



## Review article

## Evidence-based practical guidelines of the International Society for Gynecologic Endoscopy (ISGE) for vaginal hysterectomy

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## ABSTRACT

**Objective:** The study was established by the International Society for Gynecologic Endoscopy (ISGE) to provide evidence-based recommendations in the steps that should be undertaken in successfully performing a vaginal hysterectomy for a non-prolapsed uterus.

**Material and methods:** The ISGE Task Force for vaginal hysterectomy for the non-prolapsed uterus defined key clinical questions regarding the surgical technique, which led the Medline/PubMed and the Cochrane Database literature search. Identified pertinent articles, published in English from 1997 to 2019, were analysed. The available information was graded by the level of evidence using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) Working Group approach. The recommendations were developed through multiple cycles of literature analysis and expert discussion.

**Results:** Six recommendations were established:

1. A circular incision at the level of cervico-vaginal junction is recommended (grade IC).
2. The posterior peritoneum should be opened first (grade IC).
3. Clamping and cutting the uterosacral and cardinal ligaments before or after getting access into anterior peritoneum is recommended (grade IC).
4. Routine closure of the peritoneum during vaginal hysterectomy is not recommended (grade IB).
5. Vertical or horizontal closure of the vaginal vault following vaginal hysterectomy is recommended (grade IC).
6. To insert a vaginal plug following vaginal hysterectomy is not recommended (grade IB).

**Conclusion:** Vaginal hysterectomy for a non-prolapsed uterus should be the preferential route for removing the uterus when hysterectomy is indicated. The ISGE provides evidence-based practical guidelines on how vaginal hysterectomy for non-prolapsed uterus should be undertaken. All efforts should be directed in teaching the surgical technique of vaginal hysterectomy during residency.

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## Contents

Introduction	2
Material and methods	2
Results	2
Preoperative considerations	2
Antibiotic prophylaxis	3
Positioning the patient	3

**Abbreviations:** AH, abdominal hysterectomy; GRADE, grading of recommendations, assessment, development and evaluation; ISGE, International Society for Gynecologic Endoscopy; LH, laparoscopic hysterectomy; VH, vaginal hysterectomy.

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Incision of the vaginal wall .....	3
Opening the posterior peritoneum .....	4
Bladder detachment from the uterus and anterior peritoneum opening .....	5
Dissection of the utero-sacral ligaments and cardinal ligaments .....	5
Clamping, cutting, and ligating the uterine arteries .....	6
Dissection of the upper part of the uterine support .....	6
Closure of the peritoneum .....	7
Closure of the vaginal vault .....	7
Urine catheter placement and vaginal plug insertion .....	7
Discussion .....	8
Conclusion .....	8
References .....	8

## Introduction

Hysterectomy is one of the most common operative procedures for benign gynecological diseases [1,2]. It can be performed abdominally, vaginally or laparoscopically, with or without robotic assistance. The benefits of vaginal hysterectomy (VH) and laparoscopic hysterectomy (LH) over abdominal hysterectomy (AH) have been widely reported [3–7]. The advantages provided by VH, with or without laparoscopic assistance, include less post-operative pain, less analgesia needed, shorter hospital stay, and a more rapid recovery and return to daily activities [7–9]. Furthermore, following all the parameters of the least invasive non-scar hysterectomy, VH is associated with fewer intra-operative and post-operative complications as compared with AH or LH [10–14]. In spite of these benefits, all large-scale surveys of hysterectomy practice show that 70–80 % of hysterectomies are performed via the abdominal approach [11]. This preference is largely attributed to a lack of experience in VH, resulting in the surgeon's reluctance to perform VH, especially in patients without uterine prolapse, with uterine fibroids, previous caesarean sections, previous laparotomies, as well as in nulliparous women. The vaginal route has been found to be a safe option for these indications for hysterectomy, and may lead to an increased number of VH [15–23].

Globally, the focus on performing LH appears to result in significant reductions in rates of VH, without perceptible impact on the AH rates [14,24–30]. In Belgium, for example, the focus on LH resulted in VH rates dropping from 34 % in the early 1990s to only 8 % in 2006, and in Norway from 9 % in 2001 to only 3 % in 2005, mainly performed for utero-vaginal prolapse. In some regions (e.g. certain hospitals in India, Belgium, Norway and the US), the percentage of VH has remained stable, with 20 % carried out this way [13,25–27]. The decrease in VH may well reflect a lack of scientific approach in choosing the route of hysterectomy. Unfortunately, surgeons all too often choose a route based on their own personal preference, rather than appealing to the evidence contained within the Cochrane database of systematic reviews on surgical approach to hysterectomy for benign gynaecological disease [1,7]. It is a common perception that the decreasing VH rate, sacrificed in favour of LH, may be at least partially attributed to the impact of the industry that manufactures the laparoscopic equipment.

The trend in reduced rates of VH is concerning, in parallel with the fact that many residents leave residency programs without adequate proficiency in performing VH. Recent literature suggests that proficiency is achieved after 21–27 cases of VH during residency [25,28]. However, the current minimum requirement for VH in the USA residency programs is 15 cases, and only 5 cases during a four-year residency program in South Africa. This number of cases may provide exposure but is certainly not sufficient to ensure proficiency in performing VH.

Adequate training during residency and sufficient exposure to VH are vital components of the strategy to increase the prevalence

of VH. Other factors that are considered prerequisites for a successful VH include vaginal accessibility, together with the size and shape of the uterus. The confirmation of pathology confined or not to the uterus may also influence the choice in route of hysterectomy. The International Society for Gynecologic Endoscopy (ISGE) recently established evidence-based recommendations on the selection of woman with benign uterine pathology who can undergo safe VH [29]. In Fig. 1, an algorithm is reproduced from this ISGE publication, guiding the selection [29].

With the adoption of evidence-based practical guidelines and adequate surgical education, the proportion of hysterectomies performed vaginally can be increased and would lower the cost and complication rate [30–35]. For this reason, ISGE decided to introduce evidence-based practical guidelines on how VH for a non-prolapsed uterus should be undertaken.

## Material and methods

The ISGE Task Force for VH for the non-prolapsed uterus defined key clinical questions (Table 1) regarding the surgical technique, which led the search of Medline/PubMed and the Cochrane Database. English-language articles, published from 1997 to 2019, including original works and previous reviews, were analysed. Using the GRADE approach (<http://www.gradeworkinggroup.org>; Table 2), for each clinical question, we graded the available information by the level of evidence. The recommendations were developed through multiple cycles of literature analysis and expert discussion. The ISGE Ethical Committee ruled that approval was not required for this study.

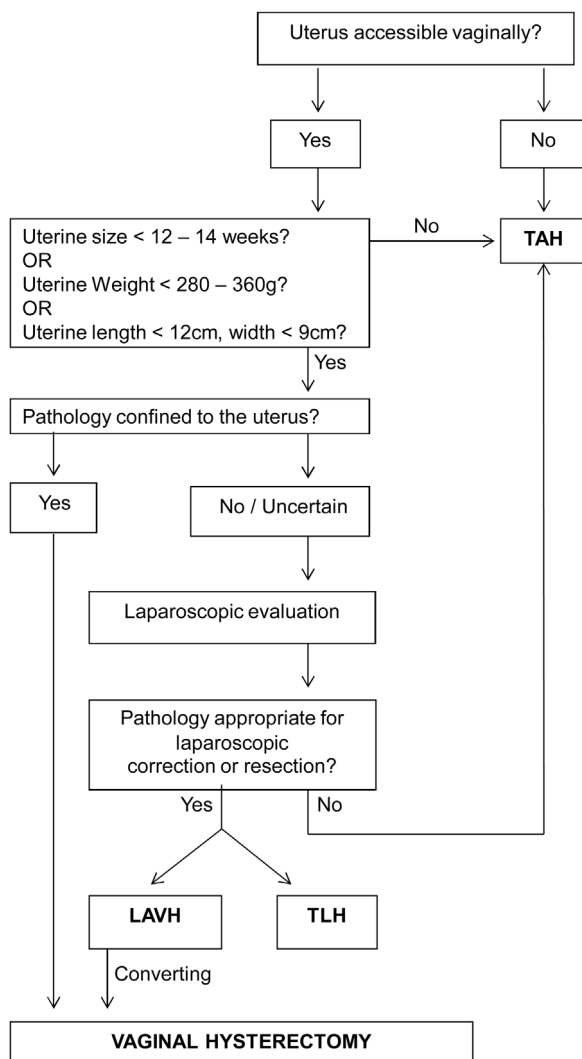
## Results

An inadequate number of randomised controlled trials (RCTs), systematic reviews, and meta-analyses are currently available to guide surgeons with respect to the VH procedure. Expert opinion has to be taken into account. The experience of surgeons with high case volumes serve as an important point of reference. The procedure presented below is a 10-step approach that is applicable in most cases of VH for benign conditions and a non-prolapsed uterus. Six recommendations on surgical steps for VH, including two grade IB and four grade IC were established (Table 3).

### Preoperative considerations

The preoperative discussion should include an informed consent specifically documenting the risks and benefits of planned hysterectomy and the removal/conservation of the ovaries, expected outcomes and alternatives. Documentation that future fertility is not desired and pregnancy test are required in premenopausal women.

Preoperative evaluation of the patient's general health status is fundamental in order to obtain a satisfactory outcome after



**Fig. 1.** Determining the route of hysterectomy for benign disease (reproduced with permission from [29]). Abbreviations, LAVH, laparoscopic-assisted vaginal hysterectomy; TAH, total abdominal hysterectomy; TLH, total laparoscopic hysterectomy.

surgery. Cervical cancer screening should be up to date. It is important to evaluate the patient for anemia and correct it when existent. The risk factors associated with venous thromboembolic events should be assessed, allowing appropriate prophylaxis to be chosen.

#### Antibiotic prophylaxis

As indicated by other specific guidelines, all women undergoing vaginal hysterectomy should receive antibiotic prophylaxis (grade IC); cephalosporins (2nd or 3rd generation) and metronidazole are of proven value for vaginal hysterectomy

(<https://elearning.rcog.org.uk/preparation-patient-theatre/practical-points/antibiotic-prophylaxis/antibiotic>).

#### Positioning the patient

After appropriate general or regional (spinal) anaesthesia is completed, the patient is placed in the dorsal lithotomy position with buttocks protruding slightly beyond the edge of the table with her feet in stirrups. The lateral aspects of the legs should be clear of the stirrups to avoid pressure on the peroneal nerve.

Obesity should not be considered as a contraindication to VH. Obese and morbidly obese (BMI > 35) patients who undergo hysterectomy are at an increased risk of suffering complications such as pulmonary compromise, venous thrombosis, wound infection, and wound dehiscence. In practice, irrespective of the BMI, abdominal hysterectomy should be taken as an undesirable route for obese patients. Vaginal hysterectomy, where feasible, may be considered the primary route for hysterectomy in even morbidly obese woman [13]. However, in obese and morbidly obese (BMI > 35) women, it is advisable to apply a super flexion position (Fig. 2A). Anatomically, this position makes the uterus descend downward and fall backward, bringing the cervix closer to introitus. This may also facilitate bilateral salpingo-oophorectomy or an ovarian cystectomy, where this is needed [36].

After the skin and vaginal area are prepped in a habitual fashion, the urinary bladder is emptied with a metallic urinary catheter. Alternative indwelling Foley catheter can be inserted. A careful and completed bimanual examination must then be performed to confirm the degree of physiological or normal uterine descent, and the width of the vaginal outlet. The cervix is exposed by placing a weighted posterior retractor or the blade of the Auvarud speculum. A small right angle retractor (Wertheim angle retractor) may be used to elevate the anterior vaginal wall. Two vulsellums are then utilized to grasp the anterior and posterior lips of the cervix and pulled into the vaginal introitus (Fig. 2B). The vulsellum is placed on the anterior lip of the cervix, upside down, so that instead of the instrument being concave upwards, it is concave downwards. The second vulsellum is placed on the posterior lip of the cervix with the instrument being concave upwards. While traction on the cervix downward is applied, massaging the uterosacral and cardinal ligaments bilaterally, especially on the left, may facilitate further descent [37].

#### Incision of the vaginal wall

While downward traction is applied with the vulsellum, a circular incision around the cervico-vaginal junction is performed (**recommendation grade IC**). The level of the incision is critical to find the correct plane of dissection between the bladder and lower uterine segment. The point of attachment of the vaginal mucosa to the cervix can be demonstrated by moving the cervix up and down. The incision should be made at the border between the smooth cervical mucosa and the vaginal rugae (Fig. 2C). An incision above the border of the cervix and vaginal rugae can lead to bladder injury and unnecessary bleeding, whereas if the incision is below the border, incision of the cervix may cause bleeding. It is

**Table 1**  
Vaginal hysterectomy – key clinical questions.

Question 1:	Circular or V incision of the vaginal wall when performing VH for non-prolapsed uterus?
Question 2:	Clamping and cutting the uterosacral and cardinal ligaments before or after getting access into anterior and posterior peritoneum?
Question 3:	Detaching the bladder before or after opening the posterior peritoneum?
Question 4:	Closure or not of the peritoneum following VH?
Question 5:	Vertical or horizontal closure of the vaginal vault following VH?
Question 6:	To insert or not vaginal plug following VH?

Abbreviation: VH, vaginal hysterectomy.

**Table 2**

GRADE approach – grading of recommendations, risk/benefit and quality of supporting evidence.

Grade of recommendation	Risk/benefit	Quality of supporting evidence
1A. Strong recommendation, high quality evidence	Benefits clearly outweigh risk and burdens, or vice versa.	Consistent evidence from well performed randomized, controlled trials or overwhelming evidence of some other form. Further research is unlikely to change our confidence in the estimate of benefit and risk.
1B. Strong recommendation, moderate quality evidence	Benefits clearly outweigh risk and burdens, or vice versa.	Evidence from randomized, controlled trials with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence of some other research design. Further research (if performed) is likely to have an impact on our confidence in the estimate of benefit and risk and may change the estimate.
1C. Strong recommendation, low quality evidence	Benefits appear to outweigh risk and burdens, or vice versa.	Evidence from observational studies, unsystematic clinical experience, or from randomized, controlled trials with serious flaws. Any estimate of effect is uncertain.
2A. Weak recommendation, high quality evidence	Benefits closely balanced with risks and burdens.	Consistent evidence from well performed randomized, controlled trials or overwhelming evidence of some other form. Further research is unlikely to change our confidence in the estimate of benefit and risk.
2B. Weak recommendation, moderate quality evidence	Benefits closely balanced with risks and burdens, some uncertainty in the estimates of benefits, risks and burdens.	Evidence from randomized, controlled trials with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence of some other research design. Further research (if performed) is likely to have an impact on our confidence in the estimate of benefit and risk and may change the estimate.
2C. Weak recommendation, low quality evidence	Uncertainty in the estimates of benefits, risks, and burdens; benefits may be closely balanced with risks and burdens.	Evidence from observational studies, unsystematic clinical experience, or from randomized, controlled trials with serious flaws. Any estimate of effect is uncertain.

**Table 3**

The ISGE recommendations for vaginal hysterectomy technique.

Recommendation	Grade of recommendation
A circular incision at the level of cervico-vagina junction is recommended	Grade IC
The posterior peritoneum should be opened first	Grade IC
Clamping and cutting the uterosacral and cardinal ligaments before or after getting access into anterior peritoneum is recommended	Grade IC
Routine closure of the peritoneum during VH is not recommended	Grade IB
Vertical or horizontal closure of the vaginal vault following VH is recommended	Grade IC
To insert a vaginal plug following VH is not recommended	Grade IB

important for the incision to be deep enough reaching the pubo-cervical fascia which appears at this level as a white or pale grey area. The vaginal mucosa is circumferentially pushed up, away from the incision, with the use of a swab-covered index finger. This is done all the way up to the peritoneal vesico-uterine fold, anteriorly and posteriorly, far away up to the insertion of utero sacral ligament to the cervix.

The blade of the Wertheim angle retractor is placed under the vaginal mucosa and the bladder. Then, with strong traction on the cervical vulsellums downward, and counter traction with the retractor lifting up the anterior vaginal wall, the proper plane of dissection between the bladder and the cervix is found. This manoeuvre aids to identify the peritoneal vesico-uterine fold or anterior peritoneum, which appears as a pearly-white transverse line across the lower uterine segment lying on the wide V-shaped, shiny serosal surface of the uterus. Circular incision around the cervico-vaginal junction had been proposed by Sheth and others [38–47].

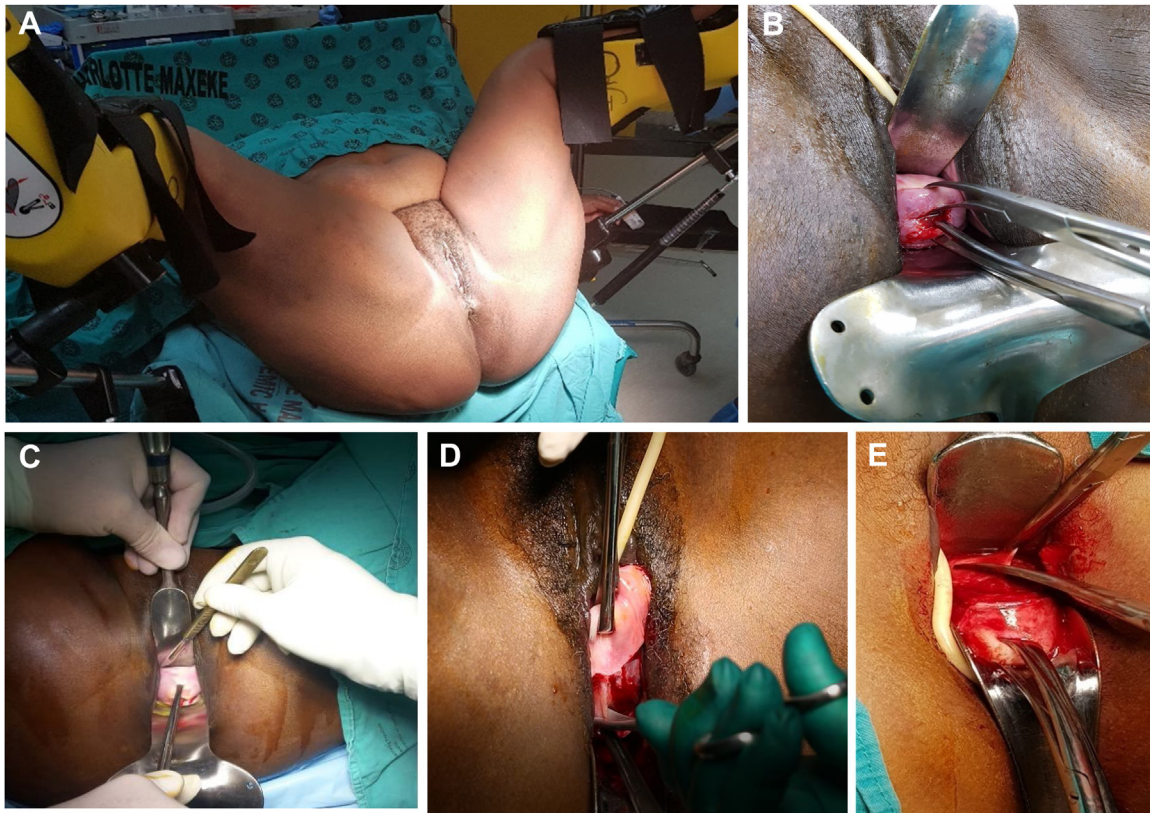
The anterior and posterior peritoneum are preferentially opened before the clamping and the cutting of the uterosacral and cardinal ligaments. This optional opening of the anterior or vesico-uterine peritoneum after clamping and cutting the uterosacral and cardinal ligaments or the uterine vessels has been proposed by J. Cohen and others [37–42]. In some circumstances, when it is not feasible to enter the anterior peritoneum, before clamping and cutting the uterosacral/cardinal ligaments, it is worthwhile to detach the uterosacral and cardinal ligaments from

their attachment, once the vaginal mucosa and the bladder have been mobilised. This can facilitate further descent of the uterus and assist with the identification and opening of the bladder peritoneum.

#### *Opening the posterior peritoneum*

Once a circular incision around the cervico-vaginal junction is made and the vaginal mucosa is pushed away, the posterior peritoneum is opened first (**recommendation grade IC**). The vulsellums holding the cervix are pulled upwards by the assistant. The peritoneum between the two utero-sacral ligaments (USLs) is grasped with artery forceps and opened with curved Mayo scissors (Fig. 2D). The scissors are then introduced into the pouch of Douglas. With the blades inside the peritoneal cavity, the scissors are opened and the blades withdrawn in the opened position so that the peritoneum is being cut by the back of the blades of the open pair of scissors, as they are being withdrawn. With the index finger into the pouch of Douglas, the posterior aspect of the uterus is palpated. Fibroids or adhesions may be identified at this point, together with the size and mobility of the uterus. The blade of the Auvard forceps or Sims speculum is introduced into the peritoneal space (pouch of Douglas). A large swab can be inserted into the posterior pouch, preventing small bowel and omentum entering the operating field. This swab keeps the rectum away. Since one third of the inserted swab is left hanging outside the vulva, this will not have any risk of leaving it behind. When the upper half of the





**Fig. 2.** Vaginal hysterectomy step 1 - 4. **A**, Positioning the patient (dorsal lithotomy super flexion position of an obese patient). **B**, Grasping the anterior and posterior lips of the cervix. **C**, Incision of the vaginal wall. **D**, Opening posterior peritoneum. **E**, Opening anterior peritoneum.

swab, which is in POD, is bloody it can be replaced with another swab.

It is necessary to open the posterior peritoneum first in some cases, such as previous caesarean sections or cases of anterior fibroids, as the anterior peritoneum may be difficult to be opened [37–45]. In such circumstances, the index finger is introduced behind the uterus over the fundus of the uterus and the vesico-uterine peritoneum is identified and opened.

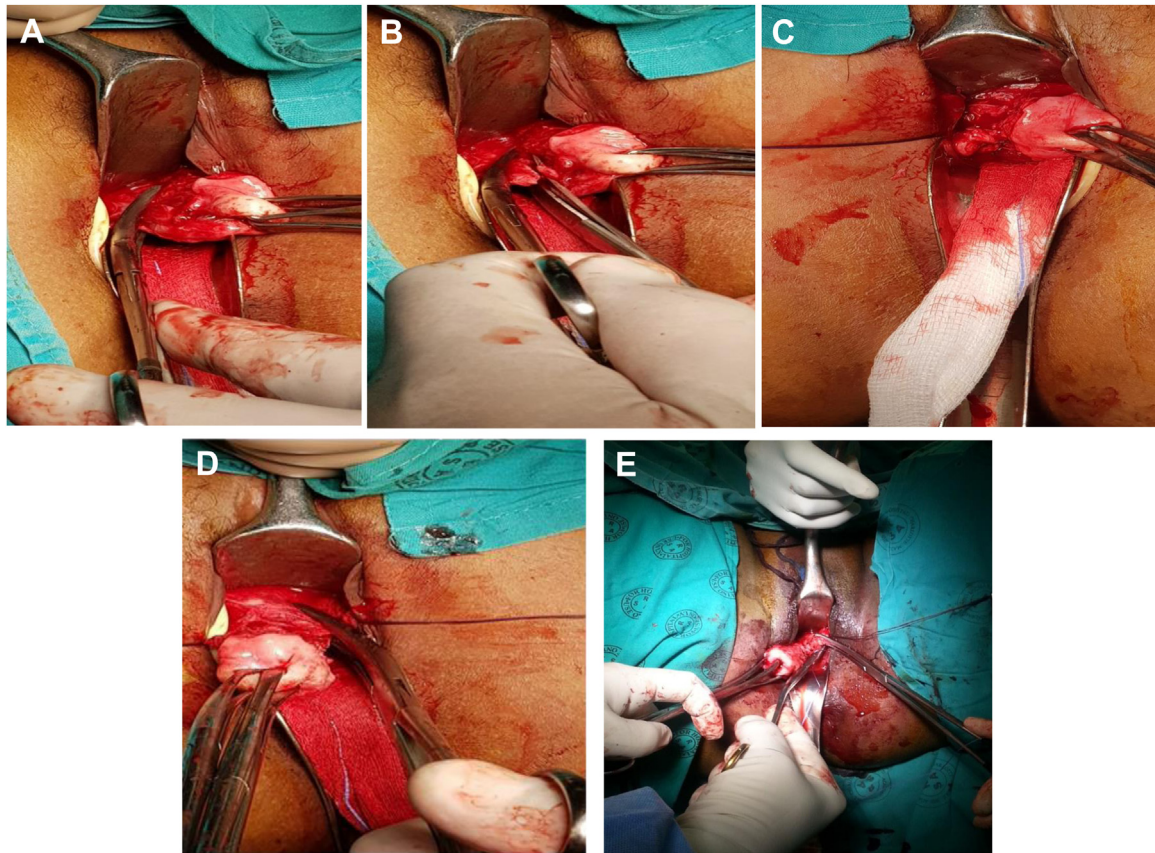
#### *Bladder detachment from the uterus and anterior peritoneum opening*

With the blade of the Wertheim angle retractor under the vaginal mucosa and bladder, the bladder is pushed up, with pressure, close to the uterus. As downward traction is applied with the vulsellums and counter traction upwards with the blade of the Wertheim angle retractor, the bladder will be separated from the uterus until the utero-vesical fold is exposed and the anterior peritoneum is identified. Exposure of the anterior peritoneal (utero-vesical) pouch is the most crucial step during VH. This is recognised as a white or pale area, owing to the double layer of peritoneum. The peritoneum is grasped with artery forceps or toothed dissecting forceps and opened with curved Mayo scissors (Fig. 2E). The scissor points must be angled towards the uterus to prevent accidental opening of the bladder. The blade of the Wertheim angle retractor is placed into the peritoneal cavity, separating the bladder from the uterus. Mild traction of this retractor not only holds the bladder out of the operating field, but also increases the distance of the ureters from the uterus. In our technique, entrance into the anterior and posterior cul-de-sac is established before clamping and cutting the uterosacral/cardinal ligaments, and definitely before clamping and cutting the uterine

vessels. This facilitates the successful vaginal removal of the non-prolapsed uterus, and is associated with less bleeding and the prevention of potential injury to the bladder and/or ureters anteriorly, as well as to the rectum and small bowel posteriorly. In extremely rare situations where, access into the vaginal is limited (i.e. nulliparous women), VH can be done well without clamps by using pedicle sealing devices or without using clamps – so-called clamplessly – by using the ligature technique [13,38]

#### *Dissection of the utero-sacral ligaments and cardinal ligaments*

It is believed that the utero-sacral ligaments (USLs) and the cardinal ligaments (CLs) may provide apical support of the upper vagina and the uterine cervix. Their dissection can be performed before or after getting access into the anterior peritoneum (**recommendation grade IC**). Although both ligaments are located in different anatomical planes and directions, they are clamped together. This is done in a specific way: the cervix is pulled toward the operator and in the contralateral direction with the vulsellums. A curved Maingot clamp or similar clamp is placed in the posterior cul-de-sac with one blade underneath the USL/CL complex and the opposite blade over the USL/CL complex. The clamp is placed perpendicular to the long axis of the uterus, next to the uterine cervix, so that some tissue of the cervix is included in the clamp. It is important that the clamp is not placed laterally to the cervix because the cardinal and uterosacral ligaments lie at the lower end of the broad ligament, below the uterine artery, and are pierced by the ureter, which lies in the ureteric canal lateral to the artery. Both anatomical structures (USLs/CLs) are cut and ligated with 0 or 2.0 delayed absorbable suture, using a full-length suture with the needle attached (Fig. 3A–C). These sutures are not cut but clipped



**Fig. 3. Vaginal hysterectomy step 5 and 6. A – C. Dissection of the utero-sacral and cardinal ligaments. D and E. Clamping, cutting and ligating the uterine arteries.**

to the covering drapes. The procedure is repeated on the contralateral side. The taking of these pedicles facilitates further descent of the uterus. The two sutures, with the needles attached will be used for closure of the vault to support the vault and avoid vault prolapse.

In patients with previous caesarean sections, or who present with previous inflammatory disease, endometriosis or anterior uterine wall fibroids, the anterior pouch, may be difficult to define. In such circumstances the index finger can be passed over the uterine fundus or broad ligament to define the anterior pouch. As described above, exposure of the anterior peritoneal (utero-vesical) pouch can be performed after the USLs/CLs are detached from their attachment, facilitating further descent of the uterus that makes the entry into the anterior peritoneal cavity easier. If it is still not possible to enter the space, we advise to make use of the uterocervical broad ligament space, described by Sheth [43]. In patient's with previous caesarean section the central 3/5 of the uterocervical surface is likely to be adherent to the bladder anteriorly and usually the bladder, the lateral 1/5 on both sides, lies freely on the cervico-uterine surface. The surgical technique had been described as follows: during VH, after the vaginal mucosa is incised push away the bladder with the assistance of the Wertheim angle retractor, the dissection is made laterally, first by scissors between the cervix and the bladder to enter the uterocervical space making room for the finger to follow, then insinuating upward and laterally beyond the lateral uterocervical border to enter into the continuing space between the two leaves of the broad ligament. The space is thus entered by sharp and blunt dissection and is gradually enlarged by the finger. After reaching the area between the uterocervical surface posteriorly and the

bladder anteriorly and using gentle traction medially with Babcock forceps on the free bladder, assisted by sharp and blunt dissection, the bladder is separated from the uterocervical surface.

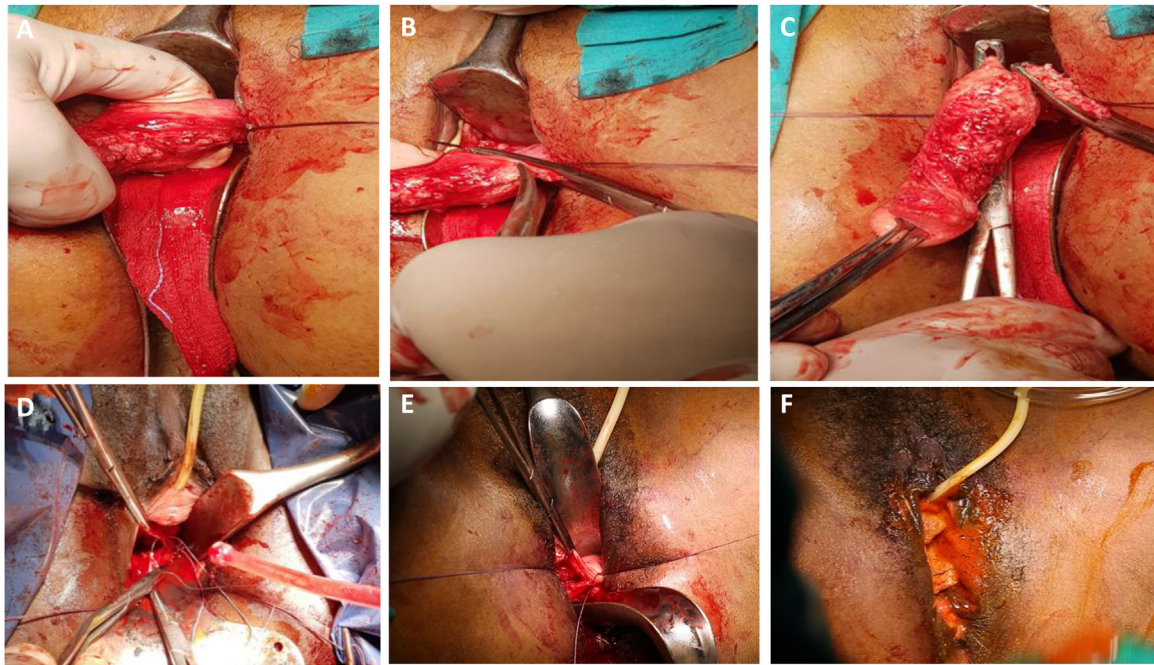
#### *Clamping, cutting, and ligating the uterine arteries*

Both uterine arteries are clamped, cut, and ligated. The uterine vessel pedicle, which contains the uterine artery and vein, and the broad ligament peritoneum anterior and posterior to these vessels, is clamped, cut, and ligated with a 0 or 2.0 delayed absorbable suture (Fig. 3D and E). Opening of the vesico-uterine peritoneum after clamping the uterine vessels, as recommended by Stark [45] and others [38,41,42], may lead to the injury of the bladder and the ureters if an inexperienced surgeon has not taken great care to mobilise the bladder well and to retract it well with the ureters. This emphasises the need for good early identification and mobilisation of the bladder. Routine opening of the vesico-uterine peritoneum after clamping the uterine vessels should be avoided. However, in rare circumstances, when the anterior peritoneal site cannot be reached earlier, careful bilateral severance of the USLs/CLs, vesico-uterine ligaments, and uterine vessels will allow the anterior peritoneal reflection provided the bladder is retracted laterally and superiorly away from the uterus, with the Wertheim angle retractor placed between the uterocervical surface and the bladder [43–47].

#### *Dissection of the upper part of the uterine support*

The remaining portion of the broad ligaments attached to the uterus (containing the round and ovarian ligaments, the proximal





**Fig. 4. Vaginal hysterectomy step 7–10.** A–C. Dissection of the upper part of the uterine support. D. Closure of the peritoneum. E. Closure of the vaginal vault. F. Vaginal plug insertion.

part of the fallopian tube and the blood vessels) is then clamped, cut, and ligated bilaterally. The Maingot clamp or equivalent should be placed as close to the uterine fundus as possible. The uterus is then detached using curved scissors, such as Mayo scissors or a scalpel if preferred (Fig. 4A–C). The pedicles are tied separately and should not be tied together. As such, we disagree with Stark [45] and Bina [44], who advised to ligate these pedicles to each another, as we have found that tying the pedicles together can bring the ovaries into the pouch of Douglas and thereby lead to severe deep dyspareunia post-operatively.

Whether to remove the adnexa with or after removal of the uterus is a decision made as the most superior pedicles are approached. We prefer to remove the uterus, and then to attend to the adnexa. It is mandatory that the decision for the removal of the adnexa, particularly ovaries, be always taken well before surgery and performed only after required counselling and consent for the oophorectomy.

Once VH is performed, a moistened pack is gently placed in the pelvis to prevent bowel obscuring visualisation. When elongation of the Infundibulo-pelvic ligament permits, traction is placed on the ovary by grasping it with a Babcock clamp. A Maingot clamp is then placed across the Infundibulo-pelvic ligaments, and the ovaries and tubes are excised. Both a suture tie and a transfixion suture ligature can be placed on these pedicles to ensure they are secure. If this is not possible, then the transected tube and utero-ovarian ligament are pulled *en bloc* medially into the operating field until the round ligament is visualised. The round ligament is then clamped, cut and ligated. This allows further descent of the tubo-ovarian pedicle into the field, which can be clamped just above the tip of the ovary, and then ligated [46]. Sheth recommends, clamping the round ligament and tube separately, then dividing the tube and utero ovarian ligament on one side. After the round ligament has been divided on the opposite side the tube and ovary can be visualised and a curved clamp is used to clamp the infundibulopelvic ligament and mesosalpinx. A specially devised clamp by the author with a curve of 2 cm beginning at 1 cm

from the tip facilitates and accommodates the infundibular pelvic ligament efficiently [38]

#### Closure of the peritoneum

Closure of the peritoneum is recommended by some, as this can prevent prolapse of the fallopian tubes, which may be a cause of severe pain post-operatively and may also prevent bowel evisceration and posterior enterocoele formation postoperatively, after the VH [41,47]. Routine re-peritonisation is not supported [45,44,48]. Leaving the peritoneum open was recommended by the Royal College of Obstetrics and Gynaecology (RCOG) in its guideline No.15 in July 2002 with **evidence level IB** [49]. The advantage of leaving the peritoneum open is the prevention of vault haematoma by allowing free drainage of blood. If an enterocoele has to be prevented or repaired, it should be done at this stage.

#### Closure of the vaginal vault

Each angle is closed separately with the stitch and needle, held at the USL/CL complex on each side. Plicating the pedicles to the vaginal mucosa laterally offers additional support to the vaginal vault, preventing vault prolapse. Once the angles are secured, the closure of the vault is carried out with continuous interlocking sutures, using the same stitch bilaterally in a horizontal manner, such that the sutures meet in the middle (Fig. 4E). There is not sufficient data to support vertical or horizontal closure of the vaginal cuff [49]. Closure technique did not demonstrate any difference in operative time, blood transfusion, or cuff cellulitis [49–52]. Thus, the surgeon can choose vertical or horizontal suturing to close the vaginal cuff following VH (**recommendation grade IC**).

#### Urine catheter placement and vaginal plug insertion

There is insufficient evidence to support routine vaginal packing following vaginal hysterectomy. Three RCTs found no

apparent net benefits to vaginal packing for postoperative pain, satisfaction, bleeding, or infections. In addition, vaginal packing did not have an effect on the presence of a cuff haematoma six weeks after the surgery [53–55]. The recommendation against routine postoperative packing reaches **grade IB**, indicating that the risks of postoperative vaginal packing generally outweigh the benefits for most patients. For cases in which vaginal packing is chosen (Fig. 4F), an indwelling catheter must be inserted in order to allow urine drainage, and to avoid postoperative urine retention. Concurrent removal of the vaginal swab and catheter after 24 h is advisable. We recommend early removal of the bladder catheter to avoid febrile morbidity, facilitate faster mobilisation, and decrease length of hospital stay. However, there is not sufficient evidence supporting prolonged catheterisation [56,57].

## Discussion

The gynaecologic literature for the last 30–40 years highlights the low percentages of hysterectomies performed vaginally, where there are not obvious contraindications. A lack of surgical experience and inadequate VH training during residency, due in part to a lack of standardised surgical technique, are major causes of this low VH rate among qualified gynaecologists. Additionally, a preference for LH over VH has emerged, driven perhaps by trade and the ever-increasing fascination with technology. Consequently, a generation of gynaecologists without the basic proficiency in VH has developed. Many patients who may have undergone an uncomplicated VH are thereby forced to undergo TAH or LH [58–60], and thus are denied the well-known patient benefits associated with VH (i.e. cost effectiveness, rapid recovery, etc.). It is evident from the literature review that this ratio can be changed in favour of VH, if focus is shifted from LH to VH. Brown, Kovac, Querleu and Sheth have reversed the ratio and performed hysterectomy vaginally for the non-prolapsed uterus in 79 %, 90 %, 77 %, and 84 % of cases, respectively, by using guidelines based on uterine size and formal decision algorithms [34,38,61,62]. Once qualified as a gynaecologist, surgeons should attend surgery at institutions where VHs are liberally or freely performed. The AAGL, recognising the inadequate training during residency and the lack of proficiency, recommends that surgeons without requisite training and skills required for the safe performance of VH should enlist the aid of colleagues who do, or should refer patients requiring hysterectomy to such individuals for their surgical care [11].

To combat the subjectivity involved in surgical decision-making regarding the method of hysterectomy clinical judgement is needed, particularly when decisions about the route of hysterectomy are to be made for benign uterine conditions. The physicians must evaluate the specific needs and expectations of each patient in order to arrive at the best management decision for each individual case. The International Society for Gynecologic Endoscopy (ISGE) has published evidenced-based recommendations on the selection of women for VH, to ensure that the most appropriate route of hysterectomy is undertaken [29]. Here, the ISGE introduces a follow-up set of guidelines, designed to provide a safe, standardised surgical algorithm for VH that can be easily taught in well-organised units. With clear guidelines in place, we hope to observe improved proficiency in VH and an increased preference for VH over more invasive routes of hysterectomy.

## Conclusion

The vaginal route should be preferential for hysterectomy for the non-prolapsed uterus. In order to ensure that this is recognised and implemented, evidence-based guidelines for selecting the patient for VH, an algorithm tree and a standardised surgical technique are fundamentally important. Although further research in the field is absolutely needed, the ISGE provides

recommendations based on published data and expert opinions for each step of the VH which should be performed in the same way and in the same order, aiming to train more residents to achieve proficiency in vaginal surgery.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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