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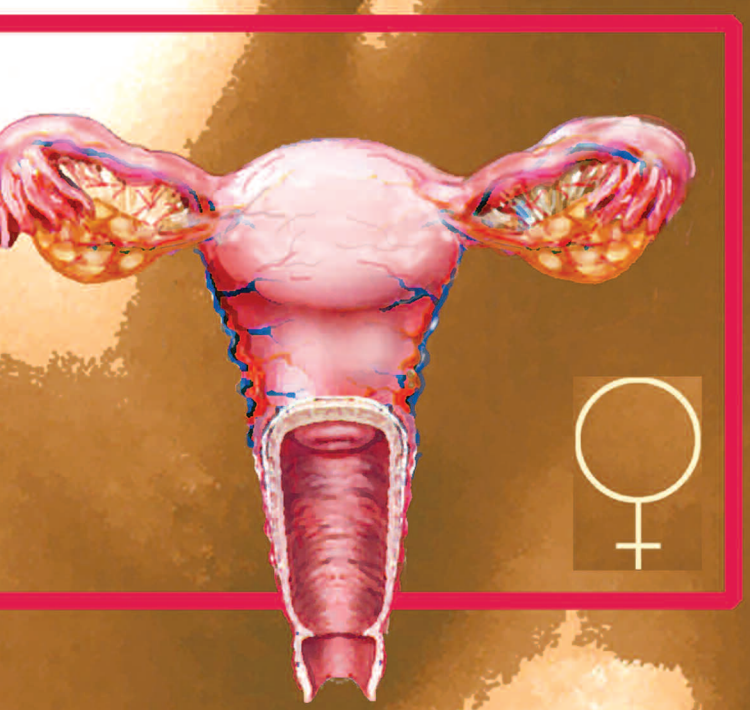
Laparoscopic-assisted vaginal hysterectomy

Donna W. Chapin, RN, CNOR, MSN



Technological advances demand that perioperative nurses be up to date with the latest in laparoscopic video equipment, electrical safety guidelines, and safe patient positioning. As with any minimally invasive surgical procedure, the perioperative nurse must be prepared to quickly respond should the case convert from a minimally invasive procedure to an open laparotomy.

Anatomy

The uterus is divided into the corpus and the cervix.[1] The corpus consists of the fundus, the upper portion of the uterus between the points where the fallopian tubes attach, the body of the uterus, and the isthmus, which is the narrow lower segment of the uterus just superior to the cervix.[1] The cervix extends from the isthmus into the vagina. The adnexa of the uterus consists of the fallopian tubes and ovaries; the fallopian tubes are supported bilaterally by a fold of the broad ligament (see *Female anatomy*).

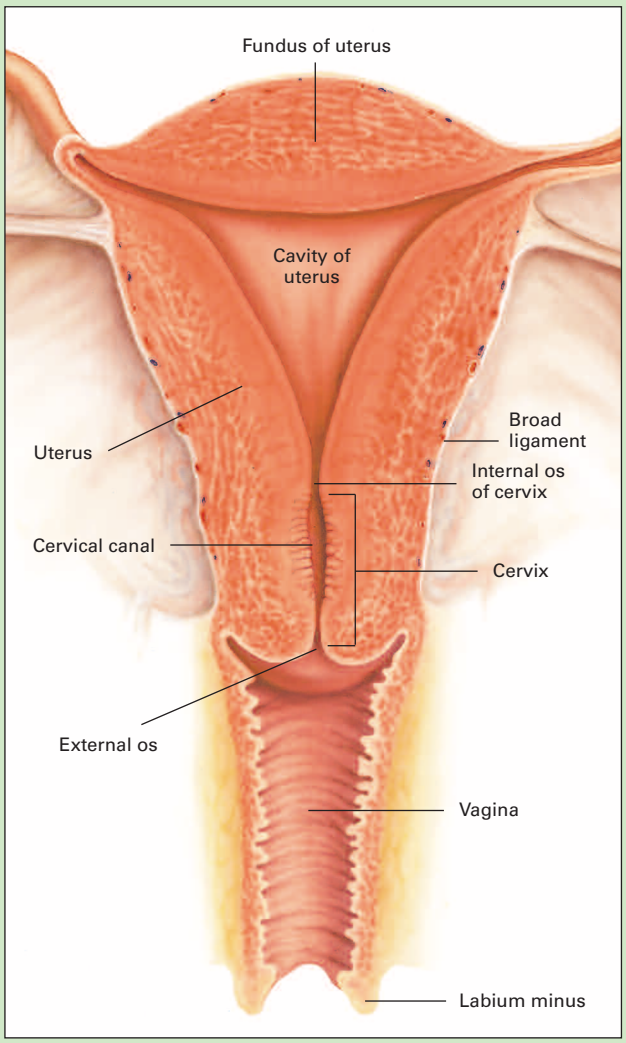
The uterus is positioned within the pelvic cavity between the bladder and rectum, suspended by eight ligaments: two broad, two cardinal, two round, and two uterosacral.[2] The broad ligaments are wide folds of peritoneum that connect the sides of the uterus to the walls and floor of the

pelvis. The broad ligaments hold the uterus in a normal position, support the fallopian tubes bilaterally, and create a barrier, which extends across the pelvic cavity.[2] The cardinal ligaments, which help to prevent uterine prolapse, consist of fibrous sheets that extend from the isthmus to the lateral pelvic fascia.[2]

The round ligaments help suspend the uterus anteriorly and are attached immediately below and in front of the fallopian tubes.[3] These are positioned between the layers of the broad ligaments and across the pelvis to the inguinal canal and are attached to the labia majora.[2] The utero-sacral ligaments also help to hold the uterus in a normal position within the pelvic cavity, extending from the sides of the cervix toward the sacrum.

Anatomy of the uterus

Below is the anterior cross-sectional view of the uterus, cervix, and vagina.



LAVH

Laparoscopic-assisted vaginal hysterectomy (LAVH) is performed both laparoscopically and vaginally. Laparoscopic hysterectomy (LH) and total laparoscopic hysterectomy (TLH) are performed completely through the laparoscope, and the vaginal vault is sutured laparoscopically.[4]

LAVH allows the surgeon to visualize the peritoneal cavity to cut adhesions, ablate endometriosis, and dissect the uterus from the pelvic cavity, then remove the dissected components via the vaginal canal. Advantages of this procedure include smaller incisional area, decreased postoperative pain, quicker recovery time, decreased length of hospital stay, and a faster return to normal activities.[5]

Preoperative preparation

The perioperative nurse is responsible for assuring that all equipment and instrumentation to be used for the procedure is in correct working order. This includes the OR table, positioning devices, equipment for hemostasis and tissue dissection, suction and lavage equipment, video equipment, and surgical instruments.

The table should be configured to accommodate the patient while in lithotomy stirrups. The lower section of the table should move freely, and there should be adequate space at the head of the bed for the patient's head and shoulders.

While in the lithotomy position, the patient's body rests only on approximately two-thirds of the table, causing a significant redistribution of body weight. The circulating nurse must assess the patient preoperatively to ensure that the table will safely accommodate the patient's weight. Most standard OR tables accommodate patient weights up to 450 pounds; however, anyone over 450 pounds will need to be positioned onto a table that will accommodate higher weights. The safety strap should be readily available. Obese patients require a longer safety strap attached to the table, which should be ready before the patient is brought into the room.

Stirrups used for positioning the patient in lithotomy should be inspected and available before the patient is positioned onto the table. If the arms are to be extended, the arm boards should be inspected and available prior to the

patient's arrival to the room. To avoid brachial plexus injury, arm boards are placed at less than a 90-degree angle. Some surgeons prefer that the patient's arms be extended and tucked close to the body, therefore, protective padding should also be available. Fingers and hands should be protected when the table is returned to a supine position.

Correct placement of a reusable patient return electrode should be established before a patient is positioned on the table. The reusable patient return electrode is extended from the head to the buttocks to allow maximum body contact while the patient is in the lithotomy position. The electrosurgical unit (ESU) should be placed within a reasonable distance of the operative field and any cables extending from the reusable patient return electrode should be plugged into the ESU. The ESU should be tested before initial use and taken out of use if problems are noted. Bipolar equipment, lasers, argon-enhanced coagulators, morcellators, and ultrasonic coagulation devices are examples of cutting/coagulation equipment that should be readily available depending on surgeon preference.[6] Before the patient arrives, all equipment safety checks should be completed and the video tower or cart turned on to make sure the equipment is working correctly.

Carbon dioxide tanks should be checked and replaced if gas volume is low. The carbon dioxide insufflator should be positioned above the level of the abdominal cavity to prevent gas and body fluids from flowing back into the insufflator.[2,6] The insufflator should be filtered with a compatible single-use hydrophobic filter that's impervious to fluids.[6]

Safety implications

Safety implications for LAVH are primarily related to the technology used in the procedure and the positioning required for visualization. These safety implications include, but aren't limited to, patient positioning, use of insufflation and video equipment, equipment for hemostasis, and preventing hypothermia.

Proper positioning

Safe patient positioning promotes correct body alignment, maintains tissue integrity, and avoids undue stress on muscles, nerves, and joints. Once anesthetized, a patient's risk for tissue and nerve damage increases when the procedure time is longer than 3 hours.[7] When exaggerated positions are necessary to allow greater visibility, pressure from the positions and/or positioning devices can contribute to postoperative complications such as nerve damage, skin breakdown, and joint injury. Complications that may occur as a result of the lithotomy position include tissue injury, joint damage, nerve compression, vascular compromise, and restricted diaphragmatic movement.

To ensure adequate visualization during LAVH the patient is positioned with the buttocks protruding slightly from the lower edge of the table.[8] Once the buttocks are positioned appropriately, the legs can be placed into the adjustable stirrups. The knees should be slightly flexed to decrease the possibility of stretching the sciatic nerve.[8] If the patient's position is altered, always check the arm placement to avoid damage to the brachial plexus.

Joint damage can be avoided by preoperative assessment of joint problems and careful positioning when using either the modified or high lithotomy positions.

Preventing joint and nerve damage

Joint damage can be avoided by preoperative assessment of joint problems and careful positioning when using either the modified or high lithotomy positions. Two people should move the legs slowly and simultaneously when placing them in and removing them from the stirrups. Restriction in movement should be reported to the surgeon, and the joint shouldn't be forced past the point of resistance. Modifications to the lithotomy position may be necessary for patients with known hip, knee, or ankle deformities, or patients with hip prosthesis.

There are four nerves at risk for damage when the lithotomy position is used: obturator, saphenous, femoral, and common peroneal nerves.[7] Neuropathies can be avoided by maintaining minimal external rotation of the hips while in the lithotomy position, and by adding padding to areas of pressure, such as the ankles and knees. The extremities should never have direct contact with metal surfaces on either the table or stirrups. Direct contact with metal surfaces not only puts pressure on bony prominences leading to tissue injury, but can also provide alternate return paths for the electrical current.[9] Padded lithotomy-adjustable stirrups placed at an even level on the table can prevent joint and nerve damage.[7] Stirrups should be manipulated to properly fit individual patients. Padded stirrups with a

boot support maintain dorsiflexion and should adequately protect any areas where pressure injuries may occur. However, the incorrect use of positioning devices can create pressure areas leading to nerve and tissue damage; all areas that come in contact with padded stirrups should be evaluated closely before draping. A final inspection will determine both proper alignment and the need for further padding.

A pneumoperitoneum (filling the abdominal cavity with gas) puts more pressure against the diaphragm, especially when the Trendelenburg position is used. Pressure against the diaphragm requires more ventilatory effort for full thoracic expansion, so the patient's arms should be positioned away from the chest to facilitate respirations.[7]

With the legs elevated above the level of the heart, the lithotomy position promotes an increase in venous return to the heart and, therefore, an increased cardiac output.

At the end of the procedure, two people should carefully remove the legs from the stirrups, and, after collaboration with the anesthesia provider, slowly lower the legs to the supine position. Collaboration with the anesthesia provider is crucial to avoid a sudden decrease in blood pressure (BP) once the legs are lowered and extended. To avoid venous stasis and clot formation, antiembolic stockings and sequential compression devices are often used.

Compartment syndrome

Compartment syndrome, though rare, has been noted after lengthy surgeries involving the lithotomy position. In compartment syndrome, the perfusion pressure falls below the tissue pressure within a closed anatomical space, resulting in compromised circulation to the tissues.[10] The lithotomy position and malfunctioning sequential compression devices are two factors that may contribute to this syndrome. Others are morbid obesity and factors that promote vasoconstriction within the vasculature, such as hypotension and hypothermia. If the procedure is lengthy, lowering the legs every 2 hours will help prevent compartment syndrome.[10]

Burns

Patient burns from illuminated endoscopic light cords have also been reported. These light cords shouldn't be in contact with drapes, the patient's or personnel's skin, or any flammable material.[6] Surgical drapes can be ignited from the heat of a light cord or endoscope. To avoid patient injury, light sources should be placed on "standby" until the scope is ready to be inserted into the abdominal cavity. Scrub personnel should be cautioned to hold light cords away from drapes. To avoid igniting drapes from illuminated light cords, the cords may be placed on a moist sterile towel.[6]

Hypothermia

All patients undergoing surgery are at risk for hypothermia; however, patients undergoing LAVH have more environmental risk factors that may lead to the condition. Carbon dioxide insufflation increases the risk for hypothermia,[7] as does the length of procedure, pelvic irrigation, and the inability to warm the entire body with warming devices secondary to the lithotomy position. Consequences of hypothermia include an increased risk for cardiac events, increased need for transfusion of red blood cells, plasma, and platelets, and decreased medication metabolism with an increased duration of action.[11]

Patient preparation

Two sterile areas are prepared for the skin preps: one for the abdominal prep, and one for the vaginal prep. The abdomen, vagina, and perineum are prepped with an antimicrobial solution. If hair must be removed, hair clippers (not razors) should be used to avoid nicking the skin. The abdomen is prepped in the same manner as an open laparotomy, from the nipple line to below the symphysis pubis. This allows for a quicker conversion should the procedure necessitate an open laparotomy.

The vaginal prep involves the symphysis pubis to the external genitalia, as well as the inside of the vagina. The bladder should be emptied before the procedure to avoid laparoscopic bladder injury; therefore, an indwelling catheter should be inserted either by the circulating nurse or the surgeon. Depending on surgeon preference, the catheter may be left in postoperatively or discontinued at the end of the procedure.

Surgical procedure

Two separate back tables are used for sterile setups, one for the vaginal instruments and supplies and one for the laparoscopic abdominal portion. Supplies and instrumentation between the two tables can't be interchanged once the surgical procedure has started. After final verification of the correct patient, site, and procedure by all members of the surgical team, the surgeon will insert a weighted speculum into the vagina to expose the cervix. A uterine manipulator is inserted through the cervix into the uterus, allowing for manipulation of the uterus during the procedure. After the sur-

geon changes gloves, the laparoscopic component of the surgery will begin; the surgeon usually stands on the patient's left side. Video equipment should be placed at the foot of the bed and close enough to the patient to avoid stretching/pulling cords or connections. Monitors should be placed at the patient's feet and on her right side to allow unrestricted visibility for the surgeon and surgical team.

A pneumoperitoneum must be created to distend the abdominal wall, create a working area, and to displace the bowel superiorly.

The umbilicus is elevated, often with towel clips, and an incision is made into the umbilicus using a No. 11 blade. The umbilicus is elevated for the initial incision to prevent injury to the bowel prior to the creation of the pseudoperitoneum. A Verres needle is then inserted through the incisional site into the abdominal cavity to allow the attachment of insufflation tubing. The insufflation tubing is flushed with gas to decrease the risk of air embolism, then attached to the Verres needle.[2,6] The pneumoperitoneum is created by infusing carbon dioxide into the abdominal cavity to a pressure of approximately 14 to 15 mmHg.[2] Placing the patient in the Trendelenburg position will further displace the bowel superiorly.

Compartment syndrome, though rare, has been noted after lengthy surgeries involving the lithotomy position.

Once the pneumoperitoneum has been safely established, more incisions will be made into the abdomen. A 12 mm trocar sleeve is inserted through the umbilical incision into the abdomen for laparoscope insertion. Using the laparoscope to aid with visualization, two more incisions are made to accommodate 12 mm trocars: one in the left lower quadrant and one in the right lower quadrant. An incision is then made suprapubically to accommodate a 5 to 12 mm trocar. The uterus is manipulated to allow visualization of the infundibulopelvic (IP) ligament. The IP ligament, or suspensory ligament of the ovary, is a fold of peritoneum that extends out from the ovary to the wall of the pelvis. If the ovaries are to be preserved, the adnexa is separated from the uterus by either cautery, endoscopic scissors, or stapled with an endoscopic gastrointestinal anastomosis (GIA). If the ovaries are being removed, grasping forceps are used to move the ovary and fallopian tube to allow better exposure of the IP ligament. After clearly identifying the left ureter and isolating the left IP ligament, the left IP ligament is cut. Endoscopic GIA staplers, endoscopic scissors, and cautery may be used for dissection. Tissue between the ovary and round ligament is divided by sharp dissection and the round ligament and the upper portion of the broad ligament are dissected, either by cautery, endoscopic scissors, or endoscopic GIA staplers.[2,12]

The right IP ligament is then excised in the same manner as the left, once again identifying the right ureter before cutting the ligament. The round and broad ligaments on the right side are dissected in the same manner. The vesicouterine peritoneum is divided to separate the bladder from the uterus.[2,12]

Once the supporting uterine ligaments have been ligated and the uterus is no longer supported within the pelvic cavity, the uterus can be removed through the vaginal canal, resembling a traditional vaginal hysterectomy. The movable stirrups are usually manipulated to place the patient in high lithotomy position, allowing greater exposure. The uterine fundus is pulled forward, both uterine arteries are clamped, ligated, cut, and tied with heavy suture ligatures. The uterus is removed, the vaginal cuff is closed, and, depending on surgeon preference, the vagina may be packed with antibiotic-impregnated vaginal packing. Before closing the vaginal cuff, sponge, needle, and instrument counts are performed as indicated per facility policy to ensure that no foreign bodies have been retained.

After the uterus is removed, the patient's legs are lowered simultaneously to a modified lithotomy position, and the laparoscope is reinserted through the abdominal cavity trocar sleeve to check for any bleeding. The pelvic cavity is lavaged with copious amounts of lactated Ringer's solution. Upon ensuring hemostasis, insufflation gas should be removed from the pneumoperitonuem via the trocar sleeves. The incisions are then closed; some surgeons inject a local anesthetic with epinephrine into the puncture wounds before closing. Final sponge, needle, and instrument counts should be completed as indicated per facility policy, and abdominal and perineal dressings applied.

To prevent joint injury and to minimize the risk of sudden BP changes, the legs are slowly lowered simultaneously from the stirrups to the operative table, and the safety strap is applied across the patient's thighs. The patient is covered with warm blankets as needed to ensure normothermia and then transferred to the PACU.

Postanesthesia care

Potential complications of LAVH may include postoperative hemorrhage, bladder, ureteral, and bowel injury, CO_2 embolism, fluid overload, hypothermia, tissue and nerve damage.

Patients undergoing LAVH have an increased risk for hypothermia secondary to intraoperative positioning and the insufflation of carbon dioxide, which is known to be one cause of hypothermia for these patients.[6] The use of the lithotomy position makes it difficult to keep patients normothermic during the intraoperative procedure. Therefore, postop care should include the use of a warming device and frequent temperature assessments to restore normothermia.

Frequent assessment of both vaginal and abdominal dressings, vital sign assessment, cardiac monitoring and inspection, and palpation of the abdomen can alert the PACU nurse to increased postop bleeding. Patient positioning during surgery, as well as long procedure times increase the potential for tissue and nerve injury; therefore, postanesthesia assessment should include peripheral pulse assessments, skin assessment, particularly posteriorly, as well as movement and sensation of the lower extremities. If the indwelling catheter is left intact during the postanesthesia period, the color and clarity of the urine should be frequently noted. Report any signs of hematuria to the surgeon. **OR**

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The author has disclosed that she has no significant relationship or financial interest in any commercial companies that pertain to this educational activity.

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Laparoscopic-assisted vaginal hysterectomy

GENERAL PURPOSE: To provide perioperative nurses with information about new LAVH procedures and associated care.
LEARNING OBJECTIVES: After reading this article and taking the test, the reader will be able to: 1. Describe the nursing role and responsibilities during LAVH procedures. 2. Identify the surgical risks and risk-avoidance strategies.

1. Perioperative nurses are responsible to check all of the following *except*
a. the surgeon's credentials.
b. proper working order of the OR table.
c. that video equipment is operational.
d. that the light and electrical sources are functional.

2. To avoid brachial plexus injury during LAVH, arm boards are
a. placed at less than a 90-degree angle.
b. positioned at an exact 90-degree angle.
c. placed at greater than a 90-degree angle.
d. not used.

3. What is the correct placement of the reusable patient return electrode while in the lithotomy position?
a. extended from head to foot
b. extended from head to buttocks
c. extended from buttocks to feet
d. placed under the buttocks only

4. How is the carbon dioxide insufflator positioned?
a. at the level of the heart
b. higher than the abdomen
c. beneath the OR table
d. next to the feet

5. Exaggerated positioning to facilitate visibility can contribute to all of the following *except*
a. longer OR time.
b. joint injury.
c. nerve damage.
d. skin breakdown.

6. What complication related to the lithotomy position may occur?
a. hyperthermia
b. aspiration
c. cardiac arrest
d. vascular compromise

7. To avoid joint problems during LAVH surgery,
a. move the patient's legs quickly into the stirrups.
b. place all patients in high lithotomy position.
c. avoid the low lithotomy position.
d. move both legs simultaneously.

8. Which of the following nerves is at risk during lithotomy positioning?
a. cervical
b. sacral
c. obturator
d. popiteal

9. Proper preparation and maintenance of the lithotomy position includes
a. maintaining external rotation of the hips.
b. adding pads to areas of pressure.
c. using bare metal foot supports.
d. keeping the feet in plantar flexion.

10. What postop complication can occur if a patient's legs are lowered and extended suddenly?
a. increase in BP
b. clot formation
c. decrease in BP
d. compartment syndrome

11. Compartment syndrome is a complication of LAVH and may be due to
a. hypertension.
b. fever.
c. intraoperative use of sequential compression devices.
d. lengthy surgery.

12. The recommended surgical prep for a hairy abdomen would be to
a. prep the area with an antimicrobial solution only.
b. shave the hairy area and prep with an antimicrobial solution.
c. clip the hairs and prep the area with an antimicrobial solution.
d. shave and clip the hairs after prepping the skin with an antimicrobial solution.

13. The bladder is continuously emptied to avoid
a. laparoscopic bladder injury.
b. abdominal distension.
c. patient urination during the surgery.
d. urinary tract infection after surgery.

14. Which statement is true regarding LAVH instrumentation setup?
a. Only one sterile setup table is required during this procedure.
b. Two tables are used in this procedure: one for sterile and one for clean instruments.
c. Three back tables are set up: for vaginal, laparoscopic, and general instruments.
d. Interchanging instruments between the back tables during surgery is prohibited.

15. Which statement is true regarding a pneumoperitoneum?
a. It's a complication that should be avoided.
b. It's used during the LAVH surgery to displace the uterus.
c. It's an essential part of the LAVH procedure.
d. It helps to reduce pressure against the diaphragm.

16. Insufflation tubing is flushed with gas to avoid
a. clot formation.
b. air embolism.
c. bowel displacement.
d. formation of a vacuum.

17. Immediately following removal of the uterus, each of the following takes place *except*
a. the patient's legs are removed from the stirrups.
b. the laparoscope is reinserted.
c. the pelvic cavity is lavaged.
d. the vaginal cuff is closed.

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