Cutting Edge Therapies: Tamponade vs. Interventional Radiology vs. Hysterectomy: When?

Ashutosh Wali, MBBS, MD, FFARCSI
Director, Obstetric/Gynecologic Anesthesia
Director, Advanced Airway Management
Department of Anesthesiology
Baylor College of Medicine
Houston
Disclosure

- None
Sometimes, first line conservative measures may fail to control obstetric hemorrhage

Under such circumstances, invasive procedures may be required urgently to avoid severe morbidity and mortality
Invasive treatment options, other than hysterectomy include:
- intrauterine balloon tamponade
- uterine compression sutures
- angiographic arterial embolization
- uterine artery and/or internal iliac artery ligation

However, no RCTs assessing relative efficacy and safety of these options exist to guide management.


Intrauterine balloon tamponade

- Intrauterine balloon tamponade is a conservative method for controlling postpartum hemorrhage, especially when uterine atony or lower uterine segment bleeding is suspected


- A 2007 systematic review reported the technique is successful (no need for additional therapy) 84% of the time, and a prospective evaluation reported a success rate of 81%


Intrauterine balloon tamponade

- A balloon specifically designed for this purpose is available
- Intrauterine balloon can be deployed quickly, requires minimal analgesia for both insertion and removal, and preserves fertility
  

- Failure is easily recognized and commonly attributed to prolapse - though a partially open cervix; in such cases, the balloon may be replaced and secured by applying bilateral ring forceps to the cervix or by placing a cervical cerclage


Intrauterine balloon tamponade

- Few complications have been reported, although concerns for infection exist
  
  Ajayi OA, Sant M, Ikhena s et al. Uterine rupture complicating sequential curettage and Bakri balloon tamponade to control secondary PPH. BMJ Case Rep 2013; 2013

- A case report described uterine rupture after curettage and subsequent tamponade balloon placement


Interventional Radiology (IR)

- Angiographic arterial embolization may be appropriate, if
  - moderate blood loss continues
  - patient is stable for transport to the IR suite

- Uterine blood supply during pregnancy
  - Primarily uterine arteries, br. of ant. trunk of the int. iliac arteries
  - Secondarily, ovarian and vaginal arteries

- In IR, bleeding vessels can be identified and embolized effectively with gelatin sponge pledgets (Gelfoam)
Gelfoam
- is temporarily occlusive
- flow through these vessels returns over time
- preserves both, the uterus and fertility

Few cases may require placement of metallic coil in addition to Gelfoam

Successful treatment of acute PPH needs
- rapid access to an angiography facility
- skilled interventional radiologist

Success rates in controlling PPH emergently variable
- 70% - 100%


Interventional Radiology

- Post-procedure observation and monitoring mandatory
- Ischemic complications of embolization therapy have been reported, but the risk is reduced with the use of selective techniques


Peripartum Hysterectomy

- Peripartum hysterectomy is the definitive treatment for postpartum hemorrhage unresponsive to
  - Medical therapy
  - Other invasive therapies
- The two most common indications are
  - Uterine atony
  - Placenta accreta

Overall rate of peripartum hysterectomy (1994 and 2007) in USA increased by 15% due to

- 130% increase in hysterectomy for atony
- 23% increase in hysterectomy for placental implantation abnormalities

Peripartum Hysterectomy

- Risk for hysterectomy rises progressively with an increasing number of previous CDs
  - Caused by placental abnormalities from increased CDs

- Parturients with a history of previous CD > 5 X as likely to require a peripartum hysterectomy than those without this history

PERIPARTUM HYSTERECTOMY

- Technically challenging operation
- Uterus is enlarged
- Exposure may be difficult
- Vessels are engorged
- Pregnant uterus receives a rich collateral blood supply
- Dense adhesions from previous surgeries
- Emergency hysterectomy for PPH
  - Perioperative morbidity rate of 56%
  - Mortality rate of 2.6%

PERIPARTUM HYSTERECTOMY

- Compared with nonobstetric hysterectomy, patients undergoing obstetric hysterectomy are more likely to have:
  - Postoperative hemorrhage
  - Require blood transfusion
  - Intraoperative urinary tract injury
  - Wound infection
  - Venous thromboembolism
  - Cardiovascular and other medical complications

- Mortality is > 25 X higher in peripartum than non peripartum hysterectomy

PERIPARTUM HYSTERECTOMY

- Transfusion is required in 44% or more of patients
- In comparison to elective peripartum hysterectomy, emergency peripartum hysterectomy is associated with
  - Increased blood loss
  - Worse coagulopathy
  - Increased transfusion rates

PERIPARTUM HYSTERECTOMY

- Multicenter review
- Mean EBL for emergency obstetric hysterectomy = 2526 mL
- Mean transfusion requirement = 6.6 units of PRBCs
- Mean EBL for elective obstetric hysterectomy = 1319mL
- Mean transfusion requirement = 1.6 units of PRBCs (Table)

Manual compression of the aorta can be lifesaving during catastrophic obstetric hemorrhage


Effective aortic compression against a vertebral body in the upper abdomen should decrease blood flow to the pelvis allowing

- Hemodynamic resuscitation
- Hemostatic resuscitation
- Surgical control

PERIPARTUM HYSTERECTOMY

- Aortic cross-clamp requires vascular surgery expertise and retroperitoneal dissection, but may be necessary to achieve hemostasis.
- Mild cardiac and renal dysfunction have been noted in nonobstetric patients if:
  - Aortic cross-clamp time exceeds 50 minutes
- If a prolonged clamp time is required, clamp release may lead to:
  - Lactic acidosis
  - Hemodynamic instability

Georgakis, P. et al. Duration of aortic cross-clamping during elective open abdominal aortic aneurysm repair operations and postoperative cardiac/renal function. Int Angiol 2010; 29:244-8
PERIPARTUM HYSTERECTOMY

- Advanced surgical techniques to control friable, engorged blood vessels include:
  - Felt pledges
  - Teflon pledges
  - Buttress sutures
  - Rapid application of straight clamps
  - Application of high-pressure surgical sealants


Anesthetic Management for peripartum hysterectomy is frequently challenging because massive blood loss may occur unpredictably.

An experienced skilled team is invaluable and critical to a successful outcome.

Intraperitoneal manipulation, dissection, and traction may lead to pain, nausea, and vomiting.

Maintenance of a T4 sensory level of anesthesia and judicious sedation may reduce the need for intraoperative conversion to general anesthesia.

In a multicenter study of peripartum hysterectomy, none of the 12 patients who received continuous epidural anesthesia for elective or emergency hysterectomy required intraoperative induction of general anesthesia.

Single-shot spinal anesthesia is unlikely to provide anesthesia of sufficient duration for an unanticipated hysterectomy.

Indications for induction of general anesthesia at the beginning of a cesarean hysterectomy include:

- Anticipated difficult airway management
- Antepartum hemorrhage with hemodynamic instability
- Known placenta accreta
  - Increases risk for massive hemorrhage and complex surgery
PERIPARTUM HYSTERECTOMY

- If epidural labor analgesia is used for VD, surgical anesthesia may be activated, but
  - Carefully consider hemodynamic status prior to adding local anesthetics into epidural space

- Animal models suggest that
  - Sympatholysis established before the onset of hemorrhage reduces excessive catecholamine response to blood loss and may improve survival
  - However, the induction of sympatholysis during hemorrhage may compromise end-organ perfusion and even, precipitate cardiopulmonary arrest

As the magnitude of blood loss increases, general anesthesia becomes the anesthetic technique of choice.

First, severely hypotensive patients may require tracheal intubation for airway protection.

Second, large fluid shifts and massive transfusion may adversely affect oxygenation.

- Ventilation control via a TT becomes necessary.

Third, these same fluid shifts increase airway edema, potentially making failed ventilation/failed tracheal intubation more likely as the surgery proceeds.
PERIPARTUM HYSTERECTOMY

- Fourth, airway edema may lead to failed extubation
- Fifth, massive transfusion of blood products may result in need for co-administration of potent vasopressors and calcium chloride and, thus central venous access
  - Placement of a central venous catheter may be more easily accomplished after induction of general anesthesia
In all cases, patients at risk for peripartum hysterectomy managed with neuraxial anesthesia should be informed in advance that intraoperative induction of general anesthesia may be necessary for:

- Anticipated hemorrhage
- Intraoperative discomfort
- Severe, ongoing hemorrhage
PERIPARTUM HYSTERECTOMY

- Induction of GA during severe hemorrhage requires careful use of small doses of non depressant induction agents
  - Etomidate
  - Ketamine

- Circulation should be supported with
  - Intravascular volume replacement
  - Vasopressors

- Review of 38 maternal deaths from PPH in France
  - 5 deaths followed cardiac arrest on induction of GA

PERIPARTUM HYSTERECTOMY

- Large-bore intravenous catheters (2 or more)
- Invasive blood pressure monitoring
  - Prompt recognition of hypotension
  - Provide access for frequent blood draws
- CVP monitoring
  - Massive hemorrhage
- Postop ventilation
- Postop ICU care
PERIPARTUM HYSTERECTOMY

- Blood bank should be alerted to the possible need for massive transfusion
  - Institute MTP
  - At least 4 units of O-ve PRBCs should be immediately available
  - Additional blood products, including platelets, plasma and cryoprecipitate, readily available without delay

- ACOG recommends consideration of intraoperative blood salvage in cases of placenta accreta


PERIPARTUM HYSTERECTOMY

- Vasoactive drugs (e.g., phenylephrine, epinephrine, NE)
- Additional equipment needed if anticipating and managing significant blood loss
  - Fluid warmers
  - Forced-air body warmer
  - Rapid infuser of fluids and blood products
- Teamwork
- Precise communication is indispensable