Peripartum Hysterectomy

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Patient counseling

Patients at risk for emergency peripartum hysterectomy should be counseled about the likelihood of the procedure and how the decision to proceed with hysterectomy will be made. Patients at risk and those with planned procedures should understand what the procedure involves, complications and outcomes of hysterectomy, and issues related to ovarian conservation. The patient should also be aware of the possible need for blood transfusion, mechanical ventilation, and recovery in an ICU rather than a postpartum floor.
Scheduling delivery of patients at high risk for cesarean hysterectomy

Patients at high risk of needing cesarean hysterectomy should be scheduled for delivery at a time when surgical staff and resources are immediately available, preferably avoiding an emergency delivery after the onset of labor. Surgical scheduling and consultations should be arranged with appropriate ancillary staff, which may include high-risk anesthesiologists, interventional radiologists, gynecologic oncologists, and urologists, depending on the complexity of the case.

The primary surgeon should have significant experience with pelvic surgery and hysterectomy. Transfer of care to a tertiary care center may be necessary if these resources are not locally available.
Total versus supracervical hysterectomy

In scheduled gynecologic surgery, there are no proven medical or surgical benefits of performing supracervical or subtotal hysterectomy if the cervix can be easily removed with the corpus.
However in obstetric cases, supracervical hysterectomy may be preferable because removal of the cervix can be particularly challenging when the cervix is significantly dilated. In addition, supracervical hysterectomy may decrease total blood loss and operative time, which is important in the setting of severe acute hemorrhage.

As a general guide, the cervix should be removed if cervical injury or bleeding is contributing to the hemorrhage, or if a previa/accreta may be invading the cervical stroma (often, this cannot be known with certainty until a pathologic analysis is performed).

It is important to ensure that the entire placental bed has been removed in cases of placenta previa, which may require total hysterectomy or partial trachelectomy
Placement of hypogastric artery balloon catheters
The author does not place preoperative arterial catheters routinely before planned puerperal hysterectomies, given little evidence of benefit and concern for complications; however, practice patterns vary among providers.
In selected cases, intraoperative uterine artery embolization may be helpful, although the benefits of this procedure are less clear when hysterectomy is to be performed
Preoperative placement of balloon catheters in the hypogastric arteries has been proposed as a means of decreasing total intraoperative blood loss in patients at risk for severe PPH. The balloons are generally placed by interventional radiologists under fluoroscopic guidance immediately prior to surgery and inflated following delivery or in the event of hemorrhage. While many centers have published success with this intervention, only a few controlled trials have been reported, and results have been inconsistent.
A retrospective case-control study of 117 patients with placenta accreta found that patients in whom an iliac balloon catheter was placed preoperatively had less blood loss than those without a catheter (2165 versus 2837 mL); 50% of patients with catheter placement did not require balloon inflation.

A limitation of this study is that placenta accreta was recognized antepartum in 98% of the catheter group, but in only 29% of those without catheter placement, and the analysis did not adjust for differences between groups in preoperative surgical preparation unrelated to catheter placement.
A similar-sized retrospective study that controlled for confounding both with propensity score matching and logistic regression found no difference in morbid outcomes with or without the balloons.
Preoperative preparation
Peripartum hysterectomy differs from hysterectomy in nonpregnant women in several important respects, most of which make the operation more difficult:

With these considerations in mind, the author makes the following preparations in patients at high risk of undergoing hysterectomy to prevent or control massive hemorrhage:
OPERATIVE PROCEDURE
Key points
This synopsis illustrates the key points of the more comprehensive discussion of the operative procedure that follows:
- The cervix may be quite soft and difficult to identify, especially if the patient has labored. In addition, the lower uterine segment may be highly developed and elongated, which may increase the risk of leaving endometrium behind with supracervical hysterectomy.
Blood vessels throughout the pelvis are greatly dilated, and varices are often found in the mesosalpinx and vesicouterine space, increasing the risk of massive hemorrhage, which may obscure the operative field.

- The uterus is large and fills the pelvis.
- Tissue, including the vaginal cuff and broad ligament, may be friable and prone to tearing when clamped.
- The myometrium surrounding an invasive placenta may be very thin or absent, and placement of clamps on this tissue may lead to severe hemorrhage.
With these considerations in mind, the author makes the following preparations in patients at high risk of undergoing hysterectomy to prevent or control massive hemorrhage:

- Notify the anesthesia team in advance so anesthesia staff experienced with anesthetic management of massive hemorrhage and transfusion conduct the case.

  While epidural or combined spinal/epidural anesthesia is possible, general anesthesia should be immediately available.

- Assign surgical assistants familiar with hysterectomy
● Ensure adequate intravenous access with multiple large-bore lines, and possibly an arterial line, before surgery.
● Administer prophylactic antibiotics within one hour of skin incision to decrease the risk of postoperative infection.
● Cross-match both packed RBC and plasma. The blood bank should ensure the availability of cryoprecipitate and platelets and the facility should have a massive transfusion protocol in place.
● Place a bladder catheter

Ureteral stents can be placed preoperatively, if the patient has an accreta or major adhesions with the need for parametrial dissection.

● Place a device for intermittent pneumatic compression to reduce the risk of DVT.

● Place the patient in lithotomy position

● We advise placing a conical collection bag under the patient's buttocks

● Unscrubbed members of the operating room team should be assigned to check vaginal blood loss periodically.
• Confirm that appropriate instrumentation is available:
  1. Self-retaining retractor designed to give adequate lateral exposure (eg, Bookwalter)
  2. Sufficient number of pedicle clamps adequate to hold tissue without tearing or slippage (eg, Heaney, Rogers, or Zeppelin clamps)
  3. Electro-dissection unit
  4. Two suction devices
  5. Adequate number and types of sutures, including absorbable synthetic sutures of various sizes and delayed absorbable suture for a vertical fascial incision
  6. LigaSure can be very helpful to control back bleeding and manage hypervascularity during the dissection
  7. Atraumatic hemostatic clamps, such as ring or lung clamps
• Prep the vagina with povidone-iodine.
• Have patient- and fluid-warming devices available to avoid hypothermia
• If available, consider using intraoperative cell salvage and autotransfusion of RBC.
In the setting of significant hemorrhage or an unstable patient, clamping or compressing the uterine blood supply takes precedence over adhesiolysis and retractor placement. Pedicles can be rapidly clamped and cut, and sutured later. When severe hemorrhage prohibits adequate visualization of the pelvis, the aorta can be compressed manually over the sacrum and the pelvis carefully packed until the bleeding slows. A trauma surgeon may be consulted, if available.
● When the patient is hemodynamically stable, obtaining adequate exposure and uterine traction will minimize vascular or ureteral injury.
● If the bladder does not reflect readily off the cervix, it should be opened at the dome.

Consultation with a gynecologic oncologist or urologist is warranted if the surgeon does not have sufficient experience with bladder surgery.
● Every attempt should be made to identify the ureter and avoid ligating it.
However, control of hemostasis is more important than preserving the ureter intact.
Incision and delivery
The author prefers a vertical skin incision to help ensure adequate exposure. (If a transverse skin incision is performed and the surgeon should be prepared to divide the rectus muscles (Maylard incision) or perform a Cherney approach).

A Pfannenstiel incision may be acceptable in thin patients without an anterior previa or prior pelvic surgical history, and at very low risk of having pelvic adhesions.

Avoiding disruption of a known abnormally implanted anterior placenta or transection of large anterior fibroids is best accomplished through a classical (fundal) uterine incision.

A high hysterotomy may also be preferable in the setting of large bladder varicosities or significant anterior adhesions.
With a fundal hysterotomy, Following delivery of the fetus, the placenta should be removed, if nonadherent, to allow maximal uterine contraction. Oxytocin is then given to maintain uterine tone until the blood supply is disconnected. Any adherent placenta should be left in place as removal can increase total blood loss. After delivery, placing the patient in Trendelenburg position, use of a self-retaining retractor, and packing the abdominal contents can facilitate visualization.
In addition, insertion of an intrauterine balloon or intrauterine packing for tamponade slows severe bleeding. The balloon or pack should be removed during the hysterectomy as bleeding is controlled surgically because lateral bulging may impede uterine artery and cardinal ligament dissection.
Hysterectomy
The technique should be simple enough to perform rapidly and should minimize the creation of dead space and raw surfaces because of the possibility of coexistent coagulopathy.
When hemorrhage is severe, control of the uterine blood supply takes precedence over surgical dissection, and, in a hemodynamically unstable patient, this may require risking urinary tract, adnexal, or bowel injury.
The procedure is begun by using electro-dissection to lyse adhesions to the uterus. When the uterus is free, the fundus is extracorporealized, and an assistant maintains traction on the fundus until the uterus is removed. If the adhesions are highly vascular, early control of the uterine blood supply with lateral uterine dissection may be preferable. This is particularly true with an anterior placenta accreta, as dissection of the vesicouterine space may lead to significant hemorrhage.
Each round ligament is doubly clamped laterally with curved clamps whose concave surface is directed medially. The tissue between the clamps is divided using Mayo scissors or electro-dissection, and each clamp is replaced with a suture ligature.
The uterus may be externalized for optimal visualization. Clamps are placed across the cornua and the uterus is put on stretch. The round ligaments are identified bilaterally clamped, cut and suture ligated.
The broad ligament is then opened, and the adnexal pedicles are isolated. The ovaries are almost always left in place, unless a severely adherent ovary necessitates a lengthy dissection during a hemorrhagic emergency. The fallopian tube and utero-ovarian ligament are then isolated and clamped.
The operator uses the index and middle finger to tent up an avascular area of the broad ligament in the space beneath the Fallopian tube and utero-ovarian ligament. A small snip is made in the broad ligament to create a window.
In the presence of severe hemorrhage, however, the operation can be performed more rapidly if the pedicles are not sutured until all of the vascular structures to the uterine arteries have been clamped and divided. This requires a sufficient number of clamps to be available. Use of a bipolar ligature device, such as the LigaSure instrument, allows the procedure to be performed more rapidly, but we still prefer to secure the proximal pedicles with sutures after the blood supply has been controlled.
The posterior leaf of the broad ligament is then opened towards the cervix, dropping the ureters inferiorly and clearing the endopelvic fascia posterior to the uterine vessels. The uterine vessels are then skeletonized by carefully opening overlying tissue with cautery. If cesarean delivery was performed, the bladder flap may have been developed.

Otherwise, the bladder may be released by gently spreading the tips of Metzenbaum scissors or a tonsil clamp in the vesicouterine peritoneum and using electro-dissection to transect the serosa. The vesicocervical space is developed and bladder pillars divided, but no further distally than will be necessary to allow exposure and clamping of the uterine vessels.
The uterus is placed on further stretch in a cephalad direction in order to lift the uterine arteries away from the ureters. The window in the broad ligament may be carefully enlarged to skeletonize the uterine vessels. The curved Heaney clamp is placed tight against the substance of the uterus taking the uterine vessels and surrounding tissue in a horizontal bite.
Anterior view of the uterus. The uterine vessels are clamped.

The uterine vessels are the most critical pedicles. For that reason, double clamping is often performed to ensure excellent hemostasis. A figure of eight suture (Heaney stitch) is placed distal to the most lateral of the two clamps. The assistant removes the lateral clamp while the surgeon snugs down the knot. The medial clamp may be flashed and the pedicle regrasped. The pedicle is then ligated again with a free tie. In the diagram a third clamp has been applied to the uterus to decrease back bleeding.
Placing clamps directly on the uterus may be inadvisable in the setting of hypertrophic vessels. In this circumstance, identifying and opening a clear space below each vascular bundle should be attempted. Each pedicle is then clamped with a vascular clamp, transected, and suture ligated. This should be done in a single bundle, if possible, but may require multiple pedicles on each side if the bundle is too large to ligate safely.
Large varicosities in the vesicouterine space, as can be seen with placenta previa or accreta, may require bipolar coagulation or clamping with suture ligation. Gentle finger dissection may speed the procedure once good planes have been created, but blunt dissection with a sponge stick is inadvisable as massive bleeding or bladder laceration may result. If scarring has obliterated the vesicocervical space (as can occur after previous cesarean deliveries), sharp dissection with Metzenbaum scissors may be necessary to perform this dissection.
If a difficult or highly vascular dissection is anticipated, then it may be prudent to secure the uterine blood supply prior to completing the midline bladder dissection. This may be accomplished by opening the paravesical spaces and clearing the endopelvic fascia just medial to the ascending uterine vessels. This allows the arteries to be safely clamped and sutured with bladder adhesions undisturbed.
These bladder adhesions can then be taken down sharply or with cautery after the majority of the uterine blood supply has been controlled.

When there is concern for placental bladder invasion, a posterior approach to the dissection may be considered. This involves opening the posterior vagina through the pouch of Douglas, then securing the uterosacral and cardinal ligaments and uterine arteries prior to developing the bladder plane from below.
Caution should be used with a retained placenta accreta or percreta, in which case clamping of the vascular uterine tissue can lead to massive hemorrhage. In this circumstance, the uterine arteries should be dissected and identified lateral to the uterus, and clamped at their insertion. This requires identification of the ureters either visually or by palpation (in the case of stenting) as the arteries are clamped.
Once the major vessels have been ligated and the bladder has been displaced inferiorly, each cardinal ligament is divided in several bites by clamping close to the cervix with a straight clamp, dividing the tissue medially with scissors or a scalpel, and suturing the pedicle.

After dissecting the upper cardinal ligaments, a supracervical hysterectomy can be performed by clamping the lateral cervical vessels and transecting the mid cervix with scissors or electrosurgery.
Clamps are placed slightly below the level of the hysterotomy incision and the uterine corpus amputated.

The final set of clamps secure the angles of the hysterotomy incision. The uterus is amputated by extending the hysterotomy incision to 360 degrees around the full circumference of the uterine isthmus. The pedicles are secured with figure of 8 sutures. Suction and irrigation of the abdomen is performed. If hemostasis is confirmed, closure proceeds. If the lower segment is bleeding more clamps may be applied closer to the cervix in order to address the bleeding site.
After ligating the lateral vascular pedicles, the cervical edges are oversewn with figure-of-eight or running sutures.

In the setting of a placenta previa, the excised boundary of the cervix should be examined to ensure that a cuff of clear endocervix lies beneath the placental bed.
The cervical stump is oversewn with running locked suture.

The anterior and posterior edges of cervical stump are oversewn with a running locked stitch. Deep “figure of 8” sutures may also be placed deep in the substance of the stump to reinforce the closure and promote excellent hemostatis.
Alternatively, if the cervix is to be completely removed, the cul-de-sac is examined to ensure that the rectal reflection is not abnormally high. The bladder is further reflected off the entire cervix and the proximal vagina. The cardinal ligaments are clamped and transected with incorporation of the lateral cervical vessels until the base of the cervix is reached. If the distal cervix is difficult to identify, the cervix may be transected above the level of vessel dissection and the uterine specimen removed.
The external cervical os can then be palpated through this incision and used to define the distal limit of cardinal ligament dissection.

The vaginal angle and uterosacral ligament on each side are clamped into a bundle with a curved clamp. The vagina is then severed with scissors medial to each clamp. Following this, each clamp is replaced with a suture ligature. The remainder of the vaginal cuff is closed with a running suture.

Incorporating the peritoneum posteriorly may aid hemostasis. The suture should include approximately 10 mm of the upper vaginal cuff to avoid later bleeding or breakdown; in this process, it is important to avoid the bladder anteriorly.
determining the portio vaginalis is mostly difficult during the surgery and one of the reason is the full cervical dilatation and effacement after a vaginal delivery
A simple method can be performed by every obstetrician in clinical practice. Using this method may eliminate the potential disadvantages of total hysterectomy after vaginal delivery by facilitating to determine the borders of the cervix. Thus, taking extra vaginal tissue from the lower level of the cervix may be avoided.
Evaluation of bladder and ureteral integrity
Integrity of the bladder can be confirmed by infusing 200 mL of saline mixed with two or three drops of methylene blue through the bladder catheter; extravasation of blue fluid signifies a leak.
The ureters are inspected to determine that they are intact, peristalsing, and of normal caliber. If there is concern for ureteral injury, this may be tested by injecting of indigo carmine intravenously; blue urine will spill into the pelvis in 10 to 15 minutes if a ureter has been cut. This method is, however, unlikely to reveal ligation of the ureter. Cystoscopy or direct visualization of the ureters through a cystotomy (the latter requiring urine dye) demonstrate urine passing through both ureteral orifices. Absence of this finding suggests that one or both ureters are obstructed as a result of surgery. A ureteral stent can be passed through the ureteral orifice to localize the site of obstruction.
If a cystotomy has been created inadvertently or intentionally, it should be closed with two layers of absorbable synthetic suture. If the injury occurs at the level of the bladder trigone, stenting may be necessary, and urologic consultation is recommended.
Inspection and closure

The pelvis should be copiously irrigated and suctioned, and blood-soaked packs should be removed.
Each vascular pedicle should be checked for hemostasis, as should the dissection sites.
The abdomen is closed using any standard technique, after ensuring good hemostasis.
No drains are necessary, unless there is concern for ongoing bleeding or persistent bladder leak.
CONTROL OF PERSISTENT PELVIC BLEEDING

Bleeding in the deep pelvis may persist following hysterectomy. Coagulation status must be assessed with laboratory testing and, if abnormal, managed with transfusion of blood products, patient warming, and correction of acidemia and hypocalcemia.

Prior to the return of the first set of laboratory studies, a red top tube of 5 mL blood can be observed for clotting.

Surgical hemostasis may be achieved by placing running and figure-of-eight absorbable sutures in bleeding areas or with the direct application of cautery. If this does not control bleeding, hemostatic agents and pelvic packing are the next steps.
Hemostatic agents
Small areas of low-volume bleeding can be treated with topical hemostatic agents.
Investigation of these agents has focused on vascular, cardiac, and hepatic surgery.
There are few high-quality data regarding treatment efficacy or use in obstetric and gynecologic surgery.
These agents should not be used for intravascular injection, in closure of skin incisions, or for treatment of bleeding from the endometrium.
They also should not be used in infected tissue.
Pelvic packing

Packing is a last resort that usually succeeds in controlling low-pressure (microvascular or venous) bleeding confined to the pelvis.

Kerlix bandages may be tied together end-to-end to form one long strip for packing.

If Kerlix is not available, dry laparotomy sponges may be used.

The dry sponges are packed gently but firmly into the pelvis so that the pack fills all interstices, but does not abrade pelvic tissue.

If the packing is successful, no blood will be seen seeping through or around the gauze after 10 minutes of observation.
Most often, a temporary abdominal closure will be placed over the packings, possibly with the addition of a negative pressure wound system to remove fluids and avoid an abdominal compartment syndrome.

Different surgeons practice slight variations of this procedure, such as the use of gauze stuffed into an x-ray cassette drape or inflated uterine balloon brought out through the vagina. These patients usually require ICU admission to manage coagulopathy, ventilation, hypothermia, and metabolic abnormalities.
Laparotomy is usually needed to remove the pack, or it may be removed through the vagina or another conduit. Postoperative fever is common, and broad-spectrum antibiotics are given until the packing is removed. Removal should take place under general anesthesia 36 to 72 hours after insertion. Bleeding may resume if the pack is removed too early or in the presence of coagulopathy, whereas pelvic infection is likely if removal is delayed.
The following portion of the postpartum hemorrhage module is based on the powerpoint presentation authored by Dr. Kristin Hoffman and presented January 15, 2020 entitled “Emergency Peripartum Hysterectomy: Bloody Hell for Family Physicians” with the author’s permission.
The hysterectomy technique diagrams are from the textbook Williams Obstetrics 25th edition. Uptodate 2021
Thank you