Critical Care Obstetrics: Severe Postpartum Hemorrhage and Blood Transfusion

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Outline

- Learning Objectives
- Background
- Management / Treatment
- Summary
- References

Learning Objectives

- Appreciate the significant impact of obstetric hemorrhage on maternal morbidity and mortality
- Understand the most common risk factors for obstetric hemorrhage
- Be confident initiating early, aggressive treatment for postpartum hemorrhage
- Utilize a staged approach to treating severe obstetric hemorrhage

BACKGROUND

PPH Background

- Obstetric hemorrhage affects 4-6% of births in the US and is a leading cause of maternal morbidity and mortality.
- Failure to recognize excessive blood loss is a major contributor to maternal morbidity and mortality.
- Lack of early recognition and intervention is common in woman who die from obstetric hemorrhage.

123(5):973-977, May 2014

OBSTETRICS & GYNECOLOGY

Current Commentary

The National Partnership for Maternal Safety

Mary E. D'Alton, MD, Elliott K. Main, MD, M. Kathryn Menard, MD, and Barbara S. Levy, MD

Recognition of the need to reduce maternal mortality and morbidity in the United States has led to the creation of the National Partnership for Maternal Safety. This collaborative, broad-based initiative will begin with three priority bundles for the most common preventable causes of maternal death and severe morbidity: obstetric hemorrhage, severe hypertension in pregnancy, and peripartum venous thromboembolism. In addition, three unit-improvement bundles for obstetric services were identified: a structured approach for the recognition of early warning signs and symptoms, structured internal case reviews to identify systems improvement opportunities, and support tools for patients, families, and staff that experience an adverse outcome. This article details the formation of the National Partnership for Maternal Safety and introduces the initial priorities.

(Obstet Gynecol 2014;123:973–7)
DOI: 10.1097/AOG.0000000000000219

issued a Sentinel Alert entitled "Preventing Maternal Death"[2] and proposed various initiatives to decrease maternal mortality including case reporting and review, health care provider education, team training and drills, and thromboembolism prophylaxis.

During the past 2 years, several organizations–including the American College of Obstetricians and Gynecologists (the College), the Centers for Disease Control and Prevention, the Society for Maternal–Fetal Medicine, the Health Resources and Services Administration, the Association of Women's Health, Obstetric, and Neonatal Nurses, and the American College of Nurse-Midwives–have collaborated to identify priorities for maternal safety. Universal recognition of the need for action to reduce U.S. maternal mortality and morbidity led to the creation of the National Partnership for Maternal Safety. This report outlines a national initiative for every birthing facility

126(1):155-162, July 2015

OBSTETRICS & GYNECOLOGY

Consensus Statement

National Partnership for Maternal Safety

Consensus Bundle on Obstetric Hemorrhage

Elliott K. Main, MD, Dena Goffman, MD, Barbara M. Scavone, MD, Lisa Kane Low, PhD, CNM, Debra Bingham, DrPH, RN, Patricia L. Fontaine, MD, MS, Jed B. Gorlin, MD, David C. Lagrew, MD, and Barbara S. Levy, MD

Hemorrhage is the most frequent cause of severe maternal morbidity and preventable maternal mortality and therefore is an ideal topic for the initial national maternity patient safety bundle. These safety bundles outline critical clinical practices that should be implemented in every maternity unit. They are developed by multidisciplinary work groups of the National Partnership for Maternal Safety under the guidance of the Council on Patient Safety in Women's Health Care. The safety bundle is organized into four domains: Readiness, Recognition and Prevention, Response, and Reporting and System Learning. Although the bundle components may be adapted to meet the resources available in individual facilities, standardization within an institution is strongly encouraged. References contain sample resources and "Potential Best Practices" to assist with implementation.

(Obstet Gynecol 2015;126:155–62)
DOI: 10.1097/AOG.0000000000000869

Obstetric hemorrhage is the most common serious complication of childbirth and is the most preventable cause of maternal mortality.[1,2] Furthermore, recent data suggest that rates of obstetric hemorrhage are increasing in developed countries, including the United States,[3] and that rates of hemorrhage-associated severe maternal morbidity exceed the morbidities associated with other obstetric and medical conditions.[4,5]

Risk Factors for PPH

- Prolonged or augmented labor
- Retained/Abnormal placentation
- Lacerations
- Operative vaginal delivery
- Macrosomic infant
- Abruption
- Hypertensive disorders
- Prior PPH
- Obesity
- High parity
- Asian/Hispanic
- Precipitous labor
- Uterine over distention
- Uterine infection
- Drugs that cause uterine relaxation

Risk Assessment

Low	Medium	High
No previous uterine surgery	Prior cesarean or uterine surgery	Placenta previa/low lying placenta
Singleton	Multiple gestation	Suspected placenta accrete, increate, percreta
≤ 4 previous vaginal deliveries	> 4 previous vaginal deliveries	Hematocrit <30 and other risk factors
No known bleeding disorder	Chorioamnionitis	Platelets <100k
No history of PPH	History of PPH	Active bleeding at admission
	Large fibroids	Known coagulopathy

Causes of PPH

- Uterine Atony
- Trauma
- Retained Placenta
- Coagulation Disorders
- Uterine Inversion
- Abnormal Placentation

Definition

- ACOG nomenclature consensus conference (reVITALize) recently revised:
  - Early postpartum hemorrhage: cumulative blood loss of >=1000ml OR blood loss accompanied by signs/symptoms of hypovolemia within 24 hours
  - Cumulative blood loss of 500-999ml alone should trigger increased

MANAGEMENT / TREATMENT

Diagnosis

- Depends on accurate assessment of blood loss which must be:
  - As quantitative as possible
  - Cumulative

1 gm weight

=

1 ml of blood loss

Sponges	20 gms
Blue/Green Towels	80 gms

Collaborative Obstetric hemorrhage toolkit 2.0

Initial Management

- Goal is early recognition, supportive care, treat the etiology and stop the bleeding.
- Unit-standard, stage-based obstetric hemorrhage emergency response plan.

Initial Management

- Supportive care:
  - Assess resources
  - Vitals, O2 saturation, empty bladder, fundal massage
  - Ensure IV access, increase fluids
  - Type and cross
  - Escalate through stages

Initial Management

Based on etiology:

- Medical therapy (atony)
- Tamponade (balloon/packing)
- Surgical therapy (based on etiology)

Medications

Medications for Uterine Atony	
Oxytocin (**Pitocin**)	10-40 international units/liter intravenously, or 10 units IM if no IV access
Methylergonovine (**Methergine**)	0.2 milligrams intramuscularly (may be repeated every 2-4 hours)
15-methyl PGF_{2a} (**Hemabate, Carboprost**)	250 micrograms intramuscularly (may repeat every 15 minutes, maximum 8 doses)
Misoprostol (**Cytotec**)	800-1000 micrograms rectally

Nonpharmacological Management of PPH

- Repair of lacerations
- Uterine curettage for retained placenta
- Tamponade devices

Laceration Repair

- These can occur in any portion of the genital tract and can lead to PPH
- Very common
- Adequate visualization and systematic inspection are essential

Uterine Curettage

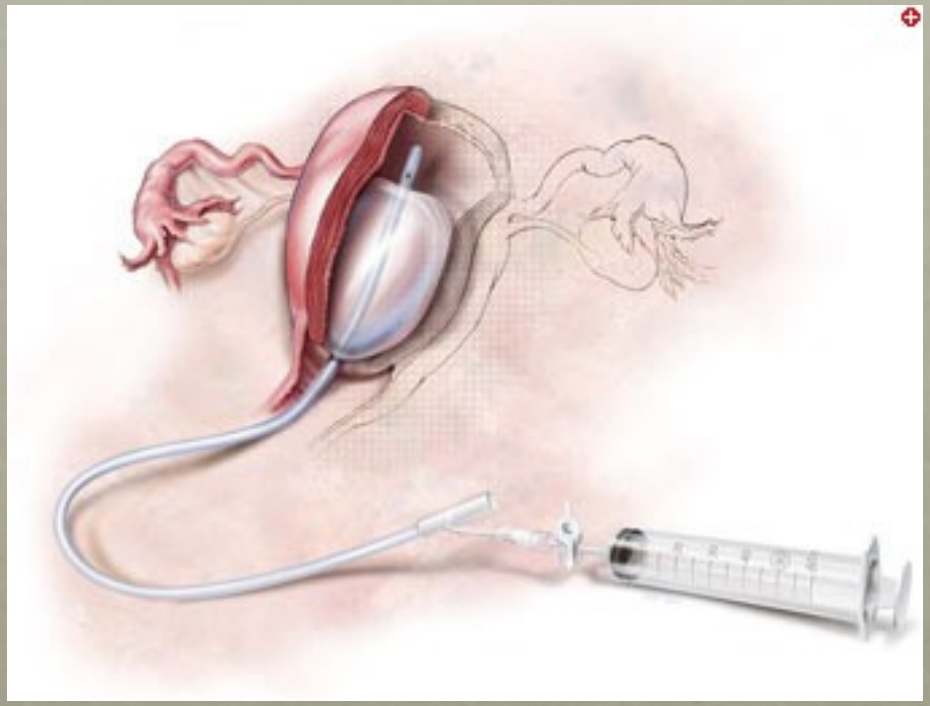
- Hemorrhage rates have found to be increased if the length of the 3rd stage of labor is >30min
- Examine placenta
- Bedside ultrasound
- Uterine curettage under ultrasound guidance using a large, blunt curette

Uterine Tamponade

- Uterine Packing
  - Initially described in 1887
  - Packing material distending the uterine cavity providing pressure against the uterine walls
  - Risk of concealed hemorrhage and continued bleeding

Intrauterine Balloon

- Initially described in 1999
- Balloon catheter placed inside the uterus
- Used in both vaginal and cesarean deliveries
- After placement of balloon – pack vagina as well



Intrauterine Balloon

- Applies inward to outward hydrostatic pressure against the uterine wall
- Compression reduces blood flow and facilitates clotting
- Success rates range from 57-100%
- Indications include atony and bleeding from abnormal placentation

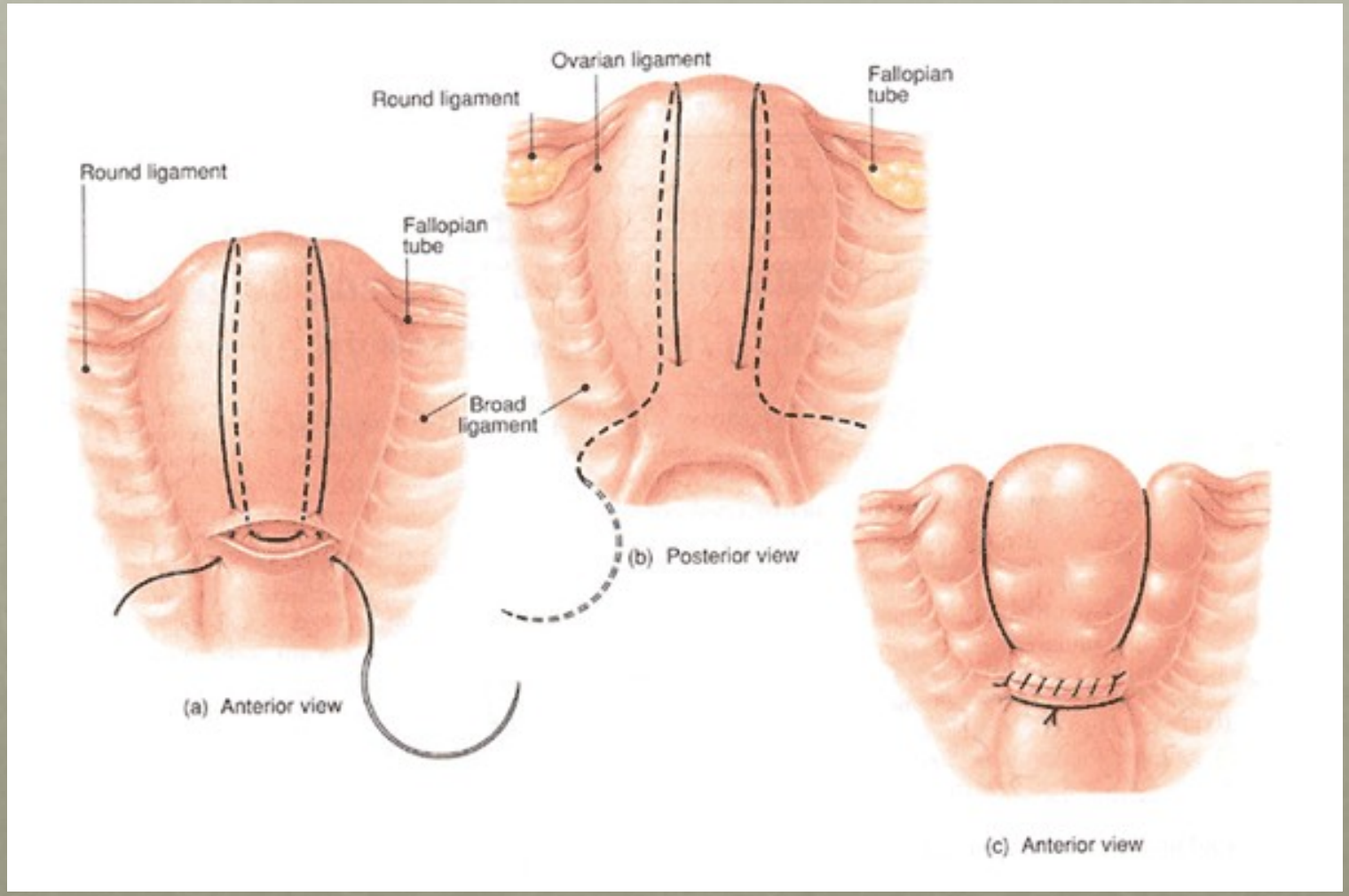
Surgical Management of PPH: Uterine Sparing Techniques

- B- Lynch Suture
- Uterine Artery Ligation
- Uterine Devascularization
- Hypogastric Artery Ligation

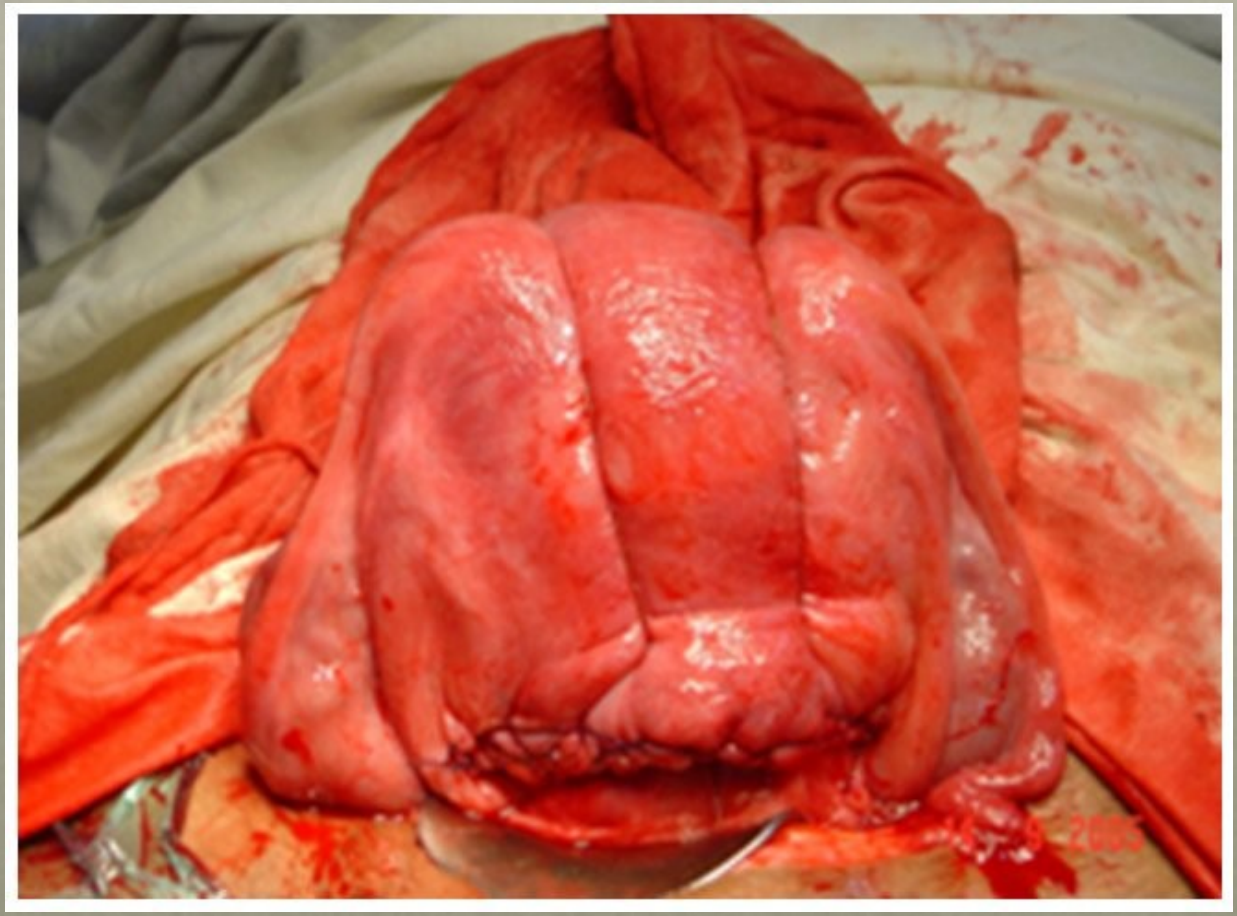
B-Lynch Suture

- Described in 1997
- Compression suture to control PPH due to atony at time of cesarean
- Preformed prior to closer of the uterine incision

B-Lynch Suture Technique

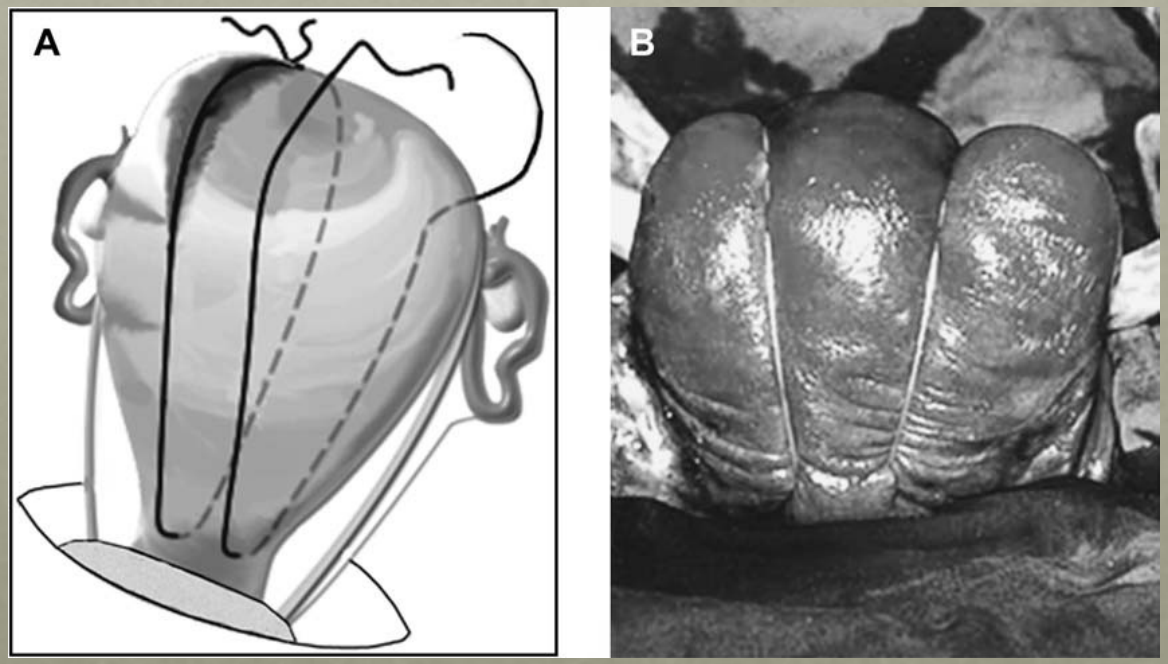


B- Lynch Technique



Hayman Modification of B-Lynch Technique

- Doesn’t require a hysterotomy



Ghezzi F, . *BJOG* 2007

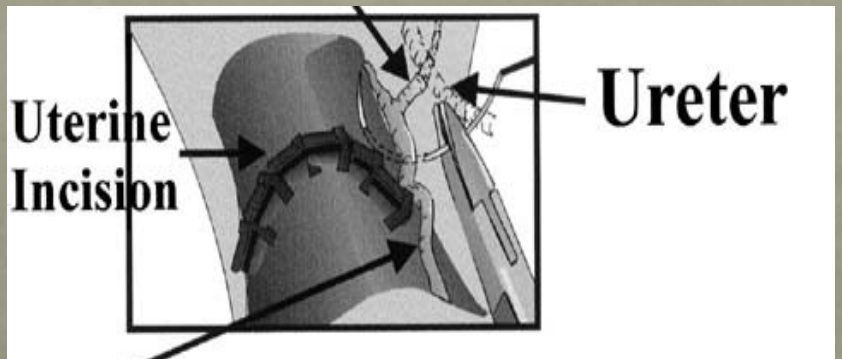
Uterine Artery Ligation

- Described in 1966 by O'Leary and O'Leary
- Uterine artery is ligated at the level of the internal os
- 2002 – Vaginal approach described



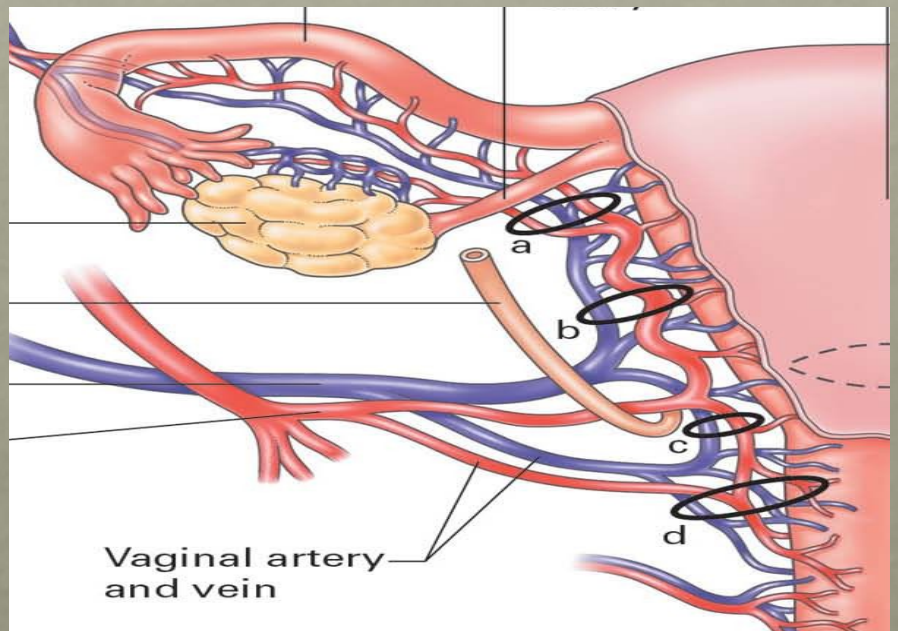
O'Leary & O'Leary. *Obstet Gynecol*.

Uterine Artery



Uterine Devascularization

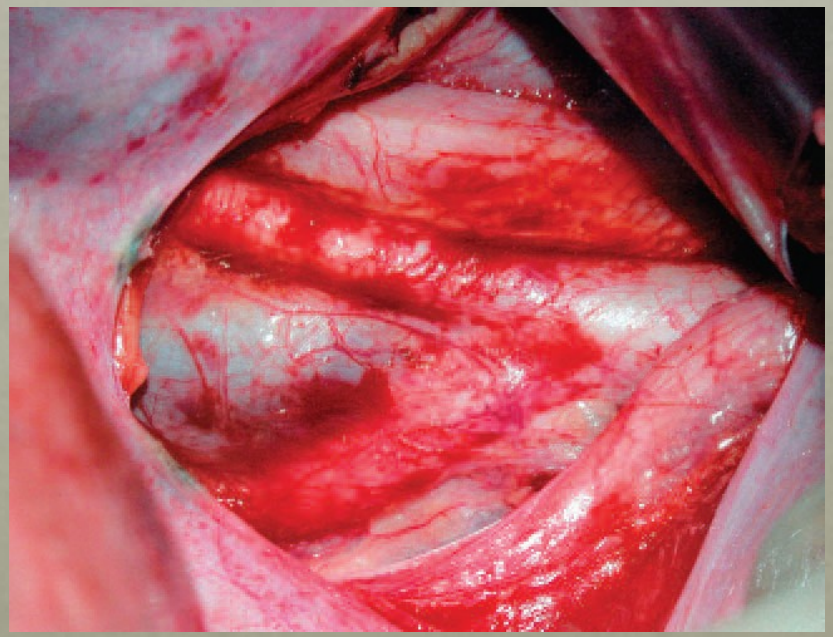
- AdbRabbo in 1994
- Extension of the O'Leary technique involving ligation of more of the uterine vascular supply
- Complications
  - Ovarian failure
  - Synechiae
  - Necrotic uterus

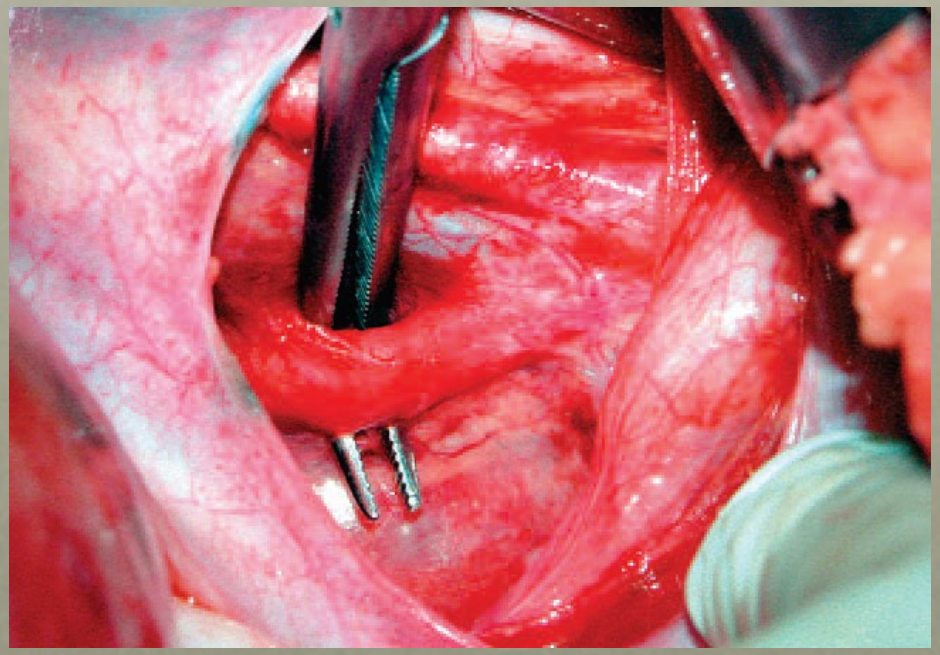


Hypogastric Artery Ligation

- Described as early as 1888 to control hemorrhage associated with gynecologic malignancy
- Requires thorough knowledge of pelvic anatomy
- Exposure is essential
- Controls hemorrhage by reducing pulse pressure which allows hemostasis to be achieved more quickly

Hypogastric Artery Ligation





Porreco R et al. *Clinical Obstetrics andGynecology* 2010

Uterine Artery Embolization

Uterine Artery Embolization

- Described in 1979 for control of vaginal lacerations
- 1980 successful use in uterine atony
- Success rates as high as 95%
- Complications – ischemia, neuropathy, uterine necrosis, vessel aneurysm, late rebleeding, fever

Uterine Artery Embolization







http://imaging.consult.com/imageSearch?query=pelvis&qyType=AND&global_search=Search&modality=&thes=false&normalVariantImage=false&groupByNo

Peripartum Hysterectomy

When all other options fail

Peripartum Hysterectomy

- Definitive surgical management
- Incidence 1/1000
- Indications
  - Atony
  - Abnormal placentation
- Risk Factors
  - Prior cesarean

Peripartum Hysterectomy Technique

- Similar to traditional hysterectomy
- Increased pedicle size
- “Clamp-cut-drop” technique

Shah M & Wright J. *Semin Perinatol*

The cervix: Take it or leave it?

- Surgeon preference
- Supracervical may be completed faster
- May need total in order to control bleeding
- No difference in complication rates, operating time, blood loss or transfusion between two techniques

Chandraharan E & Arulkumaran S. *Best Pract Res Clin Obstet*

Peripartum Hysterectomy – Maternal Outcomes

Complications	Percentage
Death	0.5-6%
ICU admission	20.1-84%
Reoperation	11.6-33.3%
Mechanical Ventilation	7-13%
Cystotomy	6-28%
Blood Transfusion	83%

Shah M & Wright J. *Semin Perinatol* 2009

MASSIVE TRANSFUSION

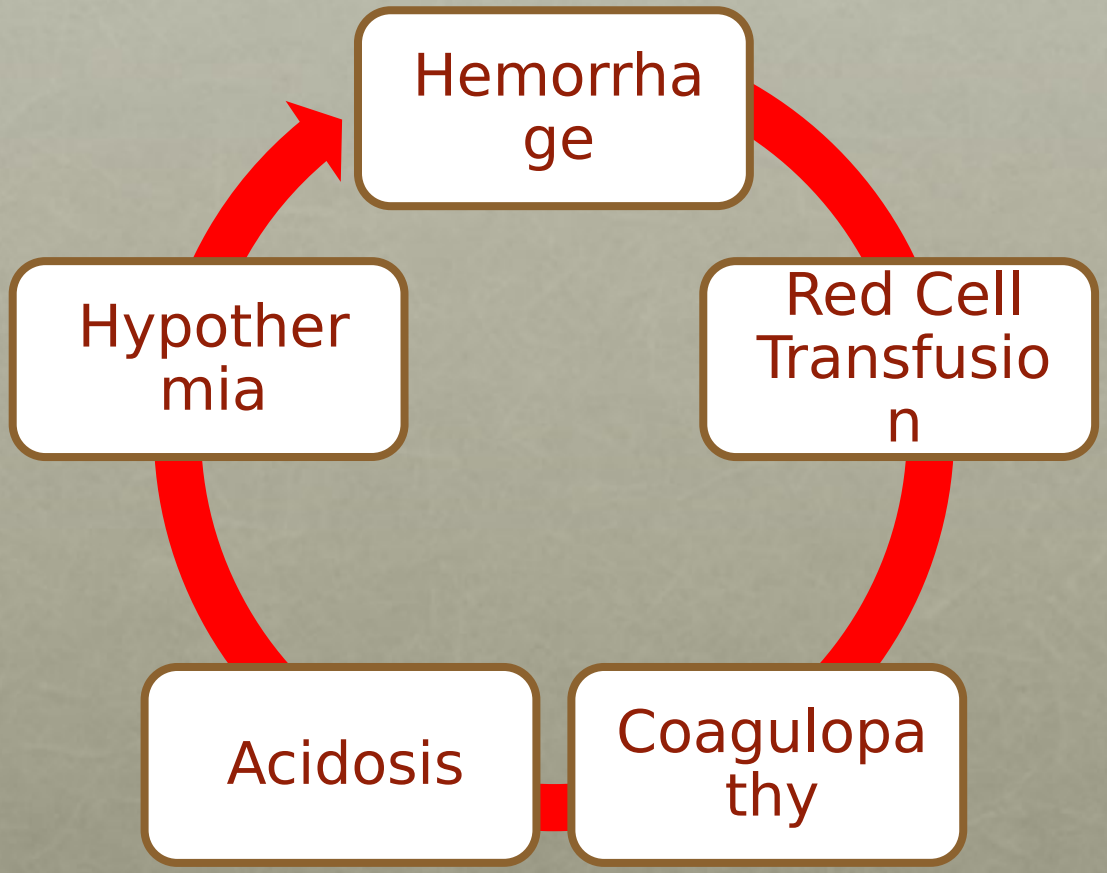
Classification of Hemorrhage

Hemorrhage Class	Acute Blood Loss	Percent Loss	Symptoms
1	900ml	15	None, palpitations, dizziness, mild tachycardia
2	1200-1500ml	20-25	Mild tachycardia, tachypnea, diaphoresis, weakness
3	1800-2100	30-35	Overt hypotension, tachycardia, tachypnea, pallor, oliguria
4	2400ml	40	Hypovolemic

Blood Products

Product	Volume (mL)	Content	Effect
Packed Red Cells	240	RBC, WBC, plasma	Increase Hct by 3%; hgb by 1g/dL
Platelets	50	Platelets, RBC, WBC, plasma	Increase platelet count by 5,000 – 10,000/mm^3 per unit
Fresh Frozen Plasma	250	Fibrinogen, antithrombin III, Factors V and VIII	Increase fibrinogen by 10mg/dL
Cryoprecipitate	40	Fibrinogen, factors VIII and XIII, von Willebrand factor	Increase fibrinogen by 10mg/dL

Massive Transfusion



Massive Transfusion Protocol

- Preset ratio of RBC:FFP:platelets
- Automatic release and replenishment
- Avoid dilution coagulopathy
- Avoid acidosis, hypocalcemia and hyperkalemia
- Additional agents available for hemorrhage unresponsive to adequate blood product replacement

Massive Transfusion Protocol

- Must ascertain:
  - Guidelines for escalation/activation/blood transport
  - How additional blood products/platelets will be obtained
  - Mechanism for obtaining serial labs to ensure transfusion targets achieved

Stage 1	Blood loss: > 500ml vaginal or >1000 ml Cesarean, or VS changes (by >15% or HR ≥110, BP ≤85/45, O2 sat <95%)		
Stage 1 is short: activate hemorrhage protocol, initiate preparations and give Methergine IM.	• Activate OB Hemorrhage Protocol and Checklist • Notify Charge nurse, OB/CNM, Anesthesia • VS, O2 Sat q5' • Record **cumulative** blood loss q5-15' • **Weigh** bloody materials • Careful inspection with good exposure of vaginal walls, cervix, uterine cavity, placenta	• **IV Access:** at least 18gauge • Increase IV fluid (LR) and Oxytocin rate, and repeat **fundal massage** • **Methergine** 0.2mg IM (if not hypertensive) May repeat if good response to first dose, BUT otherwise **move on** to 2nd level uterotonic drug (see below) • Empty bladder: straight cath or place foley with urimeter	• **T&C 2 Units PRBCs** (if not already done)

PPH

- ☐ Monitor cumulative blood loss
- ☐ Insert Foley catheter
- ☐ Ensure IV access: 16 gauge if possible
- ☐ Increase IV fluid (crystalloid: estimated blood loss in 2:1 ratio without oxytocin)

- ☐ Determine and treat etiology (4 Ts - Tone, Trauma, Tissue, Thrombin)
- ☐ Contact Blood Bank: Type and cross-match 2 units PRBCs

Stage 2	Continued bleeding with total blood loss under 1500ml		
Stage 2 is focused on sequentially advancing through medications and procedures, mobilizing help and Blood Bank support, and keeping ahead with volume and blood products.	OB back to bedside (if not already there) • **Extra help**: 2nd OB, Rapid Response Team (per hospital), assign roles • VS & **cumulative** blood loss q 5-10 min • Weigh bloody materials • **Complete evaluation** of vaginal wall, cervix, placenta, uterine cavity • Send additional labs, including DIC panel • If in Postpartum: Move to L&D/OR • Evaluate for special cases: -Uterine Inversion -Amn. Fluid Embolism	**2nd Level Uterotonic Drugs:** • **Hemabate** 250 mcg IM or • **Misoprostol** 800 mcg SL **2nd IV Access** (at least 18gauge) Bimanual massage **Vaginal Birth:** (typical order) • Move to OR • Repair any tears • D&C: r/o retained placenta • Place intrauterine balloon • Selective Embolization (Interventional Radiology) **Cesarean Birth:** (still intra-op) (typical order) • Inspect broad lig, posterior uterus and retained placenta • B-Lynch Suture • Place intrauterine balloon	• **Notify Blood Bank of OB Hemorrhage** • **Bring 2 Units PRBCs to bedside, transfuse per clinical signs – do not wait for lab values** • Use blood warmer for transfusion • Consider thawing 2 FFP (takes 35+min), use if transfusing > 2u PRBCs • Determine availability of additional RBCs and other Coag products



Abnormal vital signs/labs/oliguria:

Continued bleeding with EBL > 1500mL OR >2 units PRBCs given OR patient at risk for occult bleeding (post-cesarean) & DIC

- ☐ Outline management plan → Serial re-evaluaiton → Communicate plans with hemorrhage team
- ☐ Tranfusion → RBC-FFP-Platelets in a 6:4:1 ratio (activate Massive Transfusion Protocol - MTP) → If coagulopathic, add cryoprecipitate. Consider consultation for alternative agents
- ☐ Identify etiology for bleeding (if still unclear)
- ☐ Rule out lacerations (exam), coagulopathy (labs), occult bleeding (imaging)
- ☐ Achieve hemostasis immediately, interventions based on etiology
- ☐ Adopt additional measures (if poor response)



Cardiovascular Collapse:

For patients with cardiovascular collapse in setting of massive hemorrhage consider the following etiologies:

- ☐ Profound hypovolemic shock (blood loss not replaced)
- ☐ AFE (sudden CV collapse followed by heavy uterine bleeding from uterine relaxation and associated coagulopathy)

- **Immediate surgical intervention to ensure hemostasis (hysterectomy) may be necessary.**
- **Simultaneous aggresive blood and factor replacement & medical interventions initiated reguardless of the patient's coagulation status.**
- **Expeditious hemostasis is the only step that will maximize survival rates for these critical patients.**

Post-Hemorrhage Management

- ☐ Debrief with entire care team
- ☐ Document **after** team debrief
- ☐ Discuss interventions with patient/family members

Recurrence Risk

Pregnancy	Risk PPH
1st	5.8%
2nd with PPH in 1st	14.8%
3rd with 2 prior PPH	21.7%
3rd without PPH in 2nd	10.2%

Ford et al. *Med J Aust.* 2007; 187

SUMMARY

Obstetric Hemorrhage Best Practices

- Management varies depending on etiology and available treatment options
- Multidisciplinary approach is required
- Uterotonics are first-line treatment for atony

Obstetric Hemorrhage Best Practices

- When uterotonics fail (even with vaginal delivery), exploratory laparotomy is the next step.

- In the presence of conditions associated with placenta accreta, the obstetric care provider must have a high clinical suspicion and take appropriate precautions.

Obstetric Hemorrhage Clinical Diamonds

- Angiographic embolization is not meant to be used for acute, massive PPH.
- Never treat “PPH” without simultaneously pursuing an actual clinical diagnosis.
- In the PP patient who is bleeding or who recently has stopped bleeding and is oliguric, Furosemide is not indicated and will exacerbate the

Obstetric Hemorrhage Clinical Diamonds

- Any woman with placental previa and 1 or more cesarean deliveries should be evaluated and delivered in a tertiary care medical center.
- If your labor and delivery unit does not have a recently updated massive transfusion protocol based on established trauma protocols, get one today.

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References & Resources

- www.CMQCC.org
- www.acog.org Safe Motherhood Initiative Bundles
- www.pphproject.org