD 0.55g/L, 95%CI 0.28 to 0.82g/L), shorter duration of hospital stay (WMD 2.0 days, 95%CI 1.9 to 2.2 days), speedier return to normal activities (WMD 13.6 days, 95%CI 11.8 to 15.4 days), fewer wound or abdominal wall infections (OR 0.32, 95%CI 0.12 to 0.85), fewer unspecified infections or febrile episodes (OR 0.65, 95%CI 0.49 to 0.87), at the cost of longer operating time (WMD 10.6 minutes, 95%CI 7.4 to 13.8 minutes) and more urinary tract (bladder or ureter) injuries (OR 2.61, 95%CI 1.22 to 5.60). There was no evidence of benefits of LH versus VH and the operating time was increased (WMD 41.5 minutes, 95%CI 33.7 to 49.4 minutes). There was no evidence of benefits of LH(a) versus LAVH and the operating time was increased for LH(a) (WMD 25.3 minutes, 95%CI 10.0 to 40.6 minutes). There was statistical heterogeneity in many of the outcome measures when randomised trials were pooled for meta-analysis. No other statistically significant differences were found. However, for some important outcomes, the analyses were underpowered to detect important differences, or they were simply not reported in trials. Data were notably absent for many important long-term outcome measures.

Authors' conclusions

Significantly improved outcomes suggest VH should be performed in preference to AH where possible. Where VH is not possible, LH may avoid the need for AH, however the length of the surgery increases as the extent of the surgery performed laparoscopically increases, particularly when the uterine arteries are divided laparoscopically and laparoscopic approaches require greater surgical expertise. The surgical approach to hysterectomy should be decided by a woman in discussion with her surgeon in light of the relative benefits and hazards. Further research is required with full reporting of all relevant outcomes, particularly important long-term outcomes, in large RCTs, to minimise the possibility of reporting bias. Further research is also required to define the role of the newer approaches to hysterectomy such as TLH.

PLAIN LANGUAGE SUMMARY

Surgical approach to hysterectomy for benign gynaecological disease

Vaginal hysterectomy should be performed in preference to abdominal hysterectomy where possible. Abdominal hysterectomy involves removal of the uterus through a large incision on the lower abdomen; vaginal hysterectomy involves removal of the uterus via the vagina, with no abdominal incision; laparoscopic hysterectomy involves 'keyhole surgery' small incisions on the abdomen and the uterus is removed with surgery undertaken with the aid of a surgical telescope called a laparoscope inserted through the umbilicus (belly button), often in conjunction with vaginal surgery. Laparoscopic hysterectomy may be further subdivided depending on the extent of the surgery performed laparoscopically compared to that performed vaginally. This review found that vaginal hysterectomy meant a shorter stay in hospital, quicker return to normal activities and fewer infections and episodes of raised temperature after surgery compared to abdominal hysterectomy. Laparoscopic hysterectomy meant were less blood loss and a smaller drop in blood count, a shorter stay in hospital, quicker return to normal activities, fewer wound infections and episodes of raised temperature after surgery compared to abdominal hysterectomy, but laparoscopic hysterectomies are longer operations and have a greater risk of damaging the bladder or ureter (the tube leading to the bladder from the kidney). No benefits of laparoscopic versus vaginal hysterectomy were found and laparoscopic hysterectomies are longer operations. The authors concluded that vaginal hysterectomy should be performed in preference to abdominal hysterectomy where possible; where vaginal hysterectomy is not possible, a laparoscopic approach may avoid the need for an abdominal hysterectomy. More research is needed.

BACKGROUND

Hysterectomy is the surgical removal of the uterus. The first reported elective hysterectomy was performed through a vaginal ap-

proach by Conrad Langenbeck in 1813. The first elective abdominal hysterectomy, a sub-total operation (where the cervix was conserved), was performed by Charles Clay of Manchester in 1863 (Sutton 1997). These approaches remained the only two options until the latter part of the 20th century. The first laparoscopic-assisted vaginal hysterectomy was performed by Harry Reich in 1989 (Reich 1989). He also reported the first total laparoscopic hysterectomy in 1993. The approaches to hysterectomy may be broadly categorised into three: abdominal hysterectomy (AH); vaginal hysterectomy (VH); laparoscopic hysterectomy where at least some of the operation is conducted laparoscopically (which we will abbreviate to LH) (Garry 1994).

The abdominal approach (AH) has traditionally been the surgical approach for gynaecological malignancy, when other pelvic pathology is present such as endometriosis or adhesions, and in the context of an enlarged uterus. It remains the 'fallback option' if the uterus cannot be removed by another approach.

The vaginal approach (VH) was originally used only for prolapse, but has become more widely used for menstrual abnormalities such as dysfunctional uterine bleeding (DUB) when the uterus is fairly normal size. Compared to AH, VH was (and still is) regarded as less invasive and seemed to have the advantages of fewer blood transfusions, less febrile morbidity (fever) and less risk of injury to the ureter, but the disadvantages of more bleeding complications and greater risk of bladder injury (Harris 1996).

The term 'laparoscopic hysterectomy' usually refers to a hysterectomy where at least part of the operation is undertaken laparoscopically (Garry 1994) and these approaches require greater surgical expertise. The proportion of hysterectomies performed by LH has gradually increased and, although the surgery tends to take longer, its proponents have argued that the main advantages are the possibility to diagnose and treat other pelvic diseases such as endometriosis, to carry out adnexal surgery including the removal of the ovaries, the ability to secure thorough intraperitoneal haemostasis (direct laparoscopic vision enables careful sealing of bleeding vessels at the end of the procedure) and a more rapid recovery time from surgery compared to AH (Garry 1998). More recently, three sub-categorisations of LH have been described (Reich 2003) as follows.

(i) Laparoscopic assisted vaginal hysterectomy (LAVH) is where part of the hysterectomy is performed by laparoscopic surgery and part vaginally, but the laparoscopic component of the operation does not involve division of the uterine vessels.

(ii) Laparoscopic hysterectomy (which we will abbreviate to LH(a)) is where the uterine vessels are ligated laparoscopically but part of the operation is performed vaginally.

(iii) Total laparoscopic hysterectomy (TLH) is where the entire operation (including suturing of the vaginal vault) is performed laparoscopically and there is no vaginal component. This operation requires the highest degree of surgical skill and currently only a very small proportion of gynaecologists are able to perform this type of surgery. It has been unclear whether TLH offers any benefit over other forms of hysterectomy.

A total hysterectomy is the removal of the entire uterus including the cervix. When the cervix is not removed, this is known as a sub-total or supra-cervical hysterectomy. Sub-total hysterectomies are most easily performed abdominally or laparoscopically, although it is possible to conserve the cervix in a VH or LAVH.

In common with the overall hysterectomy rate, the proportion of hysterectomies currently being performed by each of the above approaches varies markedly across countries, within the same country and even between individual surgeons working within the same unit. Women's expectations and individual surgeons' training and experience are factors underlying this. Even though VH has been widely considered to be the operation of choice for dysfunctional uterine bleeding (DUB), the VALUE Study showed that 74% of the hysterectomies performed in 1995 for this indication in the UK were AHs (Hall 1998). The surgical approach taken at hysterectomy continues to depend upon the experience and biases of the surgeon (Johns 1995). It was interesting to note in 1998 that there was not a single randomised controlled trial (RCT) comparing AH versus VH (Garry 1998). The introduction of the newer approaches to hysterectomy (LAVH, LH(a) and TLH) has stimulated a much greater interest in the proper scientific evaluation of all forms of hysterectomy.

Apart from the surgical approach to hysterectomy, other aspects of the surgical technique may have an effect on the outcome of surgery. Examples of this include total versus subtotal (where the cervix is not removed) hysterectomy; Doderlein VH or LAVH versus standard VH or LAVH; techniques to support the vaginal vault; bilateral elective oophorectomy versus ovarian conservation; other strategies, used mainly by those conducting laparoscopic surgery with the aim of reducing the likelihood of complications, including the use of vaginal delineators, rectal probes and illuminated ureteric stents. These other aspects will not be within the scope of this review (other than for assessing trial quality) which will focus simply on benefits and harms of the different surgical approaches.

OBJECTIVES

The aim of this review was to assess the most beneficial and least harmful surgical approach to hysterectomy, when considering abdominal hysterectomy (AH), vaginal hysterectomy (VH), laparoscopic hysterectomy (LH) for women with benign gynaecological conditions.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs) where one surgical approach to hysterectomy is compared with another.

Types of participants

Women undergoing hysterectomy for benign disease (including uterine fibroids).
Exclusions - women with gynaecological cancer. Where trials included women with benign and women with malignant disease, authors would have been requested for a breakdown in order to include only women with benign disease and trials would have been be excluded if this information was not forthcoming; in the event there were no such trials.

Types of interventions

Surgical approach to removal of the uterus - where at least one approach is compared with another from, for example, AH, VH and LH. The distinction between the sub-categories of LH was made on whether ligation of the uterine vessels was undertaken laparoscopically and whether suturing of the vaginal vault was undertaken vaginally (see Table 1). Thus LH was further sub-divided in the analysis into LAVH (where the laparoscopic component did not involve ligation of the uterine vessels), LH(a) (where the uterine vessels were ligated laparoscopically, but there was still some vaginal component), TLH (where the entire hysterectomy was completed laparoscopically with no vaginal component) and non-categorisable LH (where there was insufficient information or the types of LH were too heterogeneous to otherwise sub-categorise). There are two other classifications of LH (Richardson 1995; Nezhat 1995) and these are summarised in Table 2 and Table 3.

Table 1. Sub-categorisation of laparoscopic hysterectomy

Type of LH	LH versus AH RCTs	LH versus VH RCTs
LAVH	Ferrari 2000	Ottosen 2000
	Kunz 1996	
	Marana 1999	
	Ottosen 2000	
	Raju 1994b	

Table 1. Sub-categorisation of laparoscopic hysterectomy (*Continued*)

	Tsai 2003	
LH(a)	Ellstrom 1998	Darai 2001
	Falcone 1999	Hwang 2002
	Harkki-Siren 2000	Soriano 2001
	Hwang 2000	Summitt 1992
	Langebrekke 1998	
	Olsson 1996	
	Schutz 2002	
	Seracchiolo 2002	
	Summitt 1998	
	Yuen 1998	
TLH	Perino 1999	Ribiero 2003
	Ribiero 2003	
Non-categorisable LH	Garry 2004	Garry 2004
	Lumsden 2000	Richardson 1998

Table 2. Staging of laparoscopic hysterectomy - Richardson 1995

Stage	Laparoscopic content
0	Laparoscopy done but no laparoscopic procedure before vaginal hysterectomy
1	Procedure includes laparoscopic adhesiolysis and/or excision of endometriosis
2	Either or both adnexae freed laparoscopically
3	Bladder dissected from the uterus laparoscopically
4	Uterine artery transected laparoscopically
5	Anterior and/or posterior colpotomy or entire uterus freed laparoscopically

Table 3. Steps of laparoscopic hysterectomy - Nezhat 1995

Step	Laparoscopic content
1	Severing the round ligaments and dissection of the upper portion of the broad ligament
2	Severing the tubo-uterine junction and the utero-ovarian ligament if the adnexa are to be preserved, or severing the infundibulopelvic ligaments
3	Severing the uterine vessels
4	Preparation of the bladder flap
5	Severing the cardinal uterosacral ligaments complex
6	Performing anterior and posterior culdotomy and separation of the cervix
7	Closure of the vaginal cuff

(The reason for choosing to sub-categorise is that many surgeons carrying out LH operations are practitioners of one or the other operation and require information about their perspective on the surgery. Clinicians often do not regard the three options for the approach to LH as easily interchangeable.)

Sub-total versus total hysterectomy is the scope of another Cochrane review and trials making this comparison will be excluded from this review. Trials evaluating different surgical approaches to hysterectomy will also be excluded. However, if a minority of the trial participants had a sub-total hysterectomy, but the comparison was made between any of the three approaches outlined above, the trial would be included.

Types of outcome measures

Not all clinical outcome data are of equal importance when assessing the worth of a technique. It is not possible to define some of these outcomes as 'primary' without unduly imposing reviewer bias on the review, since the effect of certain approaches for many of the outcome measures is predictable. For example, LH has the reputation of being associated with a longer operating time (a detrimental effect of this approach), but a shorter hospital stay (a beneficial effect).

The outcome measures were therefore considered as follows:

(1) Operating time

(2) Immediate complications of surgery:

(a) Urinary tract (bladder or ureter) injury

(b) Bladder injury

(c) Ureter injury

(d) Bowel injury

(e) Vascular injury

(f) Bleeding

(g) Unintended laparotomy for approaches not involving routine laparotomy

(3) Short-term outcomes:

(a) Pain

(b) Sequelae of bleeding:

(i) Haemoglobin/haematocrit drop

(ii) Transfusion

(iii) Pelvic haematoma

(c) Infection:

(i) Vaginal cuff

(ii) Abdominal wall or wound

(iii) Urinary tract infection (UTI)

(iv) Febrile episodes or unspecified infection

(d) Thrombo-embolism

(e) Perioperative mortality

(4) Recovery from surgery:

(a) Length of hospital stay

(b) Return to normal activities

(5) Long-term outcomes:

(a) Fistula

(b) Pelvi-abdominal pain

(c) Urinary dysfunction

(d) Bowel dysfunction

(e) Pelvic floor condition (prolapse)

(f) Sexual dysfunction

(g) Satisfaction/quality of life

(6) Data on the cost of treatment were sought but it was intended to describe these data qualitatively and not to include in the meta-analysis, since 'cost' could be defined differently in different studies depending upon whether they incorporate the cost of sequelae. Different health-care systems could produce markedly different results.

Search methods for identification of studies

(1) We searched the Cochrane Menstrual Disorders and Subfertility Group (MDSG) Trials Register (23 March 2004), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane*

Library Issue 1, 2004), MEDLINE (January 1966 to March 2004), EMBASE (January 1985 to March 2004), and Biological Abstracts (1969 to March 2004).

MEDLINE was searched using the following strategy:

1 randomised controlled trial.pt.
2 controlled clinical trial.pt.
3 Randomized controlled trials/
4 random allocation/
5 double-blind method/
6 single-blind method/
7 or/1-6
8 clinical trial.pt.
9 exp clinical trials/
10 (clin$ adj25 trial$).ti,ab,sh.
11 ((singl$ or doubl$ or tripl$ or trebl$) adj25 (blind$ or mask$)).ti,ab,sh.
12 placebos/
13 placebo$.ti,ab,sh.
14 random$.ti,ab,sh.
15 Research design/
16 or/8-15
17 animal/ not (human/ and animal/)
18 7 or 16
19 18 not 17
20 exp HYSTERECTOMY/
21 Hysterectom$.tw.
22 20 or 21
23 abdom$.tw.
24 vaginal$.tw.
25 (Lap$ adj Assist$).tw.
26 (Lap$ adj Vaginal$).tw.
27 LAVH.tw.
28 LH.tw.
29 or/23-28
30 22 and 29
31 route$.tw.
32 technique$.tw.
33 approach$.tw.
34 or/31-33
35 30 and 34
36 19 and 35

EMBASE was searched using the following strategy:

1 Controlled study/ or randomized controlled trial/
2 double blind procedure/
3 single blind procedure/
4 crossover procedure/
5 drug comparison/
6 placebo/
7 random$.ti,ab,hw,tn,mf.
8 latin square.ti,ab,hw,tn,mf.
9 crossover.ti,ab,hw,tn,mf.
10 cross-over.ti,ab,hw,tn,mf.
11 placebo$.ti,ab,hw,tn,mf.
12 ((doubl$ or singl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).ti,ab,hw,tn,mf.
13 (comparative adj5 trial$).ti,ab,hw,tn,mf.
14 (clinical adj5 trial$).ti,ab,hw,tn,mf.
15 or/1-14
16 nonhuman/
17 animal/ not (human/ and animal/)
18 or/16-17
19 15 not 18
20 exp HYSTERECTOMY/
21 hysterectom$.tw.
22 20 or 21
23 abdom$.tw.
24 vaginal$.tw.
25 (Lap$ adj Assist$).tw.
26 (Lap$ adj Vaginal$).tw.
27 LAVH.tw.
28 LH.tw.
29 or/23-28
30 exp Surgical Technique/
31 route$.tw.
32 technique$.tw.
33 approach$.tw.
34 or/30-33
35 22 and 29
36 34 and 35
37 19 and 36

The Cochrane Central Register of Controlled Trials (CENTRAL) was searched in all fields using the following key words:

1. Hysterectomy
2. Abdominal
3. Vaginal
4. Laparoscopic assisted
5. Laparo-vaginal
6. Laparoscopic
7. 1 and 2 or 3 or 4 or 5 or 6

(2) The National Research Register (NRR), a register of ongoing and recently completed research projects funded by, or of interest to, the United Kingdom's National Health Service, as well as entries from the Medical Research Council's Clinical Trials Register, and details on reviews in progress collected by the NHS Centre for Reviews and Dissemination, were searched for any trials with the following keywords:

1. Hysterectomy
2. Abdominal
3. Vaginal
4. Laparoscopic assisted
5. Laparo-vaginal
6. Laparoscopic
7. 1 and 2 or 3 or 4 or 5 or 6

(3) The Clinical Trials register, a registry of federally and privately

funded US clinical trials was also searched for the same keywords. (4) The citation lists of relevant publications, review articles, abstracts of scientific meetings and included studies were also searched.

Data collection and analysis

Selection of trials

The selection of trials for inclusion in the review was performed by at least two of four reviewers (ET, EC, AL and NJ) after employing the search strategy described previously. Differences of opinion were resolved by consensus after consultation with one or two other reviewers.

Trials were excluded from the review if they made comparisons other than those specified above and these were detailed in the table of characteristics of excluded trials.

Quality assessment

Included studies were assessed independently by two reviewers (ET and AL) for the following quality criteria and methodological details. This information is presented in a table describing the included studies and provides a context for assessing the reliability of results. All RCTs were included in the review, but sensitivity analyses were planned to assess the stability of results with respect to where trials compared a surgical approach performed by one surgeon with another surgical approach performed by a second surgeon (which cannot tease out the 'surgeon effect' from the effect of the surgical approach).

(A) Trial characteristics
(a) Method of randomisation, in order of preference, as follows:
(i) third party randomisation, for example by pharmacy, computer or telephone
(ii) true randomisation by carer, for example by opaque numbered envelope or register
(iii) not stated
(b) Study design:
(i) blinding
(ii) duration of follow-up
(iii) type of follow-up
(c) Size of study:
(i) number of women recruited
(ii) number of women randomised
(iii) number of women excluded
(iv) number of women withdrawn and lost to follow-up
(v) number of women analysed
(d) Study setting
(i) Single-centre or multicentre
(ii) Location
(iii) Timing and duration
(iv) Source of funding stated or not
(e) Analyses
(i) Whether a power calculation was performed and adhered to
(ii) Whether 'intention to treat' analysis was performed by authors, possible from data but not performed by authors, not possible or uncertain
(f) Criteria for hysterectomy
(i) Indications specified
(ii) Data broken down by indications for hysterectomy
(B) Characteristics of the study participants
(a) Baseline characteristics
(i) Age
(ii) Parity
(iii) Indication for hysterectomy
(iv) Investigative work-up, for example pelvic ultrasound scan, endometrial sampling
(v) Previous treatments
(vi) Exclusion criteria
(b) Treatment characteristics
(i) Pre-operative preparation, for example pre-operative medical treatment
(ii) Level of training of surgeons
(C) Interventions
(a) Total or sub-total hysterectomy
(b) Use of technique to support the vaginal vault
(c) Proportion undergoing bilateral elective oophorectomy versus ovarian conservation
(d) Other strategies to reduce the likelihood of complications
(e) Absence of co-interventions in treatment and control groups
(f) If the trial compares a surgical approach performed by one (group of) surgeon(s) with another surgical approach performed by a second (group of) surgeon(s).
(D) Outcomes
(1) Operating time
(2) Immediate complications of surgery:
(a) Surgical injury
(i) Urinary tract (bladder or ureter) injury
(ii) Bladder injury
(iii) Ureter injury
(iv) Bowel injury
(v) Vascular injury
(f) Bleeding
(g) Unintended laparotomy for approaches not involving routine laparotomy
(3) Short-term outcomes:
(a) Pain
(b) Sequelae of bleeding:
(i) Haemoglobin/haematocrit drop
(ii) Transfusion
(iii) Pelvic haematoma
(c) Infection:
(i) Vaginal cuff
(ii) Abdominal wall or wound
(iii) Urinary tract infection (UTI)
(iv) Febrile episodes or unspecified infection

(d) Thrombo-embolism
(e) Perioperative mortality

(4) Recovery from surgery:
(a) Length of hospital stay
(b) Return to normal activities
(5) Long-term outcomes:
(a) Fistula
(b) Pelvi-abdominal pain
(c) Urinary dysfunction
(d) Bowel dysfunction
(e) Pelvic floor condition (prolapse)
(f) Sexual dysfunction
(g) Satisfaction/quality of life
(6) Cost

Data Management

All data were extracted independently by at least two reviewers (from ET, EC, AL and NJ) and differences of opinion were resolved by consensus after consultation with another reviewer. Additional information on trial methodology or actual original trial data was sought from the corresponding author of trials, in which the eligibility criteria were apparently met, when aspects of methodology were unclear, or where data were in a form unsuitable for meta-analysis. Reminder correspondence was sent if a reply was not received within four weeks.

Statistical Analysis

Statistical analysis was performed in accordance with the guidelines for statistical analysis developed by the Menstrual Disorders and Subfertility Group. Statistical heterogeneity between the results of different studies was examined by inspecting the scatter in the data points on the graphs and the overlap in their confidence intervals and, more formally, by checking the results of chi^2 tests and I^2 tests. The outcomes were pooled statistically where no clinical heterogeneity was apparent. A fixed-effect model was used where statistical heterogeneity was absent. Where statistical heterogeneity was apparent after pooling of data, this was noted and statistically significant results interpreted cautiously after further analysis using a random-effects statistical model.

Dichotomous data were expressed as an odds ratio with 95% confidence intervals and combined for meta-analysis with RevMan software using the Peto-modified Mantel-Haenszel method. An increase in the odds of a particular outcome is displayed graphically in the meta-analyses to the right of the centre-line and a decrease in the odds of an outcome is displayed graphically to the left of the centre-line.

Continuous data were combined for meta-analysis with RevMan software using the weighted mean difference (WMD) with 95% confidence interval.

It was planned to perform sensitivity analyses to examine the stability of the results in relation to the following factors:

- exclusion of trials comparing a surgical approach performed by one surgeon (or group of surgeons) with another surgical approach performed by a second (group of) surgeon(s);
- the effect of analysing studies of LH(a) sub-categories compared to studies of LH(a) pooled as an overall category.

A search will be conducted for trials every two years and the review updated if new trials are found.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of studies awaiting assessment.

Forty-two trials were identified. Nine of these were initially identified as published abstracts from conference proceedings. The first authors of these studies were contacted in an attempt to extract details that were not reported: two studies were included (Darai 2001; Miskry 2003), three excluded (Møller 2001; Oscarson 2003; Park 2003) and four replies have not so far been received (Cucinella 2000; Davies 1998; Pabuccu 1996; Petrucco 1999). These four studies, along with a further study, in Swedish, that has been sent for translation but as yet has not been received (Hahlin 1994), have been transferred as the five 'Studies awaiting assessment' to the appropriate section of the review. Ten studies were excluded from the review; the reasons for their exclusion are listed in the 'Characteristics of excluded studies' table. The authors were able to extract data from the remaining 27 trials, of which two compared VH versus AH (Benassi 2002; Miskry 2003), 16 compared LH versus AH (including one LH-BSO versus AH-BSO (Raju 1994)); four compared LH versus VH (Darai 2001; Richardson 1995; Soriano 2001; Summitt 1992); one compared LAVH versus LH(a) (Long 2001); one compared both LH versus AH and LH versus VH (Garry 2004); three compared LH versus AH versus VH (Hwang 2002; Ottosen 2000; Ribiero 2003).

Participants

The 27 included trials contained 3,643 participants, the majority from the age range of 41 to 50 years. Twenty-one trials reported no dropouts. Two trials had participants withdraw pre-operatively: Falcone 1999 (4 out of 48) and Garry 2004 (34 out of 1380). In the Lumsden 2000 study, seven participants withdrew pre-operatively and case records were not available for three more. Two participants refused their assigned procedure in the Summitt 1998 study; in the Yuen 1998 study, four participants declined their assigned operation and a further two participants refused to participate post-operatively. In the Long 2001 trial, three women undergoing conversion to laparotomy, seven with incomplete records and three with combined procedures were excluded post-randomisation. A further 53 were excluded because they did not have indications of uterine fibroids or adenomyosis.

All of the included trials recruited women who needed a hysterectomy for benign causes; six studies specifically included women

who underwent hysterectomy for symptomatic uterine fibroids (Benassi 2002; Ferrari 2000; Hwang 2002; Long 2001; Ribiero 2003; Tsai 2003).

VH versus AH

Benassi 2002 specifically included women with symptomatic enlarged fibroid uteri and excluded women with prolapse, vaginal stenosis, neoplasia, previous pelvic surgery and those taking hormone treatments within 6 months prior to surgery. Miskry 2003 excluded women with uterine size greater than 14 weeks gestation, malignancy, adnexal pathology, reduced uterine mobility or reduced vaginal access and any woman requiring concomitant prolapse or incontinence surgery.

LH versus AH (including LH-BSO versus AH-BSO)

Eleven of the 16 studies that compared LH with AH specifically included participants who were scheduled for an abdominal hysterectomy or who had contraindications for a vaginal hysterectomy (Ellstrom 1998; Harkki-Siren 2000; Falcone 1999; Ferrari 2000; Lumsden 2000; Marana 1999; Olsson 1996; Seracchioli 2002; Summitt 1998; Tsai 2003; Yuen 1998). Contraindications to vaginal hysterectomy included the size of the uterus: greater than 14 weeks of pregnancy (Lumsden 2000; Seracchioli 2002), uterine volume greater than 200 ml (Ferrari 2000), greater than 300 g (Seracchioli 2002), greater than 280 g (Marana 1999) or 200 g (Schutz 2002); limited vaginal access (Ferrari 2000; Marana 1999); lack of uterine descent (Marana 1999); immobile uteri (Ferrari 2000); previous pelvic surgery or a history of pelvic inflammatory disease (Ferrari 2000; Marana 1999).

Eleven studies excluded participants according to their uterine size or width: uterine size greater than a 12-week pregnancy (Langebrekke 1996), greater than a 14-week pregnancy (Harkki-Siren 2000; Lumsden 2000; Perino 1999; Raju 1994), greater than a 16-week pregnancy (Marana 1999; Tsai 2003; Yuen 1998) and greater than an 18-week pregnancy (Summitt 1998). Ellstrom 1998 and Olsson 1996 excluded participants with a uterus width greater than 11 cm, whilst Harkki-Siren 2000 excluded women if the uterine width was greater than 10 cm.

Participants were excluded for various physiological/anatomical reasons: pubic arch of at least 90 degrees (Summitt 1998), uterine prolapse (Harkki-Siren 2000; Raju 1994; Seracchioli 2002), pelvic floor relaxation (Seracchioli 2002); immobile uteri (Ferrari 2000); and medical reasons: morbidly obese (Harkki-Siren 2000; Raju 1994), suspicious adnexal mass or malignant disease (Falcone 1999; Marana 1999; Langebrekke 1996; Seracchioli 2002; Summitt 1998), severe pelvic disease including adhesions and endometriosis (Ferrari 2000; Harkki-Siren 2000; Olsson 1996; Summitt 1998), concomitant incontinence procedure, pelvic reconstruction or colporrhaphy required (Falcone 1999;Summitt 1998) or if the participants had any serious diseases including cardiopulmonary disease, bleeding disorders etc (Harkki-Siren 2000; Langebrekke 1996; Seracchioli 2002; Summitt 1998).

LH versus VH

Two of the four studies that compared LH with VH included participants if their uterine size was larger than 280 g (Darai 2001; Soriano 2001). The remaining two studies excluded studies if their uterine size was greater than a 16-week pregnancy (Richardson 1995; Summitt 1992).

Exclusions for physiological/anatomical reasons: pubic arch of at least 90 degrees (Summitt 1992), narrow vagina (Darai 2001), immobile uteri (Darai 2001; Summitt 1992); and medical reasons: suspicious adnexal mass or malignant disease (Darai 2001; Richardson 1995; Soriano 2001), severe pelvic disease including adhesions and endometriosis (Richardson 1995; Soriano 2001), concomitant incontinence procedure, pelvic reconstruction or colporrhaphy required (Summitt 1992) or if the participants had any serious diseases including cardiopulmonary disease, bleeding disorders etc (Summitt 1992).

VH versus LH (vLH as it was called in the trial) and AH versus LH (aLH as it was called in the trial)

Garry 2004 included participants scheduled for hysterectomy for non-malignant conditions. The same exclusion criteria were used for both arms of the trial: a uterine mass greater than the size of a 12-week pregnancy, suspected malignant disease of the genital tract, uterine prolapse, serious medical illness precluding surgery, requirement for bladder or other pelvic support surgery.

LH versus AH versus VH

Two of the three trials (Hwang 2002; Ribiero 2003) specifically included those with uterine fibroids. Ottosen 2000 included participants with leiomyomas <15 cm in diameter; Hwang 2002 included women with a myoma diameter larger than 8 cm and the second myoma less than 5 cm or two myomata, both at least 6 cm in diameter but less than 8 cm (a maximum of three myomata); Ribiero 2003 included women with fibroids or adenomyosis. Ottosen 2000 excluded those with a uterine mass larger than 16 weeks of gestational size, previous dense adhesions, narrow vagina or inaccessible uterus. Hwang 2002 excluded those with indications of adenomyosis, uterine prolapse, chronic pelvic pain, dysfunctional uterine bleeding, cervical dysplasia or PID. Ribiero 2003 excluded women with uterine volume greater then 400 mls, those taking anti-inflammatories, and women with diabetes mellitus, coagulation disorders and autoimmune disease.

LAVH versus LH(a)

In Long 2001, participants were included if they had contraindications for vaginal hysterectomy (a uterine weight >280 g, previous pelvic surgery, PID, need for adnexectomy, lack of uterine descent and limited vaginal access). If their uterine volume was greater than a 16 week pregnancy (or weight greater than 700 g) they were excluded.

Interventions

Surgical procedures

LH versus AH

Twenty trials included a comparison of laparoscopic hysterectomy (LH) with abdominal hysterectomy (AH). These included four trials that randomised women to LH, AH and VH (Garry 2004;

Hwang 2002; Ottosen 2000; Ribiero 2003). Raju 1994 compared LH and bilateral salpingo-oophorectomy (LH-BSO) with AH-BSO. Ellstrom 1998 stratified the two randomised groups (LH and AH) into total and subtotal hysterectomies.

LH versus VH

Eight trials included a comparison of laparoscopic hysterectomy (LH) with vaginal hysterectomy (VH), including, again, the four trials randomising women to LH, AH and VH. Garry 2004 was a very large RCT comparing LH (called vLH in the trial) with VH and LH (called aLH in the trial) with AH - it was essentially two concurrent RCTs as part of the same study.

LAVH versus LH(a)

Long 2001 compared two types of laparoscopic hysterectomy, LAVH versus LH(a).

Although all the trials used variations of the terms "laparoscopic assisted vaginal hysterectomy" ('LAVH') or "laparoscopic hysterectomy", their definition varied according to what stages of the hysterectomy were completed laparoscopically and the point at which the operation continued vaginally. We included all trials with hysterectomies that had some laparoscopic component in a larger category LH. Using Richardson 1995's 'Staging of laparoscopic hysterectomy' table (see Additional Table 2) we were able to categorise 21 of the 24 included studies that involved LH according to the amount of laparoscopic content. We also sub-categorised these 21 trials involving LH as either LAVH, LH(a) or TLH, depending on the extent of the surgery performed laparoscopically and vaginally (see Additional Table 1). If any trial included women undergoing different Richardson LH stages in the LH arm, we arbitrarily categorised the stage firstly as the stage to which the surgeons had intended to go, secondly, if that information was not available, to the LH stage that most women underwent, or thirdly the most advanced LH stage that women underwent. According to Richardson staging, one trial involved stage zero LH (Ottosen 2000), three trials were stage two (Kunz 1996; Marana 1999; Raju 1994), two trials were stage three (Ferrari 2000; Tsai 2003), eight trials were stage four where the uterine artery was transected laparoscopically (Darai 2001; Ellstrom 1998; Olsson 1996; Schutz 2002; Soriano 2001; Summitt 1992; Summitt 1998; Yuen 1998) and seven trials were stage five (Falcone 1999; Hwang 2002; Harkki-Siren 2000; Langebrekke 1996; Perino 1999; Ribiero 2003; Seracchioli 2002). There were three trials in which we were unable to sub-categorise the LH procedures and we described these as 'non-categorisable LH': Richardson 1995 had LHs of all stages from 0 to 5 and two trials (Garry 2004; Lumsden 2000) did not stipulate LH stages performed. In Long 2001, the LAVH treatment arm was a stage three whilst the LH(a) arm was a stage five. In two trials that used total laparoscopic hysterectomy (TLH) as an intervention (Perino 1999; Ribiero 2003), all of the surgical manipulation, including incision and suturing of the vaginal vault, was carried out laparoscopically, even though the uterus was actually removed transvaginally, Nezhat stage seven (Nezhat 1995).

Surgeons' experience

The surgeons' experience or level of training was reported in 16 of the trials. Ten of the trials used the authors of the trial or surgeons of senior registrar grade to perform all the operations. Five of these trials specified that the same group of surgeons performed operations for both interventions (Benassi 2002; Long 2001; Lumsden 2000; Hwang 2002; Seracchioli 2002). In three trials, surgeons for one intervention were different to those performing the other intervention: Olsson 1996 (LH carried out by two out of five surgeons of senior registrar grade, trained in LH; AH carried out by two out of ten surgeons of senior registrar grade, trained in AH); Langebrekke 1996 (LH performed exclusively by the two authors, AH performed by any skilled gynaecologist in the department); Raju 1994 (LAVH performed by one of the authors, AH by one of the authors or a surgeon of senior registrar grade). In Ottosen 2000,15 gynaecological surgeons with assistants performed the operations, their experience varied and there were cases of residents performing operations under supervision. In Schutz 2002, 71% of LH were performed by the attending physician and 29% by a resident under supervision and 40% of AH were performed by the attending physician and 60% by the resident under supervision. One trial (Summitt 1998) used only gynaecological residents to perform all the operations with the assistance of the attending physician. It is unlikely that any of the latter three trials used the same group of surgeons for both intervention groups. In three other trials it was unclear if the surgeons performing the operations were different: Darai 2001 (all experienced in laparoscopic and vaginal surgery but no mention of who performed each intervention); Perino 1999 (LH: team of three laparoscopic surgeons with experience of more than 100 LHs, no details provided for AH arm) and Falcone 1999 (one of the senior authors performed all the LH operations with the assistance of a pelvic surgery fellow or resident but no mention of the AH group). In four of the trials, surgeons of all grades and experience carried out the operations. In Garry 2004, each surgeon recruited to the trial had to have performed 25 of each procedure however cases could be used for teaching if the main assistant was the designated surgeon.

Antibiotic prophylaxis/Anticoagulant therapy

In 18 of the trials the use of antibiotic prophylaxis was reported. Thirteen trials prescribed the following antibiotics pre-operatively: Cefazoline 2 g IV (Darai 2001; Soriano 2001; Summitt 1992; Summitt 1998); Cephalosporine 2 g IV (Langebrekke 1996; Kunz 1996); Metronidazole 500 mg IV (Harkki-Siren 2000); Cephalosporine and metronidazole IV (Ellstrom 1998; Olsson 1996; Richardson 1995); Cefuroxime 1.5 g IV and metronidazole 1 g rectally (Ottosen 2000); Cefotaxime 2 g IV (Benassi 2002); Co-amoxiclav 1.2 g IV (Miskry 2003); Ampicillin 2 g (Seracchioli 2002) and Piperacillin 2 g IV (Lumsden 2000).

Long 2001 prescribed cefazolin 1 g IV pre and post-operatively. Raju 1994 gave Amoxillin clavulanate (Augmentin) bolus IV during and for seven days following the operation. Hwang 2002 prescribed cephalosporin 1 g every 8 hours combined with amino-

glycoside 80 mg every 12 hours for one day after surgery.
In Olssen 1996, antibiotics were used in the laparoscopic arm of the study but they were not routinely given for the abdominal hysterectomies.
The use of low molecular weight heparin was reported in six trials: three trials prescribed heparin pre-operatively (Benassi 2002; Darai 2001; Soriano 2001) and three post-operatively (Langebrekke 1996; Miskry 2003; Ottosen 2000).

Anaesthesia and post-operative medication

Eighteen trials specifically stated that all hysterectomies were completed under general anaesthesia (GA). In two trials, GA was used for all LHs but the choice of regional or general anaesthesia was left to the anaesthesiologists and patients for the AH or VH (Summitt 1992; Summitt 1998). In Ottoson 2000, 109 of the 120 included participants were operated on using GA, three had spinal blockade and 8 had spinal blockade in combination with epidural blockade. Benassi 2002 used GA for AH procedures, spinal anaesthetic for VH. Five trials did not report the anaesthetic technique used.
Fifteen trials reported on the type of post-operative pain relief given to participants. In six trials morphine was used, two via intramuscular morphine sulphate injections (Raju 1994; Soriano 2001); three via a programmable infusion pump (Ellstrom 1998; Falcone 1999; Yuen 1998) and in Olsson 1996 details of how the morphine was administered were not reported. In Hwang 2002 meperidine 50 mg IV was prescribed every four hours. Long 2001 administered lysine aspirin intravenously.
The use of oral or rectal analgesics was reported in 11 trials: Summitt 1992 and Summitt 1998 discharged participants with 16 tablets of acetaminophenoxycodone; Raju 1994 gave rectal diclofenac immediately after surgery, followed by coproxamol or codidramol; Ellstrom 1998 and Hwang 2002 prescribed paracetamol; Soriano 2001: 2 g propacetamol and 100 mg ketoprofen started 30 to 60 minutes before completion of the operation and then every six hours for 24 hours followed by acetaminophen (paracetamol); Falcone 1999: Oxycodone 5 to 10 mg every 4 to 6 hours as needed then 325 to 650 g acetaminophen (paracetamol) every 4 to 6 hours as needed; Kunz 1996 prescribed Tramadol hydrochloride (100 mg); Marana 1999 and Perino 1999:Ketorolac every six hours for the first 24 hours. The use of anti-emetic drugs was reported in three trials (Summitt 1992; Summitt 1998; Ellstrom 1998).

Outcomes

All of the trials assessed the operation times and intra- or post-operative complications. Lumsden 2000 and Garry 2004 split the complications into major and minor. The majority (22 trials) assessed blood loss or haemoglobin change. Ellstrom 1998 reported on the difference in erythrocyte volume fraction. Febrile morbidity was measured in eight trials, pulmonary function in one trial (Ellstrom 1998) and nine trials reported any operations that were converted to abdominal surgery (Darai 2001; Garry 2004; Marana 1999; Ottosen 2000; Richardson 1995; Seracchioli 2002; Soriano 2001; Summitt 1992; Summitt 1998).
Postoperative pain was assessed in 11 trials, with Ellstrom 1998 listing it as a primary outcome. Twenty-four trials assessed the length of post-operative hospital stay and nine included an analysis of costs. Recovery time or the time needed to return to normal activities/work was assessed in 12 trials. An assessment of health status was reported in six trials, two trials included sexual activity or body image in the analysis (Garry 2004; Long 2001).
The selective reporting of 'interesting' results must be emphasised as it is a concern that potentially jeopardises the reliability of conclusions both from the individual studies and from this review.

Risk of bias in included studies

Study design

All of the included trials had a parallel group design. Twenty of the trials were single centre studies (four from Italy; three each from Sweden and Taiwan; two each from the UK, USA and Germany; and one each from Brazil, Finland, France and Hong Kong). Of the seven multi-centre trials, three trials recruited from two centres (Darai 2001 based in France, Langebrekke 1996 based in Norway and Miskry 2003 based in the UK). Two trials recruited from three centres (Summitt 1998 based in the USA and Lumsden 2000 based in the UK). One trial from Italy (Marana 1999) recruited from four centres and a trial based in the UK with additional centres in South Africa (Garry 2004) recruited from 30 centres.

Randomisation and allocation concealment

Six studies randomised by computer and used sealed opaque envelopes for allocation concealment (Ferrari 2000; Hwang 2002; Miskry 2003; Ottosen 2000; Raju 1994; Summitt 1998). Two trials randomised by computer and used a telephone for allocation concealment (Garry 2004; Schutz 2002). Langebrekke 1996 used a table of random digits for randomisation and used sealed opaque envelopes for allocation of concealment. Nine trials used a computer generated randomisation code (Benassi 2002; Darai 2001; Falcone 1999; Lumsden 2000; Marana 1999; Seracchioli 2002; Soriano 2001; Summitt 1992; Tsai 2003; Yuen 1998) and one trial used a random numbers table (Richardson 1995) but none of these 10 trials reported whether allocation was concealed. Two trials used sealed opaque envelopes for allocation of treatment but they did not report the randomisation method (Harkki-Siren 2000; Olsson 1996). Five trials did not report the randomisation method or if it was concealed (Ellstrom 1998; Kunz 1996; Long 2001; Perino 1999; Ribiero 2003). The methodological quality of the Long 2001 trial was suspect. Participants were randomised to treatment groups before a large number (66) of them were excluded. Therefore the participants in each treatment group are not a true representation of the original randomised groups.
In 11 studies allocation concealment was adequate and graded A (according to Cochrane criteria). In 16 studies the methods to conceal randomisation were not reported and allocation concealment was graded B (unclear).

Blinding

Blinding was not reported by any of the trials and was unlikely.

Intention-to-treat

Twenty-one trials reported no dropouts. Six trials reported dropouts, ranging from a dropout rate of 2.5 to 12%. Table 4 lists the trials that reported dropouts with the dropout circumstances. Of the six RCTs reporting dropouts, two reported analysis by intention-to-treat (ITT), defined as all randomised women reported upon according to group of randomised allocation (Falcone 1999; Garry 2004). Four RCTs reporting dropouts did not report ITT analysis of all randomised participants (Long 2001; Lumsden 2000; Summitt 1998; Yuen 1998). In the Long 2001 trial, although reasons were given for 13 participants who were excluded, it was not clear why an additional 53 had been excluded. One further trial that had no dropouts did not analyse by ITT but according to treatment received that was different to treatment assigned in two cases - the operation was converted from LH to AH and these participants were analysed in the AH group (Tsai 2003).

Power calculations for sample size

Fifteen of the studies did not report that a power calculation was performed for sample size. The only trial to report a credible, prospective power calculation that sought realistic differences (using major complications as the primary outcome) was Garry 2004 and this was by far the largest included trial (n = 1380). The recruitment target was met in the LH versus AH arm, but not in the LH versus VH arm.

Table 4. Studies reporting dropouts

Trial	No. dropouts	Details
Falcone 1999	4 (1 LH; 3 AH)	Withdrew pre-operatively
Garry 2004	34 (23 LH (11 aLH; 12 vLH); 6 AH; 5 VH)	Withdrew pre-operatively
Long 2001	13	3 laparotomy conversions; 7 incomplete records; 3 combined procedures that were excluded pot-randomisation
Lumsden 2000	10	7 withdrew pre-operatively; 3 case reports not available
Summitt 1998	2	Refused assignment procedure
Yuen 1998	6	4 declined operation; 2 refused to participate post-operatively

Source of funding

Nine studies reported their sources of funding. Two of these studies received funding from pharmaceutical or surgical instrumentation companies: Summitt 1998 received all of its funding from US Surgical Corporation, USA and Harkki-Siren 2000 received a part of its funding from the Research Foundation of the Orion Corporation.

Effects of interventions

Meta-analysis results

Where outcomes for specific comparisons included in the meta-analysis are not mentioned below, no data were available from the included trials. For results that were not statistically significant, the summary statistics and confidence intervals have not been stated

in the text, but may be viewed on the meta-analysis graphs.

Operation time

Both trials in the meta-analysis of VH versus AH showed a significant difference, but in opposite directions, thus the results were not pooled. AH had a significantly shorter operation time than LH (WMD 10.6 minutes, 95% CI 7.4 to 13.8 minutes), although it was noteworthy that in the sub-category of trials where LAVH was compared with AH, LAVH operations were significantly shorter than AH (WMD 7.6 minutes , 95% CI 3.0 to 12.2 minutes). Statistical heterogeneity was present for operation time for LH versus AH (chi^2 p-value 0.00001, I^2 = 96.2%), but similar results were obtained with a random-effects model, other than the difference in operating time between the LAVH sub-category and AH not being significant. VH had a significantly shorter operation time than LH (WMD 41.5 minutes, 95% CI 33.7 to 49.4 minutes) and, although statistical heterogeneity was present (chi^2 p-value 0.001, I^2 = 80.6%), similar results were obtained with a random-effects model. LAVH had a significantly shorter operation time than LH(a) (WMD 25.3 minutes, 95% CI 10.0 to 40.6 minutes).

Intraoperative complications

Where bladder and ureter injuries were pooled as 'urinary tract injury', there was a significant increase in urinary tract injury for LH versus AH (OR 2.61, 95% CI 1.22 to 5.60), but no statistically significant differences in urinary tract injury for LH versus VH (OR 1.00, 95% CI 0.36 to 2.75) or for LH(a) versus LAVH (OR 1.60, 95% CI 0.29 to 7.83).

There were no significant differences in the occurrence of:

- bladder injury between VH versus AH, LH versus AH, LH versus VH, or LH(a) versus LAVH;
- ureteric injury between VH versus AH, LH versus AH, LH versus VH, or LH(a) versus LAVH;
- bowel injury between VH versus AH, LH versus AH, LH versus VH, or LH(a) versus LAVH;
- vascular injury between LH versus AH, LH versus VH, or LH(a) versus LAVH;
- mean blood-loss between VH versus AH and number of women with substantial bleeding between LH versus AH and LH versus VH;
- unintended laparotomy between LH versus VH, or LH(a) versus LAVH.

Short term complications

For VH versus AH, there were significantly fewer unspecified infections or febrile episodes (OR 0.42, 95% CI 0.21 to 0.83). For LH versus AH, there were significantly fewer wound or abdominal wall infections (OR 0.32, 95% CI 0.12 to 0.85) and significantly fewer unspecified infections or occurrence of pyrexial illness (OR 0.65, 95% CI 0.49 to 0.87).

There were no significant differences in:

- the need for blood transfusion for VH versus AH, LH versus VH, LH(a) versus LAVH (and the difference in mean blood loss and haemoglobin drop for these comparisons was not statistically significant); although LH and AH showed no significant difference in the need for blood transfusion, LH was associated with a significantly lower mean blood loss (WMD 45.3 mls, 95% CI 17.9 to 72.7 mls) and smaller drop in haemoglobin (WMD 0.55 g/L, 95% CI 0.28 to 0.82 g/L);
- occurrence of pelvic haematoma or vaginal cuff infection for VH versus AH, LH versus AH, LH versus VH, or LH(a) versus LAVH;
- UTI for VH versus AH, LH versus AH, LH versus VH;
- chest infection for VH versus AH, LH versus AH, LH versus VH;
- other unspecified infection or pyrexial illness for LH versus VH, or LH(a) versus LAVH;
- thrombo-embolic events for LH versus AH, LH versus VH.

Other short term outcomes

Speedier recovery from surgery favoured VH versus AH in terms of shorter hospital stay (WMD 1.0 day, 95% CI 0.7 to 1.2 days) and speedier return to normal activities (WMD 9.5 days, 95% CI 6.4 to 12.6 days) and, although statistical heterogeneity was present with return to normal activities (chi^2 p-value 0.02, I^2 = 75.3%), similar results were obtained with a random effects model. Recovery also favoured LH versus AH (hospital stay WMD 2.0 days, 95%CI 1.9 to 2.2 days; return to normal activities WMD 13.6 days, 95%CI 11.8 to 15.4 days). Statistical heterogeneity was present for hospital stay (chi^2 p-value < 0.00001, I^2 = 95.0%) and for return to normal activities (chi^2 p-value 0.004, I^2 = 71.2%), although similar results were obtained for these outcomes using a random-effects model. There were no significant differences in recovery from surgery, in terms of hospital stay or return to normal activities for LH versus VH, or in terms of hospital stay for LH(a) versus LAVH.

Long term outcomes

No significant differences were found in long term:

- fistula formation for LH versus AH, LH versus VH;
- urinary dysfunction for VH versus AH, LH versus VH;
- sexual dysfunction in terms of dyspareunia or failure to orgasm for LH(a) versus LAVH;
- patient satisfaction for LH versus AH.

Sensitivity analyses

Exclusion of trials susceptible to 'surgeon effect'

Exclusion of the three trials in which surgeons for one intervention were unequivocally different to those performing the other intervention (Langebrekke 1996; Olsson 1996; Raju 1994) did not alter the statistical significance of any meta-analysis results.

Sub-categorisation of LH

LAVH had a significantly shorter operation time than AH (WMD 7.6 minutes, 95% CI 3.0 to 12.2 minutes), whilst other sub-categories of LH took significantly longer than AH operations (LH(a) versus AH, WMD 30.6 minutes, 95% CI 25.6 to 35.7 minutes; TLH versus AH, WMD 16.3 minutes, 95% CI 7.0 to 25.6 minutes). LH was associated with significantly fewer blood transfusions than AH (OR 0.48, 95% CI 0.24 to 0.97). All other

sub-category meta-analyses of LH versus AH and LH versus VH showed results that were similar to meta-analysis of LH as a pooled group versus AH and versus VH.

Data from included trials that were not in the meta-analysis

Data expressed as medians were not included in the meta-analysis. Only outcomes reaching statistical significance will be mentioned below (a full summary of results is presented in Other Data Tables 01 to 06) .

Operation time

Hwang 2002 found a significantly shorter median operating time for VH (74 minutes) versus AH (98 minutes). In three trials (Falcone 1999; Ferrari 2000; Raju 1994) AH had a significantly shorter median operation time than LH. Median operating time was significantly shorter for VH than for LH (Hwang 2002).

Intraoperative complications

For LH versus AH, median estimated operative blood loss was significantly lower for AH in one trial (Falcone 1999) and for LH in another (Yuen 1998). Median haemoglobin drop was significantly lower for LH in one trial (Schutz 2002).

Short term outcomes

For LH versus AH, LH was associated with significantly lower pain scores than AH in a number of trials (including Garry), on postoperative days 0, 1, 2 and 3 (Marana 1999), day 2 (Olsson 1996), day 4 (Schutz 2002) and on coughing (Ellstrom 1998). TLH was associated with significantly less severe postoperative pain than AH (Perino 1999).

Recovery from pain was significantly faster for LH (Raju 1994). Concerning analgesic use, LH was associated with significantly less opiate use (Garry 2004) and oral and rectal analgesia (Langebrekke 1996), shorter duration of analgesic use overall (Raju 1994) and of patient-controlled analgesic use (Falcone 1999), fewer patients requiring intramuscular narcotics on the day of surgery (Summitt 1998) and less analgesic use after the first 24 hours (Ferrari 2000). Median duration of hospital stay was significantly shorter for LH in five trials (Falcone 1999; Ferrari 2000; Langebrekke 1996; Raju 1994; Yuen 1998). Median duration of return to normal activities was significantly shorter for LH in two trials (Langebrekke 1996; Raju 1994).

For LH versus VH, LH was associated with significantly greater use of oral pain tablets on postoperative day two, but no other significant differences in pain scores or analgesic use were found.

Long term outcomes

For LH versus AH, Garry 2004 demonstrated that quality of life (measured by SF12 scoring system) was better for LH at six weeks, that body image was significantly improved for LH versus AH at six weeks and four months, but not 12 months and that sexual frequency was significantly higher at six weeks following LH.

Cost

No trial found a significant difference in the overall cost of LH versus AH, but only five RCTs examined comparative cost in any detail (Ellstrom 1998; Falcone 1999; Lumsden 2000; Raju 1994; Summitt 1998). The mean total hospital cost was significantly higher for LH than for VH (Summitt 1992).

DISCUSSION

Our review found a number of advantages of VH over AH. VH was less painful and was associated with earlier discharge from hospital and return to normal activities. There were conflicting data on which was the quickest operation to perform and this presumably relates to the prior experience with these procedures of the surgeons involved in the trials. LH offered a number of advantages over AH; fewer wound or abdominal wall infections, fewer unspecified infections or episodes of pyrexia, smaller drop in haemoglobin, less pain, earlier discharge from hospital and return to normal activities and improved quality of life at six weeks and four months after surgery; the cost was a longer operating time. LH was associated with less postoperative pain, earlier discharge from hospital and return to normal activities than AH, but AH required a shorter operating time. LH had a number of disadvantages compared to VH; a longer operating time, greater use of oral pain tablets on day two and a higher hospital cost. There were no significant differences between LH(a) and LAVH.

Speed of recovery is determined by avoiding an abdominal procedure; AH is associated with lengthier recovery than all other approaches to hysterectomy. Avoidance of AH also appears to be important to minimise postoperative pain and avoid abdominal wall infections and infections of unspecified origin or general pyrexial illness postoperatively.

Operating time is overall longer for LH versus AH and for LH versus VH. However LAVHs had a significantly shorter operating time than AH (when analysed as a sub-category) and LAVH had a significantly shorter mean operating time than LH(a). These data suggest that operating time seems to be governed by the proportion of the surgery performed laparoscopically; the greater proportion performed laparoscopically, the lengthier the operation. Most surgeons who are comfortable with laparoscopic techniques will be able to undertake laparoscopic adhesiolysis or excision of endometriosis (Richardson stage 1), free both adnexa (stage 2) and dissect the bladder (stage 3) laparoscopically, Richardson stages 1-3 fulfilling our definition of LAVH. A more challenging part of the laparoscopic procedure, that would fulfil our definition of LH(a), is laparoscopic uterine artery transection (stage 4) and anterior or posterior colpotomy or the complete freeing of the uterus laparoscopically (stage 5). Yet more expertise is required to complete a TLH. Although it could be speculated that laparoscopic uterine artery ligation is the manoeuvre most likely to increase the risk of ureteric injury, especially during the learning curve for such surgery, we were unable to confirm this since trials of LAVH versus AH did not report on ureteric injury.

Of the 24 trials comparing LH with either AH or VH, 21 supplied sufficient information to categorise according to Richardson stages

(Richardson 1995) and thus to fulfil the requirements of our subcategorisation. Six trials involved LAVH, 13 trials involved LH(a) with laparoscopic uterine artery transection but still included a vaginal component and two trials involved TLH (stage 5).

A significantly higher incidence of urinary tract damage has been reported with hysterectomies involving the laparoscopic approach (Garry 2004; Garry 1995; Harkki-Siren 1997). Although this meta-analysis of RCTs was underpowered to detect a clinically significant increase in the incidence or bladder damage and ureter damage from a laparoscopic approach. Much of the data for an increased incidence of urinary tract injury has come from non-randomised studies. Whilst it could be argued that only large case series usually have the power to detect such a rare complication, there is an undoubted tendency toward bias from such an approach and RCTs remain the least biased way to assess not only benefits of an intervention, but also harms. When bladder and ureter injuries in our meta-analysis were pooled under a single category 'urinary tract injury', a significant increase in urinary tract injury was detected for LH versus AH (OR 2.61, 95% CI 1.22 to 5.60). Urinary tract damage, in particular ureteric injury, remains the major concern related to the laparoscopic approach. Furthermore, in the largest RCT included in this review, Garry 2004 elected to pool cases in which at least one major complication occurred and did find a significant increase in this outcome for LH versus AH (but not LH versus VH).

Particularly difficult to address is the issue surrounding effectiveness and complications in surgical procedures where the skill base of surgeons is not only variable, but different between the surgeons' experience of 'traditional' operations and their experience of 'laparoscopic' operations. This is likely to be especially relevant to the rates at which complications, such as ureteric damage, occur. There is no good way of taking into account the risk of such rare complications in surgeons who are beyond their learning curve. In the current state of gynaecological practice and training, all training gynaecologists tend to become thoroughly trained in 'traditional' hysterectomy techniques, but there is huge variation in their learning curve position in relation to 'laparoscopic' hysterectomy techniques. This is not just a hysterectomy issue but pervades many aspects of surgical therapy involving innovations. It does not apply to anything like the same extent where drug therapy interventions are being studied, in which the efficacy is much less dependent on the skill of the investigator providing the treatment. It is on the medical model of intervention that much of the Cochrane methodology is developed. The heterogeneity in such outcomes as operating time, even when the 'traditional' hysterectomy techniques VH versus AH are compared, directly relates to the fact that some surgeons are better trained in, and thus perform faster, VH, and some AH. This heterogeneity might be expected to be even more apparent when LH is compared with either AH or VH.

Whether it is reasonable to prioritise outcomes as primary or secondary in advance is controversial. There is certainly scope for the authors of individual RCTs to report only the outcomes that they consider to have produced interesting results, resulting in reporting bias. Usual Cochrane policy is to term the most clinically relevant outcome as 'primary' rather than the one most obviously affected by the treatments under comparison. Perhaps the most plausible primary measure of effectiveness is 'return to normal activity' (where VH and LH fare most favourably). 'Major lasting problem' could perhaps be considered as the primary adverse event, but data on all long term outcomes in these RCTs are sparse. It is intended to define these outcomes as 'primary' in future updates of this review. Short-term outcomes (such as minor infections) are interesting but of secondary importance, however 'clinical indicators' traditionally used as a measure of the level of function of an individual clinician performing hysterectomy include visceral injury and blood transfusion.

The approach to hysterectomy in any given case will inevitably differ amongst gynaecologists. This is largely based on each surgeon's experience and expertise with the various approaches. Until the last few years, the vast majority of hysterectomies were performed abdominally (Vessey 1992; Hall 1998; Reich 2003) and this is likely still to be the case in most settings (Farquhar 2002). The many advantages demonstrated from avoiding AH in this review, suggest that AH should be avoided if it is possible and safe to do so. Whilst many gynaecologists in training are now exposed to laparoscopic approaches to hysterectomy, very few contemporary newly trained gynaecologists will have sufficient expertise and confidence to tackle TLH, which requires the highest level of surgical skill. More will be trained to accomplish LAVH (and indeed some gynaecologists who did not receive 'training' have acquired the skills to perform LAVH and LH(a)). Although it has been suggested that LAVH does little more than to combine the complications of laparoscopic surgery with those of vaginal surgery (Reich 2003), this has not been supported in our review. There is also a much larger database of trial experience involving LAVH than TLH and that this undermines the extent to which conclusions may be drawn about TLH currently.

One vital conclusion from our review must be that VH remains a very good option - we have not shown any significant disadvantages of VH versus any other approach. If VH can be achieved in preference to AH, it should be performed. Is there any reason to carry out LH procedures where VHs are achievable? The concepts that LH allows identification of pelvic disease (such as adhesions and endometriosis) which could otherwise lead to complications with VH and that the meticulous haemostasis achievable with 'final-look' laparoscopy during LH might reduce pelvic haematomas or vaginal cuff infections have not been borne out in the outcomes in this review. Where oophorectomy is desired, a laparoscopic approach may facilitate this. It is uncertain whether the increased detection of unexpected pathology at LH versus VH (Garry 2004) affects subsequent clinical outcomes. One important

benefit of introduction of LAVH and LH(a) into gynaecologic training has been to increase surgeons' confidence and skill with vaginal surgery, thus making VH a more feasible option for many. It also remains for the enthusiasts promoting TLH to demonstrate its efficacy and safety in comparison to VH.

What is certain is that each gynaecologist (as has been the case since AH became the alternative to VH in 1863) will have their own indications for the choice of approach to hysterectomy for benign disease, based largely on their own array of surgical skills and patient characteristics such as uterine size and descent, extrauterine pelvic pathology, previous pelvic surgery, with other features such as obesity, nulliparity and the need for oophorectomy being influential. Whether there will be more of a consensus regarding these indications in the future than there has been to date is less certain.

AUTHORS' CONCLUSIONS

Implications for practice

When technically feasible, VH should be performed in preference to AH because of more rapid recovery and fewer febrile episodes postoperatively. Where VH is not possible, LH has some advantages over AH (including less operative blood-loss, more rapid recovery, fewer febrile episodes and wound or abdominal wall infections) but these are offset by longer operating time and more urinary tract (bladder or ureter) injuries. No advantages of LH over VH could be found and LH operations took longer. Of the three sub-categories of LH, there are more RCT data for LAVH and LH(a) than for TLH, the latter being the most recently introduced approach to hysterectomy. The surgical approach to hysterectomy should be decided by a woman in discussion with her surgeon in light of the relative benefits and hazards.

Implications for research

The newest approach to hysterectomy (TLH) should be further evaluated versus AH and versus VH. Whether TLH has any benefits or harms in comparison to other forms of LH (including LH(a) and LAVH) remains unclear. The increase in the rate of ureteric injury resulting from LH, suggested by very large observational studies, remains to be conclusively proven by RCT data.

Although it is important that RCTs should have the same surgeon (or group of surgeons) carrying out each of the approaches being compared, different levels of expertise with each approach means that such RCTs are always likely to be statistically heterogeneous when considered for pooling in meta-analyses.

We strongly encourage trial authors to report their laparoscopic approach to hysterectomy according to our defined sub-categories:

(i) laparoscopic assisted vaginal hysterectomy (LAVH), where part of the hysterectomy is performed by laparoscopic surgery and part vaginally, but the laparoscopic component of the operation does not involve division of the uterine vessels;

(ii) laparoscopic hysterectomy (LH(a)), where the uterine vessels are ligated laparoscopically but part of the operation is performed vaginally;

(iii) total laparoscopic hysterectomy (TLH), where the entire operation (including suturing of the vaginal vault) is performed laparoscopically and there is no vaginal component.

This should minimise the confusion that has prevailed in the literature to date.

There is an absence of data for long term outcomes in RCTs comparing surgical approached to hysterectomy. RCTs should aim to report long term outcomes, including urinary, bowel and sexual function, along with occurrence of fistulae.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

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

Benassi 2002

Methods	Randomisation: computer selected randomisation. Single centre study, parallel group design with no blinding. Number of women randomised = 119. No dropouts reported. No power calculation reported. Source of funding: not reported.
Participants	119 women with a mean age of 47 years for the AH group and 48 years for the VH group. Participants were recruited from a university hospital in Parma, Italy. Inclusion criteria: Women with symptomatic enlarged uteri (200-1300 mls). Exclusion criteria: prolapse, uterine or adnexal neoplasia, pelvic inflammation, vaginal stenosis, previous pelvic or vaginal procedures, hormonal treatment in the 6 months prior to surgery.
Interventions	AH versus VH. AH and VH performed according to Novak technique. Perimenopausal patients also underwent bilateral oophorectomy. Both groups received prophylactic antibiotic treatment (Cefotaxime 2 g IV) and anticoagulant therapy with Enoxaparin 2000 IU. GA for AH; spinal anaesthetic for VH. The same surgeons carried out the surgery. Duration: June 1997 - December 2000.
Outcomes	Operative time; operative complications (injury to major vessel, ureter, bladder and bowel); drop in haemoglobin; postoperative complications; hospital stay.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Darai 2001

Methods	Randomisation: pre-determined computer generated randomisation code. Multicentre study (n=2), parallel group design with no blinding. Number of women randomised = 80. No dropouts reported. Power calculation to estimate sample size performed, 35 participants required for each surgery arm (assuming that the incidence of complications in women who had LH(a) was 10% and there was an increase of complication rate to 40%), with an alpha (type I error) of 0.05 and a beta (type II error) of 0.2. Source of funding not reported.
Participants	80 women with a mean age of 50 years for the LH(a) group and 49 years for the VH group. Participants recruited from 2 hospitals in Paris, France. Inclusion criteria: Women scheduled for abdominal hysterectomy for benign disease with traditional contraindications for VH, including uterine size larger than 280 g and one or more of the following: previous pelvic surgery, history of pelvic inflammatory disease (PID), moderate or severe endometriosis, concomitant adnexal masses, indication for adnexectomy, and nulliparity without uterine descent. Exclusion criteria: Anaesthetic contraindications for laparoscopic surgery; suspicious adnexal mass on ultrasound; ovarian blood flow and tumour markers; vaginal narrower to less than two fingers wide; immobile uterus with no descent and no lateral mobilization.
Interventions	VH versus LH [LH(a)]. LH(a) arm (considered LH type IV): included coagulation and sectioning of the round ligament, utero-ovarian ligaments with fallopian tubes when ovaries were conserved, and the infundibulopelvic ligaments when ovaries were removed; opening of the bladder flap and bladder dissection, uterosacral ligaments, base of cardinal ligaments, and uterine vessels. Vaginal phases included circular incision of the vagina and, when necessary, wedge morcellation, coring, or bivalving. Peritoneal closure and closure of the vaginal vault concluded the vaginal phase, at which time the pelvis and abdomen were reevaluated through the laparoscope to be sure of hemostasis and for pelvic lavage. VH arm: according to modified Heaney technique. Both groups received prophylactic antibiotic treatment (cefazoline 2g IV) at the beginning and anticoagulant therapy with low molecular weight heparin the evening before the operation. Endotracheal GA. Surgeons experienced in laparoscopic and vaginal surgery completed all the operations. Follow up: 6-8 weeks after surgery. Duration: January - December 1999 (1 year)
Outcomes	Intraoperative and postoperative complications; febrile morbidity; analgesia requirement; postoperative hospital stay; conversion to laparotomy; uterine size and weight.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Ellstrom 1998

Methods	Randomisation: method not stated and allocation concealment not reported. Single centre study, parallel group design with no blinding. Number of women randomised = 40. No dropouts reported. No power calculation for sample size was reported. Source of funding: Goteborg Medical Society Fund, Swedish Medical Research Council.
Participants	40 women with a mean age of 46 years (LH(a) group) and 48 years (AH group), recruited from Sahlgrenska University Hospital, Sweden. Inclusion criteria: scheduled for abdominal hysterectomy for benign disorders; maximum width of uterus, measured by transvaginal ultrasound, less than 11 cm. American Society of Anaesthesiologists (ASA) Grade 1. Exclusion criteria: not reported.
Interventions	AH versus LH [LH(a)]. Both groups stratified to total and subtotal hysterectomies. LH(a) arm: total hysterectomy (n=14) and laparoscopic subtotal hysterectomy (n=6). The laparoscopic part of the total hysterectomy was finished when the uterine artery and parts of the sacrouterine ligaments were transected. The operation was then continued vaginally. Second generation cephalosporin and metronidazole intravenously were given during the operation and by oral administration for 2 days after surgery. With the subtotal hysterectomy, morcellation was carried out after transection of the uterine arteries using a mechanical or an electrical morcellator. The cervical canal was dessicated with bipolar cautery. AH arm: total hysterectomy (n=14) and sub-total hysterectomy (n=6). With the abdominal hysterectomies, standard surgical techniques were used. A lower midline or Pfannenstiel incision was made. The type of incision was left to the individual surgeon and patient to decide. Both groups received standardized anaesthesia; Flunitrazepam (1 mg) was given as pre-medication approx 2 hrs before surgery. Anaesthesia was induced with propofol (1.5-2.5 mg per kg body weight). Morphine (100 ug per kg body weight) was given for perioperative analgesia. Neuromuscular block was achieved with vecuronium (0.1 mg per kg body weight). Suxamethonium (1.0 mg per kg body weight) was administrated for optimal intubation. Anaesthesia was maintained with isoflurane in oxygen/air. Morphine was postoperatively self-administered by the patients by programmable infusion pump containing morphine 1.0 mg/ml. Additional analgesic medication was restricted to paracetamol .Patients with nausea were given 10 mg metoclopramide. Surgeon experience: not reported. Follow up: Assessment of pain, nausea and vomiting, 8 pm day of surgery, 10 am and 6 pm first day and 10 am second postoperative day. Pulmonary function assessed pre-operatively and 10 am, first and second day. Time of anaesthesia, surgery, per and postoperative complications and difference in erythrocyte volume fraction (EVF) before and 2 days after surgery. Duration: not reported.
Outcomes	Primary: post-operative pain, pulmonary function. Secondary: Time of anaesthesia, time of surgery, per and post-operative complications, difference in erythrocyte volume fraction (EVF)
Notes	

Ellstrom 1998 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Falcone 1999

Methods	Randomisation: assigned according to a computer-generated randomisation schedule with random block sizes. Single centre study, parallel group design with no blinding. Number of women randomised = 48, number analysed = 44. 4 withdrew before surgery (3 AH group and 1 LH(a) group). Power calculation performed for sample size. 22 patients per group were necessary to detect a difference of 30 minutes or more in surgical time between the 2 groups with 90% power with a significance level of 0.05 Analysis was by intention to treat. Source of funding: not reported.
Participants	44 women with a mean age of 42.8 years (LH(a) group) and 43.8 years (AH group). Participants were recruited from Cleveland Clinic Foundation, Ohio USA. Inclusion criteria: scheduled for abdominal hysterectomy for benign disease. Exclusion criteria: pelvic mass size greater than 2 cm below the umbilicus; concomitant incontinence or pelvic reconstructive procedures required.
Interventions	AH versus LH [LH(a)]. LH(a) arm: three 10-mm trocar sites - 1 umbilical and 1 in each lower quadrant lateral to inferior epigastric artery 6 to 8 cm above pubic rami. Uterine arteries occluded laparoscopically with electrocautery. Cardinal ligaments cut laparoscopically. If the uterus had minimal descent, uterosacral ligaments were also cut laparoscopically. Vagina incised either laparoscopically or vaginally, depending on the ease that this could be achieved. Either anterior or posterior fornix, depending on access. Surgery then completed vaginally. Vaginal cuff closed vaginally. Performed by senior author with assistance from pelvic surgery fellow or resident. AH arm: procedure not reported. Follow up: daily diary for 6 weeks. Duration: September 1995 - February 1997 (1 year, 6 months).
Outcomes	Operative time; blood loss; length of hospital stay; uterine weight; intraoperative complications; postoperative pain; return to work/normal activities and hospital costs.
Notes	

Risk of bias

Falcone 1999 (*Continued*)

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Ferrari 2000

Methods	Randomisation: Sealed opaque envelopes containing computer-generated randomisation numbers. Single centre study, parallel group design with no blinding. Number of women randomised = 62. No dropouts recorded. With three women in the LAVH group, the procedure was converted to a AH. In all cases the decision was made during the laparoscopic part of the procedure. No power calculation for sample size was reported. Source of funding not reported.
Participants	62 women aged from 43 to 50 years, recruited from San Paolo Biomedical Sciences Institute, University of Milan Italy. Inclusion criteria: symptomatic uterine fibroids. Exclusion criteria: history of severe pelvic disease; lack of uterine accessibility and mobility or a sonographically estimated uterine volume > 1500 mL (abdominal hysterectomy). Women without a history of severe pelvic disease, with an accessible and mobile uterus and a sonographically estimated uterine volume <500 mL, underwent a vaginal hysterectomy.
Interventions	AH versus LH [LAVH]. LAVH arm: visualisation of the pelvis and upper abdomen, the treatment of adhesions or endometriosis when present, and the completion of the upper part of the hysterectomy. Round ligaments, tubes and utero-ovarian ligaments were desiccated and transected when the adnexa were to be preserved, while the round and infundibulopelvic ligaments were dessicated and transected when the adnexa were to be removed. The broad ligaments were dissected to their lower margin. When the bladder was stretched over the anterior aspect of the uterus due to previous surgery, the bladder flap was developed laparoscopically. The vaginal part of the hysterectomy included colpoceliotomy an bilateral ligation and transection of utero-sacral ligaments, uterine vessels and cardinal ligaments; cervical amputation, corporal hemisection, myomectomy and uterine morcellation were performed when necessary. AH arm: performed according to a standard technique. Surgeon experience: not reported. Participants were followed up until discharge from hospital. Post-operatively, temperature and analgesic requirement were recorded daily. Duration: 24 months.
Outcomes	Operating time; blood loss; complications; febrile morbidity; analgesic administration and hospital stay.
Notes	

Risk of bias

Item	Authors' judgement	Description

Ferrari 2000 (*Continued*)

Allocation concealment?	Yes	A - Adequate

Garry 2004

Methods	Randomisation: 2:1 imbalance randomisation method. Allocation to abdominal or vaginal trial by surgeon. Randomisation to conventional or laparoscopic approach was by telephone and performed with a computer-generated programme. Multicentre study (n=30), parallel group design with no blinding. Number of women randomised: 1380. Abdominal trial: 876 (AH: 292. aLH: 584), Vaginal trial: 504 (VH:168, vLH:336). Number of patients that withdrew pre-operatively : AH:6, aLH:11,VH:5, vLH:12. Power calculation to estimate sample size performed. The sample size for the abdominal trial was calculated on the basis of 9% of AH had major complications. In order to detect a reduction complication rate of 50%, a sample size of 450 in each arm was required using 80% power and a two-sided type 1 error rate of 5%. Analysis by intention to treat and results were confirmed using a per-protocol analysis. Source of funding: National Health Service Research and Development Health Technology Assessment Programme, UK.
Participants	1380 women with a mean age of 41 years, recruited from 28 centres throughout the UK and 2 centres in South Africa. Inclusion criteria: Women who needed hysterectomy for non-malignant conditions. Exclusion criteria: Confirmed or suspected malignant disease of any part of the genital tract; 2nd or 3rd degree uterine prolapse; a uterine mass greater than the size of a 12-week pregnancy; any associated medical illness precluding laparoscopic surgery; a requirement for bladder or other pelvic support surgery and patient refusal of consent for the trial.
Interventions	4 arms: VH, LH in the vaginal trial (vLH); AH and LH in the abdominal trial(aLH). Surgical procedures were not reported. Surgeons recruited had to have performed at least 25 of each type of procedure. Surgeons of all grades and experience participated. Follow up: 6 weeks, 4 months and 1 year. Duration: November 1996 - September 2000 (3 years).
Outcomes	Primary outcomes: major complications (major haemorrhage, bowel injury, ureteric injury, bladder injury, pulmonary embolus, anaesthesia problems, unintended laparotomy, wound dehiscence, haematoma). Secondary outcomes: Minor complications (major haemorrhage, anaesthesia problems, pyrexia, infection, haematoma, DVT); blood loss; pain; analgesia requirement; sexual activity; body image; health status; length of surgery; length of hospital stay.
Notes	

Risk of bias

Garry 2004 (*Continued*)

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Harkki-Siren 2000

Methods	Randomisation: sequentially numbered, opaque and sealed envelopes. Single centre study, parallel group design with no blinding. Number of women randomised = 50. No dropouts reported. Tissue trauma analysis for 18 uncomplicated hysterectomies in both groups were included. Power calculation for sample size performed (21 women in each group would be needed for 90% study power and for differentiation of 10 mg/L (standard deviation) between the means of C-reactive protein (CRP) concentration when type I error is 5%. For 80% study power, 15 women in each group needed). Source of funding: The Clinical Research Institution of Helsinki University Central Hospital and Jorvi Hospital, The Finnish Medical Foundation and The Research Foundation of Orion Corporation.
Participants	50 women with mean age 47 years (LH(a) group) and 48 years (AH group), recruited from Jorvi Hospital, Espoo Finland. Inclusion criteria: scheduled for AH for benign reasons. Exclusion criteria: major medical diseases; BMI above 32 kg/m2; size of uterus larger than of 14 weeks of pregnancy or uterine width greater than 10 cm by transvaginal ultrasonography; severe adhesions or endometriosis; prolapse and any other contraindications for laparoscopy.
Interventions	AH versus LH [LH(a)]. LH(a) arm : A 5-mm trocar was inserted suprapubically. Pelvis was inspected and ureters located. The uterosacral ligaments were coagulated with bipolar electrocoagulation and cut with unipolar scissors, as were the infundibulopelvic vessels and ligaments (if adnexa were to be removed) or the round ligaments, Fallopian tubes and utero-ovarian ligaments (adnexa not removed). The vesical peritoneum was opened with scissors and the bladder pulled down. Uterine vessels were prepared free and divided. The anterior fornix of the vagina was opened laparoscopically with monopolar scissors, the uterus was removed vaginally and the vagina was closed with resorbable suture. AH arm: Operated on in a standard manner through a lower midline or Pfannestiel incision. Diathermy was used only for hemostasis and peritoneal closure was performed. All patients received 500 mg metronidazole intravenously at the beginning of anaesthesia and operations were performed under GA with endotrachael intubation in both groups. The bladder was drained with a Foley catheter in all women. A drain was left from the perineal cavity in both groups. Surgeon experience: not reported. First follow up visit was scheduled 4 weeks after the operation and then followed up until complete recovery. Duration: March - September 1997 (6 months).
Outcomes	Operating time; anaesthetic time; blood loss; haemoglobin change; hospital stay; sick leave and complications.
Notes	

Harkki-Siren 2000 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	A - Adequate

Hwang 2002

Methods	Randomisation: sealed envelopes containing computer-generated block randomisation numbers, block size of 10. Single centre study, parallel group design with no blinding. Number of women randomised = 90. No dropouts reported. Power calculation to estimate sample size performed. Power of analysis was 80% at alpha=0.05 Source of funding: not reported.
Participants	90 women with a mean age of 45.1 years, recruited from Shin Kong Wu Ho-Su Memorial Medical Centre, Taipei Taiwan. Inclusion criteria: scheduled for hysterectomy for uterine fibroids; myoma diameter larger than 8 cm and second myoma less than 5 cm or two myomata, both at least 6 cm in diameter but less than 8 cm (maximum number of fibroids was three). Exclusion criteria: indications of adenomyosis; uterine prolapse; chronic pelvic pain; dysfunctional uterine bleeding; cervical dysplasia; pelvic inflammatory disease.
Interventions	AH versus VH versus LH [LH(a)] AH arm: Abdomen opened by vertical midline or Pfannestiel skin incision. Uterus removed by extrafascial technique and vaginal cuff closed with continuous interrupted suture followed by reperitonealisation. VH arm: Patients in Trendelenburg tilt position and given Vasopressin injection. Anterior circumferential incision of the cervix and posterior V-shape incision. Anterior peritoneal cavity opened and cul-de-sac of Douglas entered. After uterine artery ligation, volume reducing techniques were performed vaginally. Peritoneum closed and uterosacral ligaments and vaginal vault sutured. LH(a) arm: 10 mm trocar inserted into umbilical position, one 5 mm trocar in each lower quadrant and another inserted suprapubically. Uterosacral ligament incision and round and broad ligaments were excised. Anterior colpotomy was performed after ligation of the bilateral uterine artery. The rest of the hysterectomy was completed vaginally. The uterus was removed vaginally by volume reducing techniques and the vaginal cuff was closed. All operations performed under general anaesthesia by second author, with the assistance of the other authors. Standardised postoperative protocol of 2 doses of IV meperidine 50 mg every 4 h for pain control followed by acetaminophen 325 mg every 6 hours. Prophylactic antibiotics (cephalosporin 1.0 g every 8 h (three doses/day) combined with aminoglycoside 80 mg every 12 h (two doses/day), for one day were administered to all after surgery. Follow-up: 6 weeks after surgery. Duration: June 1999 - May 2001 (2 years).

Hwang 2002 (*Continued*)

Outcomes	Operating time; hospital stay; intraoperative blood loss; complications; post operation tenderness score; return to work; antibiotics used.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Kunz 1996

Methods	Randomisation: method not stated. Single centre study, parallel group design with no blinding. Number of women randomised = 70, number analysed = 70. No power calculation for sample size was reported. Source of funding not reported.
Participants	70 women with a mean age of 43 (LAVH group) and 48 years (AH group), recruited from Stuttgart, Germany. Inclusion criteria: scheduled for hysterectomy for non-malignant diseases. Exclusion criteria: not reported.
Interventions	AH versus LH [LAVH]. LAVH arm: A curette is inserted into the uterus and the laparoscopic video camera is introduced. Two 5 mm trocars were inserted. Division of the adnexae from the uterus or the infundibulopelvic ligaments and round ligaments was accomplished with tissue tension, bipolar coagulation and the use of hook scissors. Transverse incision on the anterior fold of the broad ligaments bilaterally and transection of the visceral peritoneum at the bladder resection. Separation of the posterior fold of the broad ligaments, uterine arteries are skeletonized and demonstrated close to the uterus (2 cm). The hysterectomy was continued vaginally. The cervix was circumcised and the vaginal skin is reflected. Reflection of the bladder and the anterior peritoneum is demonstrated. The pouch of Douglas is entered and the sacrouterine ligaments are clamped and ligated. Uterine arteries are clamped and ligated bilaterally and the uterus extracted vaginally. The secrouterine ligaments are fixed together and the vagina is closed in interrupted sutures. AH arm: The abdominal hysterectomies followed a common technique (Ober and Meinrenken 1964). Both groups received perioperative antibiotic prophylaxis with 2 g of Ceftriaxon, 15 minutes prior to the operation. Both groups had a pre and post-operative vaginal ultrasound scan. Pre and post-operative blood tests and measured CRP post-operatively (day 1 and 3). Post-operative analgesia was Piritramid (22 mg ampulle), Pentazocin (30 mg ampulle) and Tramadol hydrochloride (100 mg orally). Duration: November 1993-February 1995 (1 year and 4 months).
Outcomes	Operating time, pain relief, size of uterus, haemoglobin change, stay in hospital and complications.

Kunz 1996 (*Continued*)

Notes	Paper in German language. Translation was commissioned.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Langebrekke 1996

Methods	Randomisation: sealed envelopes containing the assignment prepared by randomisation, using a table of random digits, numbered 1 to 100. Multicentre study (n=2), parallel group design with no blinding. Number of women randomised = 100, number analysed = 100. No power calculation for sample size was reported. Source of funding not reported.
Participants	100 women recruited from two hospitals in Norway. The age of the participants was not reported. Inclusion criteria: women with indications for elective hysterectomy. Exclusion criteria: proven or suspected malignancies in the pelvic area, suspected intra-abdominal adhesions; uterus enlarged beyond the size of a 12 week size pregnancy; serious cardiopulmonary disease; previous colporrhapy.
Interventions	AH versus LH [LH(a)]. LH(a) arm: A 10-mm laparoscope was inserted through the umbilicus and a general inspection of the entire pelvic cavity was performed. Two 5 mm trocars were introduced into the iliac fossae. A 12 mm trocar was placed in the midline 4 cms below the umbilicus in cases where the automatic stapler endo-GIA was used. Bipolar diathermy or GIA were used to divide the ligaments. With unipolar scissors, the vesicouterine perioneal fold was cut and the bladder mobilized. The uterine arteries were coagulated with bipolar diathermy. The vagina was opened laparoscopically with unipolar scissors and the uterus removed vaginally. The vagina was closed with resorbable sutures from below, the sutures including the cardinal ligaments. All operations performed exclusively by two of the authors. AH arm: according to standard techniques. Abdomen was entered via a Pfannenstiehl incision. The entire abdominal cavity was palpated and the pelvis inspected. The uterine ligaments were clamped and ligated. The bladder peritoneum was opened and the bladder was mobilized away from the cervix and upper anterior vaginal wall. Uterine vessels were clamped, cut and ligated. The vagina was closed with resorbable sutures. Performed by any skilled gynaecologist in the department. Cephalosporine (2 g IV) and low molecular heparin (injected subcutaneously) was given to both groups postoperatively. Follow up: until participants returned to work/normal activities. Duration: not reported.
Outcomes	Operation time; hospital stay; time elapsed before resuming work; postoperative pain; complications and blood loss.

Langebrekke 1996 (*Continued*)

Notes		
Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	A - Adequate

Long 2001

Methods	Randomisation: randomly assigned to treatment groups. Method not stated and allocation concealment not reported. Single centre study, parallel group design with no blinding. Number of women randomised = 167 Number of dropouts = 13 Number of women analysed = 101 (participants excluded if hysterectomy performed for reasons other than uterine fibroids of adenomyosis). No power calculation for sample size or intention to treat analysis was reported. Source of funding: not reported.
Participants	101 women with a mean age of 46.3 (LAVH group) and 45.8 (LH(a) group) recruited from Kaohsiung Municipal Hsiao Kang Hospital, Taiwan. Inclusion criteria: indications of uterine fibroids of adenomyosis and contraindications for VH - uterine weight >280 g, previous pelvic surgery, history of PID, need for adnexectomy, lack of uterine descent and limited vaginal access. Criteria for choosing laparoscopic hysterectomy was based on the uterine volume, less than that of a 16 weeks pregnancy (700 g). Exclusion criteria: suitable for a vaginal hysterectomy and the uterine volume was greater than a 16 week pregnancy.
Interventions	LAVH versus LH(a) [a comparison of two LH techniques]. LAVH arm: If the ovaries were to be conserved, the Fallopian tubes, round and utero-ovarian ligament was resected with bipolar forceps and scissors. For adnexectomy, mesosalpinx, round and infundibulopelvic ligament were resected. Laparoscopic dissection of the bladder flap, resection of the broad ligaments, anterior and posterior colpotomies were performed. Proceeded vaginally - clamping, transecting and suture ligating of uterine vessels, cardinal and uterosacral ligaments. Closure of peritoneum and vaginal vault anchored to the cardinal-uterosacral ligament complex after removing uterus. LH(a) arm: Same manner as the LAVH procedure above the uterine artery level. After dissection of the bladder flap and resection of the broad ligament, the uterine artery was coagulated by bipolar electrocoagulator and separated from the uterine sidewall by scissors. Bilateral dessication and transection of the cardinal-uterosacral ligament complex. Circular colpotomy was performed close to the cervix and uterus was removed through the vagina. All operations performed under GA and by the same gynaecologist for each procedure (LAVH by one surgeon and LH(a) by another).

Long 2001 (*Continued*)

	Post-operative analgesia included lysine aspirin which was administered intravenously. Antibiotic prophylaxis IV cefazolin 1 g administered pre- and post-operatively. Follow-up: until discharged from hospital. Duration: November 1999 - December 2000 (1 year and 1 month).
Outcomes	Operation time, blood loss, hospital stay, cost, complications and sexual symptoms.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Lumsden 2000

Methods	Randomisation: performed by the research nurse using a computer-generated schedule. Multicentre (n=3) study, parallel group design with no blinding. Number of women randomised = 200, number analysed = 190. 7 did not attend for operation and the case records were not available for a further 3 women. Power calculation to estimate sample size performed. 120 patients per arm allowed an 80% chance of detecting a 15% difference in complication rates at a 5% level using a two-sided test. Analysis was stated as by intention to treat, but not all randomised participants were analysed. Source of funding: Scottish Home and Health Department, Scotland.
Participants	190 women with a mean age of 42.7 years (AH group) and 41.1 (LH group), recruited from three hospitals in Glasgow, Scotland. Inclusion criteria: scheduled for AH for benign gynaecological disease and they were not suitable for VH because of a uterine size in excess of 14 weeks or a requirement for oophorectomy. Exclusion criteria: suitable for VH.
Interventions	AH versus LH. Operation procedures not reported. Performed by 5 consultant gynaecologists who have undertaken a minimum of 50 LH procedures. Follow up: participants asked to keep a diary of recovery 'milestones' and reviewed by the research nurse four weeks after surgery. Euroqol Health Questionnaire completed at one, six and twelve months after surgery. Duration: 2 years
Outcomes	Length of operation; length of hospital stay; admission to ITU; readmissions; women requiring additional surgery; blood transfusions; complications (major and minor); patient reported outcomes; costs and change in health status.
Notes	

Lumsden 2000 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Marana 1999

Methods	Randomisation: computer generated sequence. Multicentre study (n=4), parallel group design with no blinding. Number of women randomised 116, number analysed 116. Power calculation performed for sample size, the sample size was selected to detect a difference of 25% in total complication rates with a power of 80% at the 5% level of significance, given a complication rate in the control group of 42%. No drop-outs. Source of funding not reported.
Participants	116 women with a mean age of 49 years, recruited from 4 Italian university hospitals. Inclusion criteria: scheduled for AH for benign disease and had one or more of the following contraindications to VH: uterine size >280 g and an upper limit of 16 weeks gestation (700 g); previous pelvic surgery; history of pelvic inflammatory disease; moderate or severe endometriosis; concomitant adnexal mass or indication for adnexectomy; and nulliparity with lack of uterine descent and limited vaginal access. Exclusion criteria: suitable for VH.
Interventions	AH versus LH [LAVH]. LAVH arm: 10-mm laparoscope introduced through the umbilicus, and 3 accessory 5 mm reusable trocars were introduced suprapubically. The pelvis and upper abdomen were then accurately evaluated, and endometriotic lesions, adhesions, or ovarian cysts, when present, were treated appropriately. When the ovaries were to be conserved, bipolar forceps and scissors were used to resect the round and uteroovarian ligaments with the fallopian tubes. For adnexectomy, bipolar forceps and scissors were used to resect the round and infundibulopelvic ligaments, mesosalpinx, and mesovarium. Opening of the bladder flap was performed at the laparoscopic phase, whereas bladder dissection was performed during the vaginal phase. Laparoscopic hemostasis was achieved using exclusively bipolar electrocoagulation. The vaginal phase included circular incision of the vagina; bladder dissection to the laparoscopically opened bladder flap; entry in the posterior cul-de-sac; and clamping, transecting, and suture ligating of uterosacral ligaments, base of cardinal ligaments, and uterine vessels. Where necessary, wedge morcellation, coring, or bivalving was performed. Peritoneal closure with pedicles exteriorized and closure of vaginal vault anchored to the uterosacral and cardinal ligaments concluded the vaginal phase. AH arm: Performed according to the technique described by Mattingly and Thompson. Surgeon experience: not reported. Pre-operative evaluation of uterine size, mobility and pelvic sonogram. Haemoglobin and hematocrit determinants performed for autologous blood transfusion, performed if HB level > 11 g/100 mL. All received antibiotic prophylaxis (intravenous piperacillin 2 g) administered 30 mins before surgery. Postoperative medication consisted of the administration of ketorolac by intramuscular injection or by mouth every 6 hours for the first 24 hours.

Marana 1999 (*Continued*)

	Post-operative follow-up included evaluation of pain on post-operative days 1, 2 and 3, length of post-operative hospital stay and evaluation of post-operative complications. Duration: until patient left hospital. Duration: October 1995 - November 1996 (1 year, 1 month)
Outcomes	Blood loss; postoperative fever; postoperative pain; length of postoperative hospital stay; postoperative complications; hemoglobin reduction and intraoperative conversion to abdominal surgery.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Miskry 2003

Methods	Randomisation: computer generated in blocks of 10; sequentially numbered sealed opaque envelopes, opened by nursing staff immediately prior to surgery. Double blind until discharge from hospital, maintained by a sham opaque lower abdominal dressing (unless pyrexia or other complication necessitated direct inspection of the abdomen) and vaginal staining with methylene blue in cases undergoing VH. Two centre study, parallel group design. Number of women randomised = 36, number analysed = 36. Power calculation performed and adhered to: 36 women required for 80% power to show a 2-day difference in hospital stay at p=0.05. Source of funding: not stated.
Participants	36 women with mean age 42 years, recruited from Royal Free and North Middlesex Hospitals, UK. Inclusion criteria: scheduled for elective hysterectomy. Exclusion criteria: genital tract malignancy; adnexal pathology; uterine size >14 weeks; need for concurrent procedure (eg vaginal repair, colposuspension); reduced uterine mobility on VE; inadequate vaginal access.
Interventions	AH versus VH. Total hysterectomy performed by standard technique for each route. Low transverse incision, closed with subcuticular absorbable suture, for AH; Heaney technique for VH. In all cases, concurrent oophorectomy performed if indicated; peritoneal and vaginal vault closed. Performed by most senior surgeon available. All GA plus caudal block for one VH case. Antibiotic prophylaxis Co-amoxivlav 1.2 g at induction of anaesthesia. Thromboprophylaxis heparin 5000 units at induction and twice daily until mobile. Follow-up at 6 weeks and 6 months with completion of SF-6 Short Form General Health Survey. Duration of trial not stated.

Miskry 2003 (*Continued*)

Outcomes	Primary outcome: duration of hospital stay. Secondary outcomes: analgesic requirements; complications; return to normal function.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Olsson 1996

Methods	Randomisation: sealed opaque envelopes. 1:1 ratio. Single centre, parallel group design with no blinding. Number of women randomised = 143, number analysed = 143. Power calculation for sample size was performed, assuming a complication probability of 40% for AH, the power of predicting a difference in complication rate was at least 80% at the 5% level, two-sided test, provided that the probability of complications following LH(a) is at most 18% and at least 64% when 70 patients are included in each group. Source of funding: Goteborg Medical Society Fund, Swedish Medical Research Council.
Participants	143 women with median age 48 years, recruited from Sahlgrenska University Hospital, Sweden. Inclusion criteria: scheduled for AH for benign disorders, with a maximum uterine width of less than 11 cm and not considered suitable for VH. Exclusion criteria: suitable for VH (adnexa are not to be removed; no suspicion of endometriosis or post-inflammatory disorders, when uterine size is normal, or in the case of uterovaginal prolapse, less than the size of an eight week pregnancy).
Interventions	AH versus LH [LH(a)]. LH(a) arm: All patients were prescribed a second generation cephalosporin as well as metronidazole intravenously during the operation and by oral administration for 2 days after surgery. Ureters were identified, where this was difficult, the ureters were dissected free down to the level of the uterine arteries. If the adnexa were to be removed, the infundibulopelvic ligaments were transected by diathermial cautery and monopolar scissors. If the adnexa were to be conserved the utero-ovarian pedicles were transected on both sides, using the same instruments. The round ligaments and the upper portion of the broad ligaments were divided using monopolar scissors and the bladder was dissected to the level just below the vaginal cuff. The posterior part of the broad ligaments were divided by scissors close to the uterus, down to the upper part of the uterosacral ligaments, which were then transected. The uterine arteries were transected close to the uterus after bipolar coagulation. The upper portion of the cardinal ligaments were divided close to the uterus, after which an incision was made into the anterior fornix of the vagina. The vaginal phase: vaginal epithelium surrounding the cervix was transected as well as any residual tissue from the cardinal and uterosacral ligaments. The transected ligaments were ligated together and incorporated into the vaginal wall. 2 out of 5 surgeons of senior registrar grade and specifically trained in LH(a).

Olsson 1996 (*Continued*)

	AH arm: Antibiotics were not routinely prescribed in this group of patients. They underwent either a lower midline or Pfannenstiel incision. If the adnexa were to be removed, the infundibulopelvic ligaments were clamped, transected and ligated. In cases where the adnexa were not to be removed, the utero-ovarian pedicles were transected and ligated. The anterior broad ligaments were divided down to the vesico-vaginal junction and the bladder reflected to just below the vaginal cuff. The uterine vessels were divided close to the uterus. Following division of the cardinal and uterosacral ligaments, the uterus was excised. The vaginal cuff was closed with interrupted sutures and the peritoneal layers closed and attached to the top of vagina. Two out of 10 surgeons of senior registrar grade trained in AH. Follow up: 4-6 weeks after surgery, all patients returned for a gynaecological examination including vaginal ultrasound. 6-8 weeks after surgery patients were asked to complete an anonymous questionnaire if they considered the duration of their post-operative hospital stay and sick leave to have been adequate. In a subgroup of patients (TLH: n=38; AH: n=38), postoperative health status and QOL were self assessed prospectively 1, 3, and 12 weeks after surgery using "The Medical Outcome Trust 36-item Short-Form Health Survey questionnaire". Duration: not reported.
Outcomes	Operating time (mins); complications; postoperative pain relief; convalescence (sick leave); hospital stay; QOL; economic analysis (cost)
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Ottosen 2000

Methods	Randomisation: computer generated numbers and information on the allocation schedule was kept in sealed opaque envelopes prepared by and successively opened by the research nurse. Single centre study, parallel group design with no blinding. Number of women randomised = 120, number analysed = 120. Randomly allocated to one of three operating methods in four blocks of 30 to ensure a balanced number of patients throughout study period. Interim analysis done after 25 patients were randomised to each group. Power calculation for sample size performed, sample size based on reported hospital stay for vaginal and abdominal hysterectomy of 2.3 and 4 days, respectively. If 1.5 is the SD for hospital stay, 40 women were randomised to achieve a power of 80% at alpha = 0.05. Source of funding: Thelma Zoegas Foundation and the Stig and Ragna Gorthons Foundation, Sweden.
Participants	120 women with mean age 47 years (AH group), 49 years (VH group) and 48 years (LAVH group), recruited from the Hospital of Helsingborg, Sweden. Inclusion criteria: scheduled for hysterectomy for anticipated benign causes. Inclusion: menorrhagia, leiomyomas <15 cm in diameter, dysplasia, endometrial atypia and pain.

Ottosen 2000 (*Continued*)

	Exclusion criteria: ovarian pathology, uterus larger than 16 weeks of gestational size, previously known dense adhesions, narrow vagina or obvious inaccessible uterus.
Interventions	AH versus VH versus LH [LAVH] - three treatment arms. LAVH arm: the laparoscopic part was minimised. Trocars were left in place and after closing the vaginal wall the surgeon returned to laparoscopic view to confirm haemostasis. The surgery was performed under GA in 109/120 cases, spinal block in 3/120 or in combination with epidural block in 8/120 cases. AH arm: the abdomen was opened and closed in different ways according to surgeon preference. The uterus was removed by extrafascial technique and the vagina closed and covered by peritoneum. VH arm: the vault was injected with 20 mL of mepivacain/adrenalin before incision in order to minimise bleeding. The peritoneal folds were opened and ligaments and uterine vessels were divided. If at this time the uterine size did not allow easy exteriorisation, bisecting, coring, morcellation, enucleation or combinations of these volume-reducing techniques were performed. The peritoneum was closed, followed by suturing of the sacrouterine ligaments and vaginal vault. One of 15 gynaecological surgeons, experience varied and in some cases residents performed under supervision. All patients had at least one dose of prophylactic antibiotic perioperatively, namely cefuroxim 1.5 g intravenously and metronidazol 1g rectally. A daily dose of exoxaparin 20 mg subcutaneously was given as thrombolic prophylaxis through the hospital stay. Follow up: 2 weeks post operation in outpatient clinic for examination to detect complications and evaluate need for further sick leave. Duration: January 1996 - May 1998 (2 years, 5 months).
Outcomes	Duration of surgery, duration of anaesthesia, stay in hospital, recovery time, peroperative blood loss and complications.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Perino 1999

Methods	Randomisation: method not stated and allocation concealment not reported. Single centre study, parallel group design with no blinding. Number of women randomised = 102, number analysed = 102. No power calculation for sample size was reported but there were no reported dropouts. Source of funding: not reported.

Perino 1999 (*Continued*)

Participants	102 women with a mean age of 48 years, recruited from Gynaecologic University Hospital, Palermo Italy. Inclusion criteria: Scheduled for hysterectomy for benign diseases. Exclusion criteria: not stated.
Interventions	AH versus LH [TLH]. TLH arm: After a CO2 pheumoperitoneum was created, a 10 mm trocar was placed in the umbilical site to introduce the laparoscope and the camera. Three ancillary 5 m trocars were placed suprapubically. After an abdominal inspection, lysis of any adhesions was performed, the uterus was then mobilized. After bipolar coagulation, the round ligament was sectioned at 3 cm from the uterus. The areolar tissue of the broad ligament was then dissected and its posterior fold fenestrated at an avascular area above the uterine vessels. The infundibulo-pelvic ligament vessels were coagulated and cut using bipolar forceps and scissors under direct visualization of the pelvic ureter. Once the uterine ligaments were sectioned, the operation continued centrally in a downward direction. If the adnexae were not to be removed, the utero-ovarian ligament was coagulated and sectioned proximal to the ovaries. The vesico-uterine peritoneal fold was opened by scissors and a bladder dissection from the low uterine segment down to the upper part of the vagina was performed. The utero-sacral ligaments were then coagulated and sectioned. The uterine artery was skeletonized and then coagulated with bipolar forceps and cut with scissors. Incision and coagulation of the cardinal ligaments to expose the vaginal fornices, separated from the stump of the uterine artery. Circular colpotomy was then performed and the uterus was removed from the vagina. The vaginal vault was then sutured laparoscopically or vaginally. AH arm: Performed according to the technique described for benign disease (Mattingly and Thompson). All operations performed by the same team of three surgeons with experience of 100+ TLH procedures. Follow up: until participants were discharged from hospital. Postoperative pain was assessed 3 days after surgery. Duration: January 1997 - 30 September 1998 (1 year, 9 months).
Outcomes	Operating time; blood loss; postoperative pain; postoperative decrease in haemoglobin; complications and duration of postoperative hospital stay
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Raju 1994

Methods	Randomisation: sealed envelopes containing computer generated block randomisation numbers. Block size of 10. Single centre study, parallel group design with no blinding. Number of women randomised = 80, number analysed = 80. Power calculation for sample size performed, 40 patients in each arm were estimated to detect a 25% difference in morbidity between the groups, with a power of 90% at the 5% level. No dropouts were reported. Source of funding: not reported.
Participants	80 women with mean age of 46 years, recruited from St Thomas's Hospital, London. Inclusion criteria: scheduled for hysterectomy and bilateral oophorectomy for benign conditions. Exclusion criteria: morbid obesity, uterus larger than 14 weeks gestation size, or uterovaginal prolapse.
Interventions	AH + BSO versus LH [LAVH] + BSO. LAVH+BSO arm: 5.5 mm flap-valved trocars were inserted enabling the insertion of laparoscopic instruments. 12 mm trocar and cannula were introduced suprapubically in the midline 3 cm above the upper border of the symphysis pubis as a port for the use of the Autosuture Multifire Endo GIA 30 stapling device.The cervix was grasped with a vulsellum and a broad-ended blunt uterine curette was inserted to manipulate the uterus from the perineal end. Any adhesions between the uterus or adnexae to adjacent structures were divided with scissors after diathermy coagulation. Both round ligaments were treated with diathermy and cut with scissors approx 3 cm from the internal inguinal ring whilst holding the ligament with a grasping forceps. The peritoneum of the anterior leaf of the broad ligament was dissected from the divided round ligament back towards the infundibulo-pelvic ligament thus opening the tissue space between the two folds of broad ligament. The posterior leaf of the broad ligament was then pierced with endoshears to make a window, a safe distance above the ureter which had been previously identified. The ovarian pedicle was then sized for thickness of tissue by means of a GIA endogauge inserted through the midline suprapubic incision. The correct size of endostapling clamp was selected. The ovarian pedicle was clamped and cut with the appropriate GIA endostapling device, placed from the upper border of the infundibulo-pelvic ligament and with the jaws of the stapler passing well through the peritoneal window in the broad ligament. By using this technique each ovarian pedicle required only one firing of the GIA stapler to divide it. Finally the uterovesical fold of the peritoneum was divided with scissors and sometimes the uterosacral ligaments were divided after diathermy coagulation. The uterus, tubes and both ovaries were then removed vaginally after circumcising the cervix and opening the pouch of Douglas to allow ligation and division of the cardinal ligaments and uterine vessels as in a traditional vaginal hysterectomy. The vaginal vault was anchored to the cardinal ligaments and closed with interrupted sutures. Operations performed on by one of the authors. AH+BSO arm: Procedures were performed using a standard technique. Operations performed by one of the authors or by another surgeon of senior registrar grade. Premedication: temazepam 20mg, 2 hours before operation. GA induced with thiopentone and maintained with enflurane and nitrous oxide. Under anaesthesia a bolus intravenous injection of Augmentin, 1.2g was given. Antibiotic therapy continued for 7 days postoperatively Follow up: 6 weeks after surgery and until participants return to work. Duration: March 1992 - October 1993 (1 year, 8 months)

Raju 1994 (*Continued*)

Outcomes	Operating time, blood loss, haemoglobin change, hospital stay, post-operative analgesia, complications, recovery time (subjective assessment of patient's general wellbeing and return to normal activity) and cost.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Ribiero 2003

Methods	Randomisation: method not stated. Single centre study, parallel group design with no blinding specified. Number of women randomised = 60, number analysed = 60. No power calculation for sample size reported. No dropouts reported. Source of funding: Foundation of Research Support from Sao Paulo State.
Participants	60 women with overall mean age 42.3 years (range 34 - 76 years). Participants were recruited from Sao Paulo University School of Medicine Hospital, Brazil. Inclusion criteria: Benign uterine disease: myoma n=41; adenomyosis n=19. Exclusion criteria: uterine volume greater than 400 mls; use of any anti-inflammatory medication during preceding 3 months; diabetes mellitus; coagulation disorders; autoimmune diseases.
Interventions	AH versus VH versus LH [TLH]. AH by Thompson and Warshaw technique. VH by Heaney's technique. LH [TLH]: 10mm laparoscope inserted at umbilicus, two 5mm secondary ports for laparoscopic instruments. Uterine mobiliser with blunt tip used to antevert uterus and delineate vaginal fornices. Round ligaments divided with monopolar forceps and vesico-uterine fold divided with scissors and bladder mobilised until anterior vagina identified. Utero-ovarian ligament and fallopian tube pedicles dessicated with bipolar forceps, then scissors division of broad ligament peritoneum. Uterine artery grasped, elevated and bipolar coagulated. Cardinal and uterosacxral ligaments divided with monopolar forceps. Vagina entered posteriorly near cervico-vaginal junction. 4 cm vaginal delineator outlined circumferentially the cervico-vaginal junction and prevented loss of pneumoperitoneum. Monopolar forceps completed the circumferential culdotomy. Uterus removed vaginally (after morcellation if necessary). Laparoscopic vaginal vault interrupted suturing and suspended by suture attachment to uterosacral/cardinal pedicles, sutures being tied extracorporally. Surgeon experience: not reported. Follow up: routinely up to 6 days. Antibiotic and thromboprophylaxis not specified. Duration: not reported.
Outcomes	Operative time; pre- and post-operative haemoglobin; complications.

Ribiero 2003 (*Continued*)

Notes		
Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Richardson 1995

Methods	Randomisation: random numbers table. Single centre study, parallel group design with no blinding. Number of women randomised = 45, number analysed = 45. No power calculation for sample size reported. No dropouts reported. Source of funding: not reported.
Participants	45 women with mean age of 41 years (LH group) and 45 years (VH group). Participants were recruited from Royal Free Hosptial, London. Inclusion criteria: contraindications for vaginal surgery according to traditional criteria (absence of vaginal prolapse, nulliparity, uterine enlargement, previous pelvic surgery endometriosis and need for oophorectomy). Exclusion criteria: uterine size greater than the equivalent of 16 weeks' gestation, endometrial carcinoma, adnexal masses, known dense pelvic adhestions, or moderate/severe endometriosis.
Interventions	VH versus LH. LH arm: The laparoscope was inserted sub-umbilical incision, and usually two 5mm secondary portals were used for the laparoscopic instruments. Surgery was performed under the guidance of the image generated by a Supercam 9050 PB video chip camera attached to a 30 degree forward oblique laparoscope. The principal method of haemostasis was bipolar electrosurgical dessication but Endo-GIA 30 linear staplers were used in 8 women. In 1 woman VH was done after diagnostic laparoscopy (stage 0 VH) and in 2 VH was carried out after laparoscopic adhesiolysis had made this possible (stage 1 LH). When the ovaries were conserved, bipolar diathermy was used medially to dessicate the round and ovarian ligaments, and the fallopian tube. The approach to the ovarian pedicle during oophorectomy depended on whether the uterine vessels were to be divided laparoscopically or vaginally. If divided vaginally, the ovarian vessels were coagulated and divided but not the round ligaments. Dissection then proceeded towards the uterine origin of the round ligament, after which the hysterectomy was completed vaginally (stage 2 LH) or after laparoscopic mobilisation of the bladder (stage 3 LH). If the uterine vessels were treated laparoscopically (stage 4 LH), the round ligaments were always divided, together with the ovarian vessels and fallopian tubes, and the dissection continued to the level of the uterine arteries which were then dessicated and cut close to the uterus. Laparoscopic dissection only continued further than the uterine artery in 3 cases (stage 5 LH), all other procedures being completed vaginally. VH arm: Modified Heaney approach. Surgeon experience: not reported.

Richardson 1995 (*Continued*)

	Follow up: 6-8 weeks after surgery, participants completed a questionnaire on their recovery. All kept a prospective diary of their recovery for 6 weeks. Duration: not reported.
Outcomes	Operating time; analgesia required; hospital stay; recovery time and postoperative complications.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Schutz 2002

Methods	Randomisation: computer-generated randomisation list and concealment by telephone inquiry. Single centre study, parallel group design with no blinding. Numer of women randomised = 48, number analysed = 48. Power calculation to estimate sample size performed. No reported dropouts. Source of funding: not reported.
Participants	48 women with median age of 48 years, recruited from Friedrich Schiller University, Jena Germany. Inclusion criteria: sonographically estimated uterine weight >200g and patient has no preference for either surgical technique. Exclusion criteria: not stated.
Interventions	AH versus LH [LH(a)]. LH(a) arm: Either type I or II procedure. Type I: the laparoscopic part included coagulation and transection of the round ligament and transection of the bladder peritoneum. If the adnexae was desired, the fallopian tube and the ovarian ligament were coagulated and transected. Where salpingo-oophorectomy was needed, the infundibulo-pelvic ligament was isolated, coagulated and transected following visualisation of the ureter. Type II: the uterine artery was identified at its origin when branching off the internal iliac artery. The identification was made coming from either the internal umbilical ligament or the pararectal fossa. Prior to coagulation of the uterine artery, the ureter was identified and pushed medially. After coagulation, it was left to the discretion of the surgeon to transect the uterine artery. The uterus was mobilized by pulling on the transected round ligaments and no intrauterine probes were applied for mobilization of the uterus. 71.4% operations performed by attending physician, 28.6% by resident assisted by physician. AH arm: followed the standard extrafascial technique. A Balfour retractor was used and the skin incision was stapled. 40% performed by physician and 60% by resident assited by physician. Follow up: following discharge from hospital the participants received a self-administered questionnaire to evaluate their recouperation over a period of 12 months. Duration: August 1995 - December 1997 (2 years, 4 months).

Schutz 2002 (*Continued*)

Outcomes	Primary outcome: length of stay in hospital. Secondary outcomes: Operating time; postoperative pain; blood loss and recovery time until return to full work activity.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Seracchioli 2002

Methods	Randomisation: computer generated randomisation unknown to the surgeons. Single centre study, parallel group design with no blinding. Number of women randomised = 122, no dropouts reported. No power calculation for sample size was reported. Source of funding: not reported.
Participants	122 women with a mean age of 46.3 (LH(a) group) and 47.3 (AH group), recruited from S. Orsola Hospital, University of Bologna Italy. Inclusion criteria: eligible for AH due to a large uterus (>14 weeks) caused by myomas. Uterine weight >300g, determined by a pelvic examination and transvaginal ultrasonography. Exclusion criteria: uterus projecting above the transverse umbilical line and with other pelvic pathologies (prolapse, pelvic floor relaxation, stress incontinence and adnexal masses). Medical conditions that require hospital monitoring, eg. diabetes, heart disease, if they had undergone previous abdominal surgery requiring longitudinal laparotomy or contraindications to operative laparoscopy.
Interventions	AH versus LH [LH(a)] LH(a) arm: 10 mm cannula placed in the umbilical site to introduce the lapaproscope and camera. Two 5mm suprapubic access routes were inserted lateral to deep inferior epigastric arteries. A third cannula was inserted between the umbilicus and xiphoid. Round ligaments, fallopian tubes, and utero-ovarian ligaments(or infundibulopelvic ligaments if the ovaries were to be removed) were coagulated and sectioned. Uterine peritoneal fold was opened with scissors, dissecting the bladder off the lower uterine segment and cervix. Incision of the fornix, extended laterally, stopping close to uterine vessels. Uterine pedicles skeletonised, coagulated and sectioned. Parametrial tissues were coagulated and sectioned so the uterus is free to be removed vaginally. Vaginal vault was sutured vaginally with the cardinal-uterosacral ligaments. Antibiotic prophylaxis of ampicillin 2 g. All surgical procedures were performed by the same investigators under GA. Follow-up:Phone interviews 2 months after discharge to determine the number of days before going back to normal activities. Duration: January 1997- January 2001 (3 years).

Seracchioli 2002 (*Continued*)

Outcomes	Operating time, laparoconversions, blood loss, haemoglobin drop, fever, transfusions, hospital stay and convalescence.	
Notes		
Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Soriano 2001

Methods	Randomisation: pre-determined computer-generated randomization code. Single centre study, parallel group design with no blinding. Number of women randomised = 80, number analysed = 80. Power calculation to estimate sample size performed. Assumed that the incidence of complications in patients undergoing LH(a) is 10% and there will be an increase of complication rate to 40%, with alpha (type I error) of 0.05 and beta (type II error) of 0.2. It was planned to recruit at least 35 women to each arm. No reported dropouts. Source of funding not reported.
Participants	80 women with a mean age of 49 years, recruited from the Hopital Hotel-Dieu, Paris France. Inclusion criteria: women referred for hysterectomy due to benign pathology. Uterine size larger than 280g and one or more of the following: previous pelvic surgey, history of pelvic inflammatory disease, moderate or severe endometriosis, concomitant adnexal masses, or indication for adnexectomy. Exclusion criteria: suspicious adnexal mass, anesthetic contra-indications for laparoscopic surgery. Women with contra-indications to acetaminophen, or to nonsteroidal antiinflammatory drugs and those whose pain evaluation was judged unreliable due to neurological disease, or treatment by steroids, NSAIDs or opoids prior to surgery.
Interventions	VH versus LH [LH(a)]. LH(a) arm (LH type IV): After induction of pneumoperitoneum and insertion of the video laparoscope, three suprapubic trocars were introduced for the ancillary instruments. The pelvis and the upper abdomen were evaluated and endometric lesions, adhesion or ovarian cysts, when present were treated. When the ovaries were to be conserved, bipolar forceps and scissors were used to resect the round ligament and the uteroovarian ligaments with the fallopian tubes. For adnexectomy, bipolar forceps and scissors were used to resect the round and infundibulopelvic ligaments, mesosalpinx and mesovarium. The laparoscopy included opening the bladder flap and bladder dissection, coagulating and transecting the uterosacral ligaments, base of cardinal ligaments and uterine vessels. Laparoscopic hemostasis was achieved using exclusively bipolar electrocoagulation. The vaginal phases included only circular incision of the vagina and wedge morcellation, coring or bivalving was performed. Peritoneal closure and closure of the vaginal vault concluded the vaginal phase.

Soriano 2001 (*Continued*)

	VH arm - performed using the modified Heaney procedure. When necessary, wedge morcellation, coring, or bivalving was performed. Surgeon experience: not reported. Prophylactic antibiotic (cefazoline 2 g IV and low molecular heparin the evening before the operation. Follow up: until participants were discharged from hospital. Duration: January 1999 - December 1999 (1 year).
Outcomes	Uterine weight; operative time; hemoglobin drop; postoperative complications; blood loss; pain relief and hospital stay.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Summitt 1992

Methods	Randomisation: computer generated randomisation numbers. Single centre study, parallel group design with no blinding. Number of women randomised = 56, number analysed = 56. One operation was unsuccessful therefore for certain outcomes only 55 were analysed. No power calculation for sample size was reported. Analysis by intention to treat. Source of funding: not reported.
Participants	56 women with a mean age of 38 years, recruited from a gynecology clinic, University of Tennessee, Memphis USA. Inclusion criteria: 1) age 18-65 years; 2) no significant medical illness that required prolonged post-operative monitoring or care; 3) a telephone in working order; 4) a support person who could assist the patient for the first 48 hours after surgery and 5) an understanding of all post-operative instructions. Criteria for VH: 1) uterine size no larger than 16 gestational weeks; 2) the prescence of uterine mobility; 3) a pubic arch of at least 90 degrees. Factors that did not influence the decision to proceed vaginally include: 1) a preoperative diagnosis of pelvic pain; 2) the need for oophorectomy, or 3) a history of previous pelvic surgery. Exclusion criteria: 1) A concomitant anterior or posterior colporrhaphy was required; 2) cervical conization was performed within the previous 48 hours; and 3) additional antibiotic prophylaxis was required for valvular heart disease. They were also excluded if they had absolute contraindications to laparoscopy, such as 1) any condition that could not tolerate anaesthesia, 2) severe bleeding disorder, 3) acute peritonitis of the upper abdomen and uterine myomata or 4) a pelvic mass larger than 16 gestational weeks in size.

Summitt 1992 (*Continued*)

Interventions	VH versus LH [LH(a)]. LH(a) arm: Three 12-mm trocars were used, one placed infraumbilically and one placed in each lower quadrant approx. 6-8cm above the pubic rami, lateral to the inferior epigastric arteries. A Hulka tenaculum was used to manipulate the uterus. The bladder flap was developed by incising the vesicouterine fold of peritoneum and dissecting the bladder below the cervix. The urethers were then identified and mobilized using linear incisions in the medial leaf of the broad ligament, midway between the uterosacral ligaments and infundibulopelvic vessels. The Multifire EndoGIA disposable surgical stapler was used to staple-ligate and cut all uterine pedicles, each consisting of the round ligament, fallopian tubes, and utero-ovarian ligament, were cut. If the ovaries were to be removed, the stapler was instead placed outside the tube and ovary, encompassing the infundibulopelvic ligament. The uterine arteries were next staple-ligated and cut bilaterally. If possible, the stapling device was also used to ligate and cut the cardinal ligaments. Otherwise, stapling of uterine pedicles ended and the anterior vaginal formix was entered with unipolar cautery, incising over a moistened sponge distending the anterior vagina. The remainder of the hysterectomy was completed vaginally. Performed by a team of 3 surgeons (2 attending faculty and a senior gynaecology resident). VH arm: Anesthesiologist's choice of general or regional anesthesia. A modified Heaney technique was performed using O-coated polyglycolic acid suture for all pedicles. The vaginal cuff was closed in all cases. Performed by a gynaecology resident with attending faculty member. All received pre-operative antibiotic prophylaxis (cefazolin 2 g) intravenously. If allergic to penicillin, 200 mg dose of doxycycline intravenously was used. Post-operative follow-up consisted of a telephone call by the attending surgeon on the evening of surgery and the first 2 post-operative days. Patients were then seen 1 and 6 weeks post-operatively in the outpatient clinic. Duration: June 1991 - February 1992 (9 months).
Outcomes	Operating time, blood loss, anaesthesia time, intraoperative complications, febrile morbidity, pain relief and costs.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Summitt 1998

Methods	Randomisation: computer-generated randomisation list. Each surgical assignment placed in consectutive sealed envelopes and opened by an independent person (study secretary). Multicentre study (n=3), parallel group design with no blinding. Number of women randomised = 67, number analysed = 65. 2 women who were randomised refused their assigned procedure and they were removed from the study and their random numbers discarded. Power calculation to estimate sample size was not reported. Analysis said to be by intention to treat, but 2 randomised participants were not analysed. Source of funding: US Surgical Corporation, Norwalk, Connecticut USA.
Participants	65 women with a mean age of 38.3 (LH(a) group) and 41.5 (AH group), recruited from three hospitals in the USA. Inclusion criteria: Scheduled for AH for benign diseases. Indications for AH: 1) documented visual diagnosis of pelvic endometriosis; 2) documented pelvic adhesions; 3) three or more previous laparotomies; 4) uterine leimyomata 12-18 gestational weeks in size; 5) previous tuboovarian abcess or two documented episodes of pelvic inflammatory disease requiring IV antibiotic therapy; 6) adnexal mass in the prescence of an indication for hysterectomy; and 7) indicated hysterectomy with lack of mobility and unfavorable vaginal introitus. The following inclusion criteria were met: 1) age at least 18 years, 2) a working telephone in the home, 3) an available support person in the home for 48 hours after surgery, and 4) an understanding of the postoperative instructions. Exclusion criteria: concomitant colporrhaphy, urethropexy, vaginal vault suspension, or a nongynecologic major operation required. Medical conditions requiring in-hospital monitoring or if they had known cervical or endometrial cancer. Candidates were also excluded if they had absolute contraindications to operative laparoscopy, including: 1) uterine leiomyomas or pelvic masses greater than 18 gestational weeks in size, 2) conditions making them intolerant to anesthesia, 3) severe bleeding disorders, 4) acute periodontitis of the upper abdomen with severe distension, or 5) a midline abdominal hernia.
Interventions	AH versus LH [LH(a)]. LH(a) arm: Three 12-mm trocars were used, one placed infraumbilically and one placed in each lower quadrant approx. 6-8 cm above the pubic rami, lateral to the inferior epigastric arteries. A Hulka tenaculum was used to manipulate the uterus. The bladder flap was developed by incising the vesicouterine fold of peritoneum and dissecting the bladder below the cervix. The urethers were then identified and mobilized using linear incisions in the medial leaf of the broad ligament, midway between the uterosacral ligaments and infundibulopelvic vessels. The Multifire EndoGIA disposable surgical stapler was used to staple-ligate and cut all uterine pedicles, each consisting of the round ligament, fallopian tubes, and utero-ovarian ligament, were cut. If the ovaries were to be removed, the stapler was instead placed outside the tube and ovary, encompassing the infundibulopelvic ligament. The uterine arteries were next staple-ligated and cut bilaterally. If possible, the stapling device was also used to ligate and cut the cardinal ligaments. Otherwise, stapling of uterine pedicles ended and the anterior vaginal formix was entered with unipolar cautery, incising over a moistened sponge distending the anterior vagina. The remainder of the hysterectomy was completed vaginally. AH arm: modified Richardson technique. Surgeon experience: not reported. All received pre-operative antibiotic prophylaxis (cefazolin 2 g) intravenously. If allergic to penicillin, 200 mg dose of doxycycline intravenously was used. Follow up: 2 and 6 weeks post-operatively in the outpatient office. Duration: not reported.

Summitt 1998 (*Continued*)

Outcomes	Operating time; blood loss; intraoperative and postoperative complications; hospital stay; febrile morbidity; requirement for analgesia; recovery time; conversion to abdominal hysterectomy and costs.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Tsai 2003

Methods	Randomisation: computer generated random number sequence. Single centre study, parallel group design with no blinding. Number of women randomised = 200, number analysed = 200. Not analysed on intention to treat basis - two LAVHs converted to AH analysed as AH. No power calculation for sample size reported. Source of funding: not reported.
Participants	200 women with a mean age of 46.9 years (AH) and 46.7 years (LAVH), recruited from a university and municipal hospital in Kaohsuing, Taiwan. Inclusion criteria: good mobility of an enlarged uterus on bimanual pelvic examination. Exclusion criteria: upper uterine margin higher than midpoint between symphisis pubis and umbilicus; pre-existing cardiopulmonary dysfunction or poorly controlled systemic disease; cervical malignancy on colposcopy; indication for conventional VH.
Interventions	AH versus LH [LAVH]. AH technique not specified. LAVH technique under GA as follows. Uterine manipulator applied and pneumoperitoneum established. Two trocar puncture sites, 12 mm umbilically and 2 mm right lower quadrant. 2 mm minilaparoscope allowed inspection and treatment of emdometriosis lesions or adhesions through umbilical port. Multifire EndoGIA stapler resection of round and utero-ovarian ligaments (or bipolar forceps applied to round ligaments if large myoma present). Vaginal phase included insertion of 10mm laparoscope after division of the vesicouterine fold and peritoneal entry (the LETS technique). Then standard VH technique, including clamping, transection and suture ligation of uterosacral, cardinal and uterine pedicles, followed by peritoneal closure, then laparoscopic re-evaluation and lavage after haemostasis if necessary. Antibiotic and thromboprophylaxis not specified. Follow-up duration not specified. Duration: August 1997 to March 1999.
Outcomes	Operating time; complications; duration of hospital stay.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Yuen 1998

Methods	Randomisation: computer-generated sequence of random numbers. Single centre study, parallel group design with no blinding. Number of women randomised = 50, number analysed = 44. 4 declined the operation and 2 refused to participate postoperatively. No power calculation for sample size or analysis by intention to treat was reported. Source of funding: Direct grant for research from the Chinese University of Hong Kong.
Participants	44 women with a median age of 44 (LH(a) group) and 43 (AH group), recruited from the Chinese University of Hong Kong. Inclusion criteria: no major medical diseases requiring hysterectomy for benign disorders. Exclusion criteria: suitable for VH or a uterus larger than 16 weeks' gravid size.
Interventions	AH versus LH [LH(a)]. LH(a) arm: Performed with the use of three ports and bipolar desiccation for hemostasis. The laparoscopic part of the operation stopped after securing the uterine arteries, and the remainder of the operation was performed vaginally. AH arm: Performed in the standard manner through a Pfannenstiel or lower midline incision. Surgeon experience: not reported. Follow up: until discharge from hospital. Duration: January 1996 - June 1996 (6 months).
Outcomes	Operation time; blood loss; postoperative stay and postoperative complications.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

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

Apoola 1998	Non-randomised comparison of VH and AH for women with moderately enlarged uterus. Women undergoing VH had less blood-loss, a smaller haemoglobin drop and a shorter hospital stay.
Chapron 1999	Not a randomised controlled study. Study to assess hysterectomy techniques and the rate of total laparoscopic hysterectomy (TLH).
Ellstrom 2003	Randomised trial of TLH versus AH (n=74), but did not measure any of our pre-specified outcome measures, focussing on psychological well being. No differences were found.
Holub 2000	Randomised controlled trial (n=70) but compared two variants of LAVH (described in the study as LAVH and VALH [vaginally assisted laparoscopic hysterectomy] respectively), rather than comparing LAVH with another surgical approach. In LAVH, the round ligament, upper broad ligament, infundibulopelvic or uteroovarian ligament, bladder pillars in preparation of the bladder flap were taken laparoscopically; the uterine vessels, cardinal-uterosacral ligaments, anterior and posterior culdotomy and vaginal cuff closure were taken vaginally. In VALH, all steps were performed laparoscopically, other than taking the uiterine vessels and vaginal cuff closure which were performed vaginally. Operation time shorter for VALH (mean 81.33 versus 89.47 mins, p=0.01), with no other significant differences in outcomes reported.
Howard 1993	Not a randomised controlled study. Allocated to study groups based on the attending physician scheduled for the case. Intervention: laparoscopic hysterectomy (LH) versus abdominal hysterectomy (AH).
Møller 2001	Not a randomised controlled study, allocated to study groups by the attending gynecologist in a non-randomised manner. Intervention: laparoscopic hysterectomy (LH) versus abdominal hysterectomy (AH).
Nezhat 1992	Not a randomised controlled study, alternatively assigned to study groups. Intervention: laparoscopic hysterectomy (LH) versus abdominal hysterectomy (AH).
Oscarson 2003	Randomised trial comparing subtotal AH versus subtotal LH (n=48). The complication profile for subtotal hysterectomy is different to total hysterectomy. Inclusion of this trial and pooling for meta-analysis would introduce undue clinical heterogeneity. No outcome differences found, other than operating time, which was longer for subtotal LH.
Park 2003	Not a randomised controlled study. Historical comparison of LAVH and TLH.
Phipps 1993	Not a truly randomised controlled study, allocated to study groups according to the last digit of their hospital record number by secretarial staff. Intervention: laparoscopic hysterectomy (LH) with bilateral salpingo-oophorectomy (BSO) versus abdominal hysterectomy (AH) with BSO.

Characteristics of studies awaiting assessment *[ordered by study ID]*

Cucinella 2000

Methods	not detailed by review author
Participants	
Interventions	
Outcomes	
Notes	

Davies 1998

Methods	not detailed by review author
Participants	
Interventions	
Outcomes	
Notes	

Hahlin 1994

Methods	not detailed by review author
Participants	
Interventions	
Outcomes	
Notes	

Pabuccu 1996

Methods	not detailed by review author
Participants	
Interventions	
Outcomes	

Pabuccu 1996 (*Continued*)

Notes	

Petrucco 1999

Methods	not detailed by review author
Participants	
Interventions	
Outcomes	
Notes	

DATA AND ANALYSES

Comparison 1. VH vs AH

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Operation time (mins)	2		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Operation time (descriptive data)			Other data	No numeric data
3 Intraoperative complications (dich)	3		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Bladder injury	3	239	Odds Ratio (M-H, Fixed, 95% CI)	3.11 [0.31, 30.90]
3.2 Ureter injury	1	119	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
3.3 Urinary tract (bladder or ureter) injury	3	239	Odds Ratio (M-H, Fixed, 95% CI)	3.11 [0.31, 30.90]
3.4 Bowel injury	1	119	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
3.5 Vascular injury	1	119	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
4 Intraoperative complications (cont)	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
4.1 Estimated bloodloss (mls)	2	140	Mean Difference (IV, Fixed, 95% CI)	-11.93 [-70.70, 46.84]
5 Intraoperative complications (descriptive data)			Other data	No numeric data
5.1 Estimated bloodloss			Other data	No numeric data
6 Short term outcomes (dich)	4		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
6.1 Transfusion	4	295	Odds Ratio (M-H, Fixed, 95% CI)	1.31 [0.46, 3.72]
6.2 Pelvic hematoma	3	235	Odds Ratio (M-H, Fixed, 95% CI)	0.99 [0.28, 3.53]
6.3 Vaginal cuff infection	2	140	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
6.4 Wound/ abdominal wall infection	2	155	Odds Ratio (M-H, Fixed, 95% CI)	0.24 [0.03, 2.18]
6.5 UTI	3	176	Odds Ratio (M-H, Fixed, 95% CI)	0.59 [0.08, 4.61]
6.6 Chest infection	1	60	Odds Ratio (M-H, Fixed, 95% CI)	1.0 [0.13, 7.60]
6.7 Infection unspecified	4	295	Odds Ratio (M-H, Fixed, 95% CI)	0.42 [0.21, 0.83]
6.8 Thrombo-embolism	1	119	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
7 Short term outcomes (descriptive data)			Other data	No numeric data
7.1 Change in haemoglobin			Other data	No numeric data
8 Pain relief (descriptive data)			Other data	No numeric data
9 Recovery from surgery	4		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
9.1 Length of hospital stay (days)	3	235	Mean Difference (IV, Fixed, 95% CI)	-0.95 [-1.24, -0.65]
9.2 Return to normal activities (days)	3	176	Mean Difference (IV, Fixed, 95% CI)	-9.47 [-12.57, -6.37]
10 Recovery from surgery (descriptive data)			Other data	No numeric data
11 Long term outcomes - negative (dich)	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
11.1 Urinary dysfunction	1	80	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable

12 Long term outcomes - positive (dich)	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
12.1 Satisfaction	1	119	Odds Ratio (M-H, Fixed, 95% CI)	2.69 [0.50, 14.42]

Comparison 2. LH vs AH

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Operation time (mins)	10	988	Mean Difference (IV, Fixed, 95% CI)	10.58 [7.39, 13.77]
1.1 LAVH versus AH	4	466	Mean Difference (IV, Fixed, 95% CI)	-7.59 [-12.19, -2.98]
1.2 LH(a) versus AH	5	420	Mean Difference (IV, Fixed, 95% CI)	30.61 [25.58, 35.65]
1.3 TLH versus AH	1	102	Mean Difference (IV, Fixed, 95% CI)	16.30 [7.01, 25.59]
1.4 Non-categorisable LH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
2 Operation time (descriptive data)			Other data	No numeric data
3 Intra-operative complications (dich)	12		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Bladder injury	9	1810	Odds Ratio (M-H, Fixed, 95% CI)	2.04 [0.89, 4.67]
3.2 Ureter injury	4	1268	Odds Ratio (M-H, Fixed, 95% CI)	3.43 [0.83, 14.15]
3.3 Urinary tract (bladder or ureter) injury	10	1912	Odds Ratio (M-H, Fixed, 95% CI)	2.61 [1.22, 5.60]
3.4 Bowel injury	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	0.17 [0.02, 1.60]
3.5 Vascular injury	2	956	Odds Ratio (M-H, Fixed, 95% CI)	1.76 [0.52, 5.87]
3.6 Bleeding	4	1185	Odds Ratio (M-H, Fixed, 95% CI)	0.39 [0.12, 1.31]
4 Short term outcomes (dich)	18		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Transfusion	13	2046	Odds Ratio (M-H, Fixed, 95% CI)	0.84 [0.54, 1.32]
4.2 Pelvic haematoma	6	563	Odds Ratio (M-H, Fixed, 95% CI)	0.95 [0.46, 1.97]
4.3 Vaginal cuff infection	8	733	Odds Ratio (M-H, Fixed, 95% CI)	1.48 [0.68, 3.25]
4.4 Wound/abdominal wall infection	5	449	Odds Ratio (M-H, Fixed, 95% CI)	0.32 [0.12, 0.85]
4.5 UTI	7	609	Odds Ratio (M-H, Fixed, 95% CI)	0.98 [0.50, 1.92]
4.6 Chest infection	3	294	Odds Ratio (M-H, Fixed, 95% CI)	0.31 [0.07, 1.35]
4.7 Infection unspecified	12	1879	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.49, 0.87]
4.8 Thrombo-embolism	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	1.11 [0.24, 5.13]
5 Short term outcomes (cont)	7		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
5.1 Estimated blood loss (ml)	7	693	Mean Difference (IV, Fixed, 95% CI)	-45.26 [-72.68, -17.85]
5.2 Change in Hb	3	288	Mean Difference (IV, Fixed, 95% CI)	-0.55 [-0.82, -0.28]
6 Short term outcomes (descriptive data)			Other data	No numeric data
6.1 Estimated blood loss (ml)			Other data	No numeric data
6.2 Change in Hb			Other data	No numeric data
7 Pain relief (descriptive data)			Other data	No numeric data
7.1 Pain scales			Other data	No numeric data
7.2 Postoperative analgesics			Other data	No numeric data
7.3 Recovery from pain (days)			Other data	No numeric data
8 Recovery from surgery	10		Mean Difference (IV, Fixed, 95% CI)	Subtotals only

8.1 Length of hospital stay (days)	9	948	Mean Difference (IV, Fixed, 95% CI)	-2.03 [-2.19, -1.88]
8.2 Return to normal activities (days)	6	520	Mean Difference (IV, Fixed, 95% CI)	-13.63 [-15.42, -11.84]
9 Recovery from surgery (descriptive data)			Other data	No numeric data
9.1 Length of hospital stay (days)			Other data	No numeric data
9.2 Return to normal activities (days)			Other data	No numeric data
10 Long term outcomes - negative (dich)	4		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
10.1 Fistula	2	245	Odds Ratio (M-H, Fixed, 95% CI)	3.07 [0.32, 29.96]
10.2 Urinary dysfunction	2	246	Odds Ratio (M-H, Fixed, 95% CI)	0.94 [0.48, 1.84]
11 Long term outcomes - positive (dich)	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
11.1 Satisfaction	1	166	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.32, 1.30]
12 Long term outcomes (descriptive data)			Other data	No numeric data
12.1 Satisfaction			Other data	No numeric data
13 Cost (descriptive data)			Other data	No numeric data

Comparison 3. LH sub-category analyses versus AH

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Bladder injury	10	1804	Odds Ratio (M-H, Fixed, 95% CI)	2.01 [0.88, 4.60]
1.1 LAVH versus AH	3	396	Odds Ratio (M-H, Fixed, 95% CI)	1.0 [0.14, 7.17]
1.2 LH(a) versus AH	3	300	Odds Ratio (M-H, Fixed, 95% CI)	1.77 [0.37, 8.48]
1.3 TLH versus AH	2	42	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
1.4 Non-categorisable LH versus AH	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	2.59 [0.81, 8.32]
2 Ureter injury	5	1308	Odds Ratio (M-H, Fixed, 95% CI)	3.43 [0.83, 14.15]
2.1 LAVH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
2.2 LH(a) versus AH	1	100	Odds Ratio (M-H, Fixed, 95% CI)	6.12 [0.29, 130.87]
2.3 TLH versus AH	2	142	Odds Ratio (M-H, Fixed, 95% CI)	3.06 [0.12, 76.88]
2.4 Non-categorisable LH versus AH	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	2.82 [0.44, 18.03]
3 Urinary tract (bladder or ureter injury)	8	1672	Odds Ratio (M-H, Fixed, 95% CI)	3.03 [1.34, 6.87]
3.1 LAVH versus AH	2	196	Odds Ratio (M-H, Fixed, 95% CI)	3.05 [0.12, 76.48]
3.2 LH(a) versus AH	3	308	Odds Ratio (M-H, Fixed, 95% CI)	2.81 [0.64, 12.29]
3.3 TLH versus AH	1	102	Odds Ratio (M-H, Fixed, 95% CI)	3.06 [0.12, 76.88]
3.4 Non-categorisable LH versus AH	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	3.13 [1.06, 9.28]
4 Bowel injury	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	0.17 [0.02, 1.60]
4.1 LAVH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
4.2 LH(a) versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable

4.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
4.4 Non-categorisable LH versus AH	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	0.17 [0.02, 1.60]
5 Vascular injury	2	956	Odds Ratio (M-H, Fixed, 95% CI)	1.76 [0.52, 5.87]
5.1 LAVH versus AH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	5.26 [0.24, 113.11]
5.2 LH(a) versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
5.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
5.4 Non-categorisable LH versus AH	1	876	Odds Ratio (M-H, Fixed, 95% CI)	1.34 [0.35, 5.08]
6 Bleeding	4	1185	Odds Ratio (M-H, Fixed, 95% CI)	0.39 [0.12, 1.31]
6.1 LAVH versus AH	1	116	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.21]
6.2 LH(a) versus AH	2	193	Odds Ratio (M-H, Fixed, 95% CI)	0.16 [0.02, 1.34]
6.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
6.4 Non-categorisable LH versus AH	1	876	Odds Ratio (M-H, Fixed, 95% CI)	1.50 [0.16, 14.51]
7 Transfusion	13	2046	Odds Ratio (M-H, Fixed, 95% CI)	0.84 [0.54, 1.32]
7.1 LAVH versus AH	4	458	Odds Ratio (M-H, Fixed, 95% CI)	0.37 [0.10, 1.40]
7.2 LH(a) versus AH	7	522	Odds Ratio (M-H, Fixed, 95% CI)	0.48 [0.24, 0.97]
7.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
7.4 Non-categorisable LH versus AH	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	2.14 [0.95, 4.81]
8 Pelvic haematoma	6	563	Odds Ratio (M-H, Fixed, 95% CI)	0.95 [0.46, 1.97]
8.1 LAVH versus AH	3	276	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.05, 2.10]
8.2 LH(a) versus AH	3	287	Odds Ratio (M-H, Fixed, 95% CI)	1.22 [0.54, 2.75]
8.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
8.4 Non-categorisable LH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
9 Vaginal cuff infection	8	733	Odds Ratio (M-H, Fixed, 95% CI)	1.48 [0.68, 3.25]
9.1 LAVH versus AH	3	396	Odds Ratio (M-H, Fixed, 95% CI)	0.75 [0.17, 3.37]
9.2 LH(a) versus AH	5	337	Odds Ratio (M-H, Fixed, 95% CI)	1.94 [0.75, 4.99]
9.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
9.4 Non-categorisable LH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
10 Wound/abdominal wall infection	5	449	Odds Ratio (M-H, Fixed, 95% CI)	0.32 [0.12, 0.85]
10.1 LAVH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
10.2 LH(a) versus AH	4	259	Odds Ratio (M-H, Fixed, 95% CI)	0.35 [0.12, 1.03]
10.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
10.4 Non-categorisable LH versus AH	1	190	Odds Ratio (M-H, Fixed, 95% CI)	0.24 [0.03, 2.21]
11 UTI	7	609	Odds Ratio (M-H, Fixed, 95% CI)	0.98 [0.50, 1.92]
11.1 LAVH versus AH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.22]
11.2 LH(a) versus AH	5	339	Odds Ratio (M-H, Fixed, 95% CI)	1.27 [0.55, 2.95]
11.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
11.4 Non-categorisable LH versus AH	1	190	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.18, 2.39]
12 Chest infection	3	294	Odds Ratio (M-H, Fixed, 95% CI)	0.31 [0.07, 1.35]
12.1 LAVH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
12.2 LH(a) versus AH	2	104	Odds Ratio (M-H, Fixed, 95% CI)	0.63 [0.10, 3.93]
12.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
12.4 Non-categorisable LH versus AH	1	190	Odds Ratio (M-H, Fixed, 95% CI)	0.11 [0.01, 2.01]

13 Infection unspecified	12	1879	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.49, 0.87]
13.1 LAVH versus AH	3	258	Odds Ratio (M-H, Fixed, 95% CI)	0.28 [0.09, 0.89]
13.2 LH(a) versus AH	6	453	Odds Ratio (M-H, Fixed, 95% CI)	0.43 [0.24, 0.75]
13.3 TLH versus AH	1	102	Odds Ratio (M-H, Fixed, 95% CI)	0.24 [0.03, 2.18]
13.4 Non-categorisable LH versus AH	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	0.92 [0.63, 1.34]
14 Thromboembolism	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	1.11 [0.24, 5.13]
14.1 LAVH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
14.2 LH(a) versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
14.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
14.4 Non-categorisable LH versus AH	2	1066	Odds Ratio (M-H, Fixed, 95% CI)	1.11 [0.24, 5.13]
15 Estimated blood loss	7	693	Mean Difference (IV, Fixed, 95% CI)	-45.26 [-72.68, -17.85]
15.1 LAVH versus AH	3	396	Mean Difference (IV, Fixed, 95% CI)	-33.08 [-68.27, 2.11]
15.2 LH(a) versus AH	4	297	Mean Difference (IV, Fixed, 95% CI)	-64.08 [-107.82, -20.35]
15.3 TLH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
15.4 Non-categorisable LH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
16 Drop in haemoglobin	3	288	Mean Difference (IV, Fixed, 95% CI)	-0.55 [-0.82, -0.28]
16.1 LAVH versus AH	1	116	Mean Difference (IV, Fixed, 95% CI)	-0.46 [-0.83, -0.09]
16.2 LH(a) versus AH	2	172	Mean Difference (IV, Fixed, 95% CI)	-0.66 [-1.05, -0.27]
16.3 TLH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
16.4 Non-categorisable LH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
17 Hospital stay (days)	9	948	Mean Difference (IV, Fixed, 95% CI)	-2.03 [-2.19, -1.88]
17.1 LAVH versus AH	4	466	Mean Difference (IV, Fixed, 95% CI)	-2.13 [-2.37, -1.90]
17.2 LH(a) versus AH	4	380	Mean Difference (IV, Fixed, 95% CI)	-1.57 [-1.81, -1.34]
17.3 TLH versus AH	1	102	Mean Difference (IV, Fixed, 95% CI)	-3.80 [-4.33, -3.27]
17.4 Non-categorisable LH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
18 Return to normal activities (days)	6	520	Mean Difference (IV, Fixed, 95% CI)	-13.63 [-15.42, -11.84]
18.1 LAVH versus AH	1	80	Mean Difference (IV, Fixed, 95% CI)	-8.40 [-12.15, -4.65]
18.2 LH(a) versus AH	5	440	Mean Difference (IV, Fixed, 95% CI)	-15.17 [-17.21, -13.14]
18.3 TLH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
18.4 Non-categorisable LH versus AH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
19 Fistula	2	245	Odds Ratio (M-H, Fixed, 95% CI)	3.07 [0.32, 29.96]
19.1 LAVH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
19.2 LH(a) versus AH	1	143	Odds Ratio (M-H, Fixed, 95% CI)	3.09 [0.12, 77.01]
19.3 TLH versus AH	1	102	Odds Ratio (M-H, Fixed, 95% CI)	3.06 [0.12, 76.88]
19.4 Non-categorisable LH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
20 Urinary dysfunction	2	246	Odds Ratio (M-H, Fixed, 95% CI)	0.94 [0.48, 1.84]
20.1 LAVH versus AH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
20.2 LH(a) versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
20.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable

20.4 Non-categorisable LH versus AH	1	166	Odds Ratio (M-H, Fixed, 95% CI)	0.88 [0.44, 1.76]
21 Satisfaction	1	166	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.32, 1.30]
21.1 LAVH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
21.2 LH(a) versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
21.3 TLH versus AH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
21.4 Non-categorisable LH versus AH	1	166	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.32, 1.30]

Comparison 4. LH vs VH

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Operation time (mins)	4	293	Mean Difference (IV, Fixed, 95% CI)	41.54 [33.67, 49.41]
1.1 LAVH versus VH	1	80	Mean Difference (IV, Fixed, 95% CI)	21.0 [8.05, 33.95]
1.2 LH(a) versus VH	3	213	Mean Difference (IV, Fixed, 95% CI)	53.58 [43.67, 63.49]
1.3 TLH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.4 Non-categorisable LH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
2 Operation time (mins) (descriptive data)			Other data	No numeric data
3 Intraoperative complications (dich)	7		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Bladder injury	6	805	Odds Ratio (M-H, Fixed, 95% CI)	0.91 [0.32, 2.56]
3.2 Ureter injury	1	504	Odds Ratio (M-H, Fixed, 95% CI)	1.51 [0.06, 37.18]
3.3 Urinary tract (bladder or ureter) injury	6	805	Odds Ratio (M-H, Fixed, 95% CI)	1.00 [0.36, 2.75]
3.4 Bowel injury	1	504	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
3.5 Vascular injury	4	685	Odds Ratio (M-H, Fixed, 95% CI)	1.58 [0.48, 5.27]
3.6 Bleeding	1	504	Odds Ratio (M-H, Fixed, 95% CI)	1.51 [0.06, 37.18]
3.7 Unintended laparotomy	6	842	Odds Ratio (M-H, Fixed, 95% CI)	1.55 [0.75, 3.21]
4 Short term outcomes(dich)	6		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Transfusion	5	801	Odds Ratio (M-H, Fixed, 95% CI)	1.70 [0.80, 3.63]
4.2 Pelvic haematoma	2	160	Odds Ratio (M-H, Fixed, 95% CI)	0.42 [0.06, 2.90]
4.3 Vaginal cuff infection	4	276	Odds Ratio (M-H, Fixed, 95% CI)	0.98 [0.22, 4.39]
4.4 Abdominal wall infection	1	80	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
4.5 UTI	2	140	Odds Ratio (M-H, Fixed, 95% CI)	1.00 [0.14, 7.25]
4.6 Chest infection	1	60	Odds Ratio (M-H, Fixed, 95% CI)	0.19 [0.01, 4.06]
4.7 Infection unspecified	5	780	Odds Ratio (M-H, Fixed, 95% CI)	0.77 [0.46, 1.26]
4.8 Thrombo-embolism	1	504	Odds Ratio (M-H, Fixed, 95% CI)	2.52 [0.12, 52.76]
5 Short term outcomes (cont)	5		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
5.1 Estimated blood loss (mls)	3	196	Mean Difference (IV, Fixed, 95% CI)	9.72 [-50.21, 69.65]
5.2 Change in Hb	2	157	Mean Difference (IV, Fixed, 95% CI)	0.15 [-0.26, 0.56]
6 Short term outcomes (descriptive data)			Other data	No numeric data
6.3 Estimated blood loss (ml)			Other data	No numeric data
6.5 Change in Hb			Other data	No numeric data
7 Pain relief (descriptive data)			Other data	No numeric data
7.1 Pain scales			Other data	No numeric data

7.2 Postoperative analgesics			Other data	No numeric data
8 Recovery from surgery	4		Mean Difference (IV, Random, 95% CI)	Subtotals only
8.1 Length of hospital stay (days)	3	237	Mean Difference (IV, Random, 95% CI)	0.33 [-0.13, 0.79]
8.2 Return to normal activities (days)	2	140	Mean Difference (IV, Random, 95% CI)	-1.07 [-4.21, 2.06]
9 Recovery from surgery (descriptive data)			Other data	No numeric data
9.1 Length of hospital stay			Other data	No numeric data
9.2 Return to normal activities			Other data	No numeric data
10 Long term outcomes - negative	2		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
10.1 Fistula	1	56	Odds Ratio (M-H, Fixed, 95% CI)	0.30 [0.01, 7.67]
10.2 Urinary dysfunction	1	80	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
11 Cost (descriptive data)			Other data	No numeric data

Comparison 5. LH sub-category analyses versus VH

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Bladder injury	6	805	Odds Ratio (M-H, Fixed, 95% CI)	0.91 [0.32, 2.56]
1.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.22]
1.2 LH(a) versus VH	2	136	Odds Ratio (M-H, Fixed, 95% CI)	2.98 [0.30, 29.43]
1.3 TLH versus VH	1	40	Odds Ratio (M-H, Fixed, 95% CI)	0.32 [0.01, 8.26]
1.4 Non-categorisable LH versus VH	2	549	Odds Ratio (M-H, Fixed, 95% CI)	0.83 [0.18, 3.79]
2 Ureter injury	1	504	Odds Ratio (M-H, Fixed, 95% CI)	1.51 [0.06, 37.18]
2.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
2.2 LH(a) versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
2.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
2.4 Non-categorisable LH versus VH	1	504	Odds Ratio (M-H, Fixed, 95% CI)	1.51 [0.06, 37.18]
3 Urinary tract (bladder or ureter) injury	6	805	Odds Ratio (M-H, Fixed, 95% CI)	1.00 [0.36, 2.75]
3.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.22]
3.2 LH(a) versus VH	2	136	Odds Ratio (M-H, Fixed, 95% CI)	2.98 [0.30, 29.43]
3.3 TLH versus VH	1	40	Odds Ratio (M-H, Fixed, 95% CI)	0.32 [0.01, 8.26]
3.4 Non-categorisable LH versus VH	2	549	Odds Ratio (M-H, Fixed, 95% CI)	1.01 [0.23, 4.38]
4 Bowel injury	1	504	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
4.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
4.2 LH(a) versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
4.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
4.4 Non-categorisable LH versus VH	1	504	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
5 Vascular injury	4	685	Odds Ratio (M-H, Fixed, 95% CI)	1.58 [0.48, 5.27]
5.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
5.2 LH(a) versus VH	2	136	Odds Ratio (M-H, Fixed, 95% CI)	2.89 [0.11, 74.15]
5.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable

5.4 Non-categorisable LH versus VH	2	549	Odds Ratio (M-H, Fixed, 95% CI)	1.42 [0.39, 5.22]
6 Bleeding	1	504	Odds Ratio (M-H, Fixed, 95% CI)	1.51 [0.06, 37.18]
6.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
6.2 LH(a) versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
6.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
6.4 Non-categorisable LH versus VH	1	504	Odds Ratio (M-H, Fixed, 95% CI)	1.51 [0.06, 37.18]
7 Unintended laparotomy	6	842	Odds Ratio (M-H, Fixed, 95% CI)	1.55 [0.75, 3.21]
7.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	4.33 [0.46, 40.61]
7.2 LH(a) versus VH	3	213	Odds Ratio (M-H, Fixed, 95% CI)	6.11 [1.06, 35.21]
7.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
7.4 Non-categorisable LH versus VH	2	549	Odds Ratio (M-H, Fixed, 95% CI)	0.67 [0.26, 1.74]
8 Transfusion	5	801	Odds Ratio (M-H, Fixed, 95% CI)	1.70 [0.80, 3.63]
8.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	0.49 [0.04, 5.60]
8.2 LH(a) versus VH	3	217	Odds Ratio (M-H, Fixed, 95% CI)	2.49 [0.63, 9.86]
8.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
8.4 Non-categorisable LH versus VH	1	504	Odds Ratio (M-H, Fixed, 95% CI)	1.74 [0.63, 4.79]
9 Pelvic haematoma	2	160	Odds Ratio (M-H, Fixed, 95% CI)	0.42 [0.06, 2.90]
9.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.22]
9.2 LH(a) versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	0.49 [0.04, 5.60]
9.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
9.4 Non-categorisable LH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
10 Vaginal cuff infection	4	276	Odds Ratio (M-H, Fixed, 95% CI)	0.98 [0.22, 4.39]
10.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	1.0 [0.06, 16.56]
10.2 LH(a) versus VH	3	196	Odds Ratio (M-H, Fixed, 95% CI)	0.97 [0.16, 5.73]
10.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
10.4 Non-categorisable LH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
11 Wound/abdominal wall infection	1	80	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
11.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
11.2 LH(a) versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
11.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
11.4 Non-categorisable LH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
12 UTI	2	140	Odds Ratio (M-H, Fixed, 95% CI)	1.00 [0.14, 7.25]
12.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.22]
12.2 LH(a) versus VH	1	60	Odds Ratio (M-H, Fixed, 95% CI)	3.10 [0.12, 79.23]
12.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
12.4 Non-categorisable LH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
13 Chest infection	1	60	Odds Ratio (M-H, Fixed, 95% CI)	0.19 [0.01, 4.06]
13.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
13.2 LH(a) versus VH	1	60	Odds Ratio (M-H, Fixed, 95% CI)	0.19 [0.01, 4.06]
13.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
13.4 Non-categorisable LH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
14 Infection unspecified	5	780	Odds Ratio (M-H, Fixed, 95% CI)	0.77 [0.46, 1.26]

14.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	1.0 [0.06, 16.56]
14.2 LH(a) versus VH	3	196	Odds Ratio (M-H, Fixed, 95% CI)	0.99 [0.28, 3.51]
14.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
14.4 Non-categorisable LH versus VH	1	504	Odds Ratio (M-H, Fixed, 95% CI)	0.72 [0.41, 1.25]
15 Thromboembolism	1	504	Odds Ratio (M-H, Fixed, 95% CI)	2.52 [0.12, 52.76]
15.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
15.2 LH(a) versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
15.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
15.4 Non-categorisable LH versus VH	1	504	Odds Ratio (M-H, Fixed, 95% CI)	2.52 [0.12, 52.76]
16 Estimated blood loss (mls)	3	196	Mean Difference (IV, Fixed, 95% CI)	9.72 [-50.21, 69.65]
16.1 LAVH versus VH	1	80	Mean Difference (IV, Fixed, 95% CI)	24.0 [-90.93, 138.93]
16.2 LH(a) versus VH	2	116	Mean Difference (IV, Fixed, 95% CI)	4.39 [-65.85, 74.63]
16.3 TLH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
16.4 Non-categorisable LH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
17 Drop in haemoglobin	2	157	Mean Difference (IV, Fixed, 95% CI)	0.15 [-0.26, 0.56]
17.1 LAVH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
17.2 LH(a) versus VH	2	157	Mean Difference (IV, Fixed, 95% CI)	0.15 [-0.26, 0.56]
17.3 TLH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
17.4 Non-categorisable LH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
18 Hospital stay (days)	3	237	Mean Difference (IV, Fixed, 95% CI)	0.33 [-0.13, 0.79]
18.1 LAVH versus VH	1	80	Mean Difference (IV, Fixed, 95% CI)	0.30 [-0.25, 0.85]
18.2 LH(a) versus VH	2	157	Mean Difference (IV, Fixed, 95% CI)	0.40 [-0.42, 1.22]
18.3 TLH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
18.4 Non-categorisable LH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
19 Return to normal activities (days)	2	140	Mean Difference (IV, Fixed, 95% CI)	-1.07 [-4.21, 2.06]
19.1 LAVH versus VH	1	80	Mean Difference (IV, Fixed, 95% CI)	-1.60 [-5.11, 1.91]
19.2 LH(a) versus VH	1	60	Mean Difference (IV, Fixed, 95% CI)	1.0 [-5.95, 7.95]
19.3 TLH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
19.4 Non-categorisable LH versus VH	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
20 Fistula	1	56	Odds Ratio (M-H, Fixed, 95% CI)	0.30 [0.01, 7.67]
20.1 LAVH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
20.2 LH(a) versus VH	1	56	Odds Ratio (M-H, Fixed, 95% CI)	0.30 [0.01, 7.67]
20.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
20.4 Non-categorisable LH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
21 Urinary dysfunction	1	80	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
21.1 LAVH versus VH	1	80	Odds Ratio (M-H, Fixed, 95% CI)	3.08 [0.12, 77.80]
21.2 LH(a) versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
21.3 TLH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
21.4 Non-categorisable LH versus VH	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 6. Comparisons of different types of LH - LH(a) versus LAVH

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Operation time (mins)	1	101	Mean Difference (IV, Fixed, 95% CI)	25.30 [10.00, 40.60]
2 Intraoperative complications (dich)	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Bladder injury	1	101	Odds Ratio (M-H, Fixed, 95% CI)	0.72 [0.06, 8.27]
2.2 Ureter injury	1	101	Odds Ratio (M-H, Fixed, 95% CI)	3.03 [0.27, 34.52]
2.3 Urinary tract injury	1	101	Odds Ratio (M-H, Fixed, 95% CI)	1.5 [0.29, 7.83]
2.4 Bowel injury	1	101	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
2.5 Vascular injury	1	101	Odds Ratio (M-H, Fixed, 95% CI)	1.48 [0.09, 24.27]
2.6 Conversion to laparotomy	1	104	Odds Ratio (M-H, Fixed, 95% CI)	0.73 [0.06, 8.34]
3 Short term outcomes (dich)	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Transfusion	1	101	Odds Ratio (M-H, Fixed, 95% CI)	0.72 [0.13, 4.11]
3.2 Infection unspecified	1	101	Odds Ratio (M-H, Fixed, 95% CI)	1.5 [0.29, 7.83]
3.3 Vaginal cuff infection	1	101	Odds Ratio (M-H, Fixed, 95% CI)	0.28 [0.03, 2.45]
4 Estimated blood loss (descriptive data)			Other data	No numeric data
5 Long term outcomes (dich)	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
5.1 Dyspareunia	1	101	Odds Ratio (M-H, Fixed, 95% CI)	2.64 [0.59, 11.72]
5.2 Orgasm (<1 of 3)	1	101	Odds Ratio (M-H, Fixed, 95% CI)	0.84 [0.38, 1.86]
6 Recovery from surgery	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
6.1 Hospital stay (days)	1	101	Mean Difference (IV, Fixed, 95% CI)	Not estimable
6.2 Return to normal activities (weeks)	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable

WHAT'S NEW

Last assessed as up-to-date: 8 February 2006.

6 November 2008	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 2, 2002

Review first published: Issue 1, 2005

9 February 2006	New citation required and conclusions have changed	Substantive amendment

CONTRIBUTIONS OF AUTHORS

Neil Johnson: conceptualised the review, wrote the protocol and the review, having supervised the selection of trials and data extraction.

David Barlow: involved in conceptualising the review; commented on the protocol and the review.

Anne Lethaby: commented the protocol, assisted with selection of trials, data extraction, data entry and commented on the review.

Emma Tavender: trial selection, data extraction, trial quality assessment, data entry, wrote part of the description of studies and the methodological quality of included studies sections and commented on the review.

Elizabeth Curr: trial selection, data extraction and commented on the review.

Ray Garry: commented on the protocol and the review.

DECLARATIONS OF INTEREST

Ray Garry is the principal investigator in a UK-based multicentre randomised trial comparing LH with both AH and VH (Garry 2004).

SOURCES OF SUPPORT

Internal sources

- None detailed, Not specified.

External sources

- No sources of support supplied

INDEX TERMS

Medical Subject Headings (MeSH)

Genital Diseases, Female [*surgery]; Hysterectomy [adverse effects; *methods]; Hysterectomy, Vaginal [adverse effects; methods]; Laparoscopy [adverse effects; *methods]; Randomized Controlled Trials as Topic

MeSH check words

Female; Humans