

# OBSTETRIC HEMORRHAGE: ROLE OF THE IR

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## CONCEPT: PPH EMBOLIZATION

- Arterial embolization for Ob-Gyn applications
  - 1979 first embolization for PPH
- Etiology:
  - Uterine atony
  - Cervical or uterine injury
    - Curettage → Pseudo-aneurysm or AVM formation
  - Retained placental products
- Hemorrhage: 1cc/min to be visualized on angiography
- Bilateral uterine artery embolization in absence of extravasation

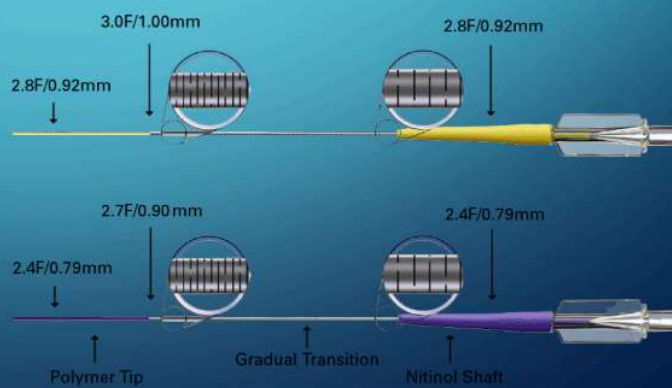
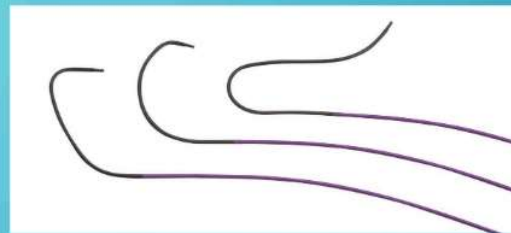
## PRIMARY VS SECONDARY PPH

- Primary PPH appears during the first 24 hours after delivery
- Secondary PPH occurs for more than 24 hours and up to 12 weeks after delivery

	Primary PPH	Secondary PPH
Etiology	Atony (mc)	Retained placental tissue (mc)
	Genital tract laceration	UA injury or rupture
	Retained placental tissue	Uterine AVM
	Coagulopathy	Uterine subinvolution/atony
	Uterine rupture	Coagulopathy
Angiographic bleeding focus		Higher incidence of UA pseudoaneurysm and contrast extravasation in secondary PPH
Technical success	90–100%	Almost 100%
Clinical success	86–98%	88–90.4%

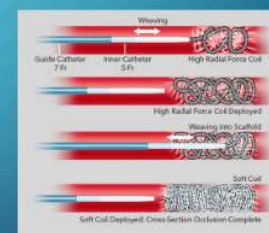
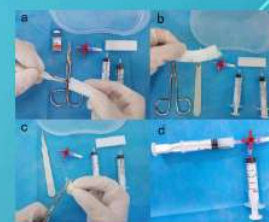
## TECHNIQUE

- Femoral approach (uni - or bilateral)
- 5F short sheath
- Cobra catheter 5F
  - Direct embolization
  - Microcatheter 2,7F
- Unilateral or bilateral



## TECHNIQUE: EMBOLIZATION MATERIALS

- Gelatin sponge particles – “slurry”
  - temporary occlusion for 3–6 weeks and recanalization of the target arteries which is advantageous for future fertility
- N-butyl cyanoacrylate (NBCA)
  - active bleeding, i.e., contrast extravasation or a pseudoaneurysm, 2) hemodynamically unstable conditions, or 3) failed embolization with gelatin sponge particles
  - PPH with disseminated intravascular coagulation (DIC), extravasation or pseudoaneurysm
- Polyvinyl alcohol particles
  - is not recommended as they may cause uterine necrosis
- Metallic coils
  - can be used to occlude ruptured pseudoaneurysms
  - sole or an adjunctive embolic material



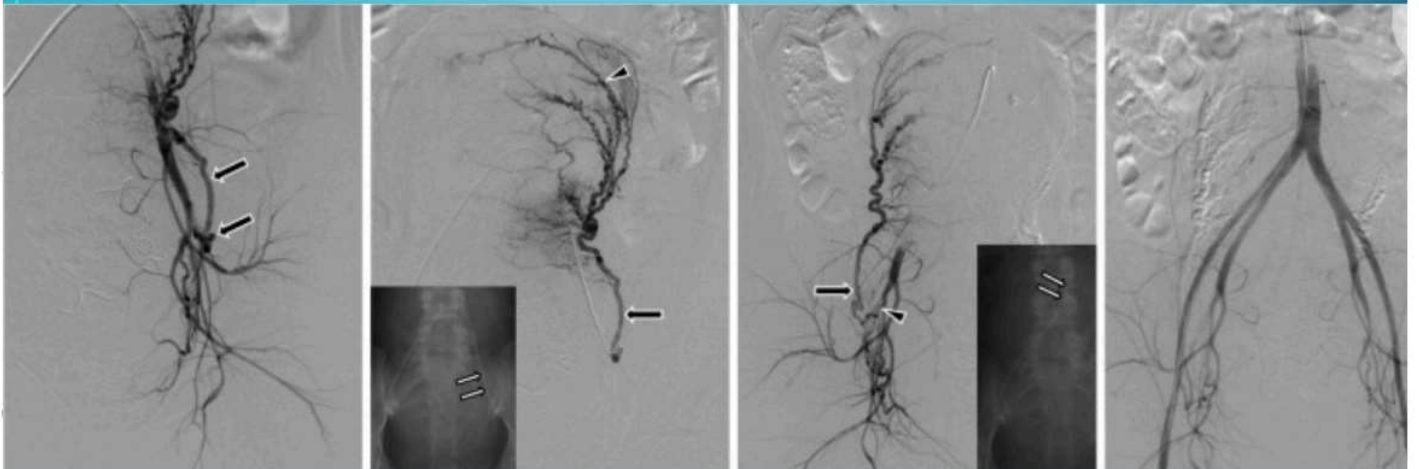
## TIMING OF EMBOLIZATION

- Delay in appropriate management
  - major factor in the adverse outcomes associated with primary PPH
- abnormal bleeding is observed, regardless of the severity of PPH
  - Interventional radiologists should be involved
- TAE should even be considered as the first-line hemostatic measure for patients
- Hemodynamic instability should not be considered as a contraindication for TAE
- Repeat embolization should also be considered before performing hysterectomy

## TYPES OF EMBOLIZATION: UTERINE ATONY

- Uterine atony is found in 70–80% of PPH
- Best indication for preferring TAE as the first-line measure
- Angiography shows dilated uterine and arcuate arteries which extend cephalad to the aortic bifurcation
- Bleeding is usually diffuse with rarely visible extravasation of contrast material
- Gelatin sponge particles are the preferred and sufficient embolic materials when coagulopathy is not associated.

## TYPES OF EMBOLIZATION: UTERINE ATONY





## TYPES OF EMBOLIZATION: GENITAL TRACT LACERATION

- Lacerations of the genital tract 8–20% of PPH, alone or in association with atony,
- higher rate in primary and severe PPH
- Conventional suture and packing methods are generally first performed for hemostasis in genital tract laceration
- however, TAE can stop the bleeding and provide a clear visual field when repairing the trauma
- NBCA is the preferred embolic material as it makes a solid filling cast and occludes the artery.
- A contrast-enhanced CT scan
  - helpful for determining the amount and location of a hematoma
  - detecting bleeding arteries,
  - subsequently facilitating catheterization
  - reducing the procedure time

## TYPES OF EMBOLIZATION: GENITAL TRACT LACERATION



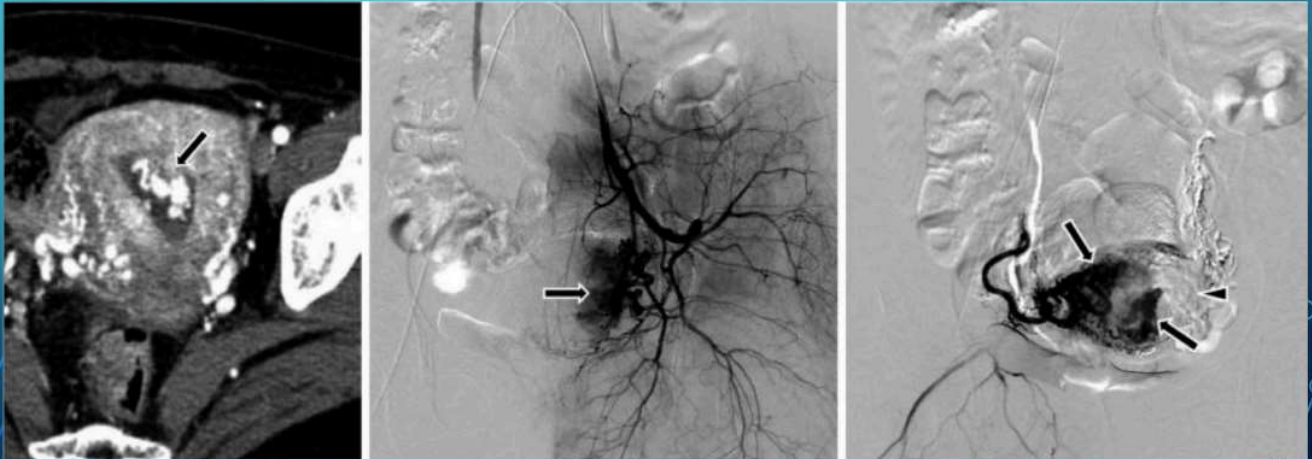
## TYPES OF EMBOLIZATION: GENITAL TRACT LACERATION



## TYPES OF EMBOLIZATION: UTERINE ARTERIOVENOUS MALFORMATION

- AVM is a condition associated with delivery or surgical procedures
- Uterine AVM is one of the etiologies of secondary PPH
- Unexpected, excessive, and intermittent bleeding after delivery
- Bilateral UAs are usually found to be feeding arteries. Angiography shows hypertrophied UAs into the AVM and early drainage from the AVM to pelvic veins
- Embolization of bilateral UAs by gelatin sponge particles is the first-line therapy

## TYPES OF EMBOLIZATION: UTERINE ARTERIOVENOUS MALFORMATION



## TYPES OF EMBOLIZATION: PLACENTAL ABNORMALITY

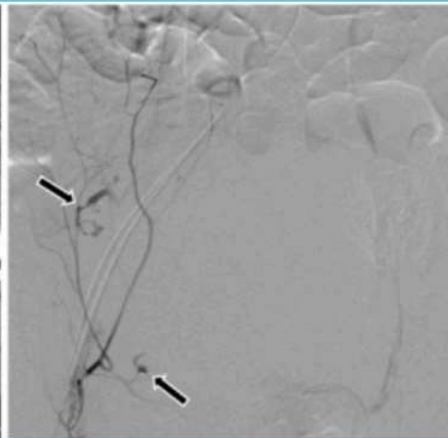
- Placenta previa and placenta accreta/increta/percreta
- TAE has shown a success rate of approximately 80% with only 20% of women requiring further surgery and hysterectomy
- Gelatine sponge
- Possible approaches:
  - Prophylactic sheath/catheter placement with or without TAE after delivery
  - Balloon occlusion with or without TAE after delivery or TAE after delivery
  - Prophylactic embolization of IIA or UA before delivery is controversial



## EMBOLIZATION AFTER CESAREAN SECTION

- Primary PPH due to injuries to pelvic arteries, uterine atony or placental abnormality
- spontaneous pseudoaneurysm rupture frequently causes secondary PPH.
- TAE should be considered while the woman is out of the operating room

## EMBOLIZATION AFTER CESAREAN SECTION





## REBLEEDING RATE AFTER TAE

- Rebleeding rate after TAE has been reported to range from 5.2% to 13.5%
- Despite its technical success of almost 100%
- The main reason for rebleeding after TAE:
  - Recanalization of embolized arteries
  - The opening of the collateral communications
  - The presence of spontaneous arterial anastomoses:
    - round ligament artery
    - ovarian artery,
    - middle rectal artery
    - inferior mesenteric artery,

## IMAGING IN PPH

- Computed tomography (CT) with intravenous contrast
  - 3 phase: NECT, Arterial and venous.
  - Not recommended as a first line option in classic PPH
  - Problem solving tool if clinical ambiguity remains after initial work up.
  - Cases of persistent or recurrent bleeding after empiric embolization
- CTA can determine if active arterial extravasation is present
- Localize the site of bleeding.
- Multiphase imaging can also be useful in the detection of vascular anomalies
- Detailed anatomic evaluation of feeding and draining vessels.
- CTA is more sensitive for extravasation than angiography:
  - CTA: Threshold for bleeding: 0,35mL/min
  - Catheter angiography: >0,5 mL/min to be positive

## COMPLICATIONS OF TAE

- The complication rate of both primary PPH and secondary PPH is about 4.0%
- Major complication:
  - hemoperitoneum related to dissection of IIA
  - endometritis,
  - zonal ischemic necrosis of the inner half of the myometrial wall,
  - uterine necrosis.
- Minor complications
  - postembolization syndromes (transient fever, mild leukocytosis, and abdominal pain),
  - altered menstruations (heavier menses, lighter menses, and dysmenorrheal),
  - dissection of the UAs,
  - transient buttock/foot ischemia,
  - puncture site hematoma

## CONCLUSION: TAE

- Embolization is a useful and Important treatment option for any type of PPH
- Should be considered as the first-line therapy to control PPH
- Close communication among the OB-GYN and the IR to avoid delay
- Why TAE?
  - minimally invasive procedure
  - rapid procedure
  - faster recovery
  - can be performed without general anesthesia
  - preserves uterus
  - makes future menstruation and fertility possible
  - low complication risk