Impeding the Bleeding: Spectrum of Gynecologic and Obstetric Indications for Transcatheter Embolization

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Disclosures

- Medtronic – Faculty
- TerSera – Consultant

Objectives

- Identify scenarios for OB and GYN interventional therapies
- Counsel on outcomes from IR interventions relating to OB and GYN
- Advise teams about patient outcomes and satisfaction for minimally invasive approaches to OB and GYN bleeding

Advantages of Transcatheter Embolization

- Minimally invasive
- Obviate surgery
- Decrease morbidity and mortality
- Safeguard future fertility potential

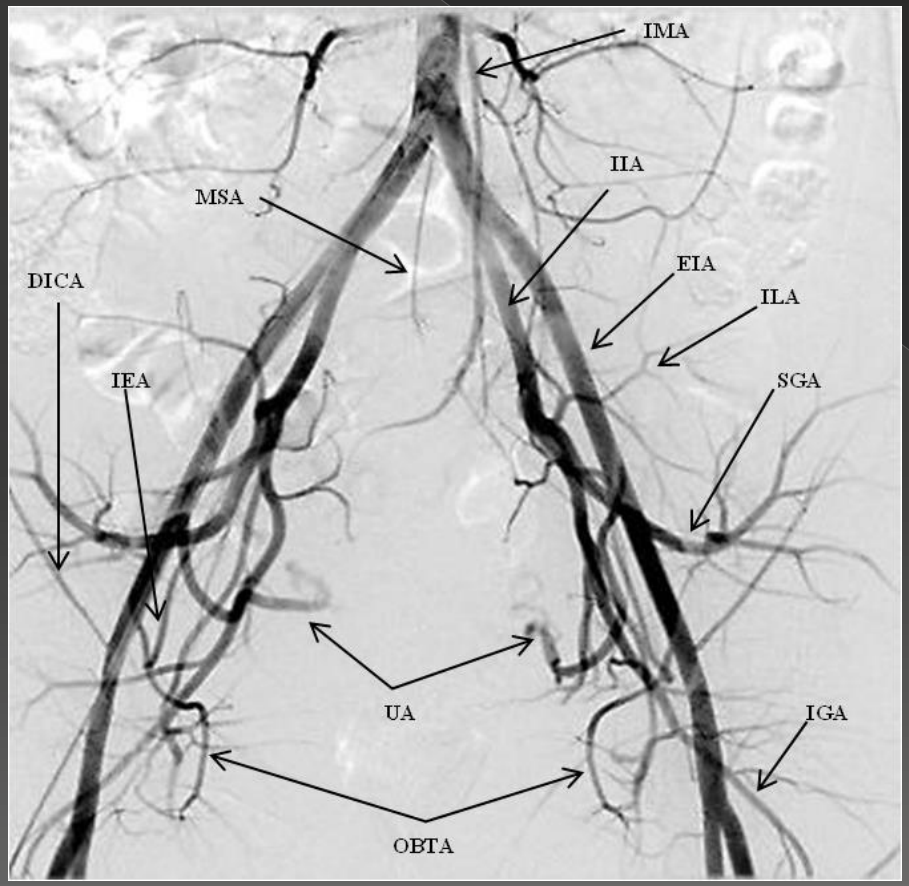
TCE integration into treatment plan

- Clinical indications
- Relevant vascular anatomy
- Technique of the procedure
- Potential risks and benefits of embolization

Vascular Anatomy

- Uterine artery
  - Proximal branch of internal iliac artery
  - Cervico-vaginal branches
  - Anastomoses with ovarian arteries and between left and right sides common
- Artery to the round ligament
  - From external iliac artery or inferior epigastric artery
- Ovarian artery
  - From aorta just below renal arteries

Pelvic arterial anatomy



Utero-ovarian anastomosis

Early

Late

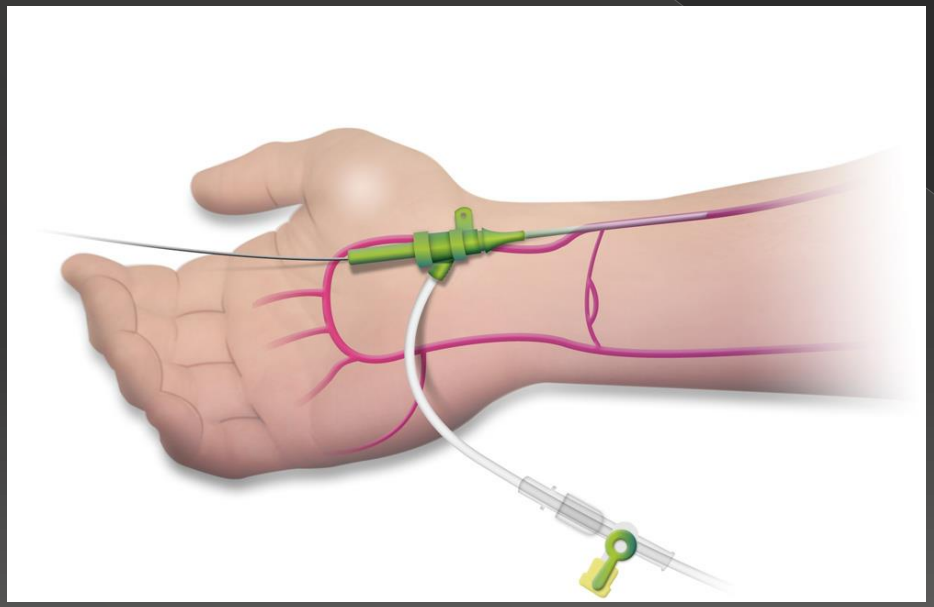
Indications for Embolization

- Elective treatment of uterine fibroids and pelvic venous disorder
- Emergent/urgent control of vaginal/pelvic hemorrhage
- No absolute contraindications in emergency
- Elective contraindications
  - Renal insufficiency, coagulopathy, contrast allergy
  - Pelvic infection, malignancy, previous irradiation, IUP

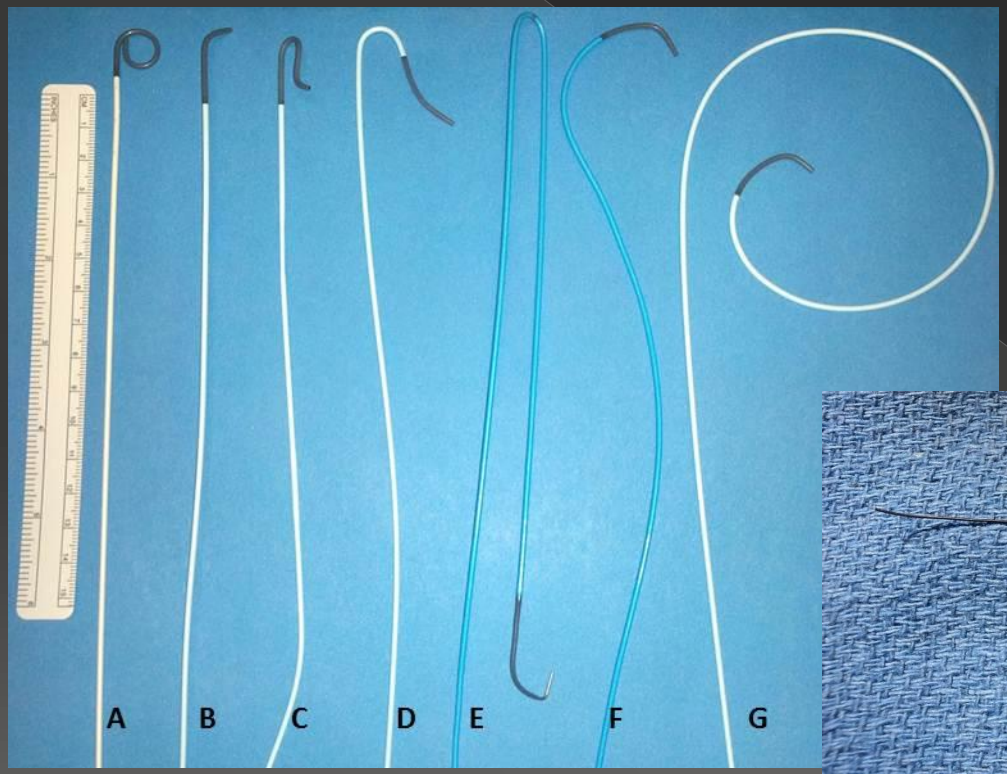
Angiography techniques

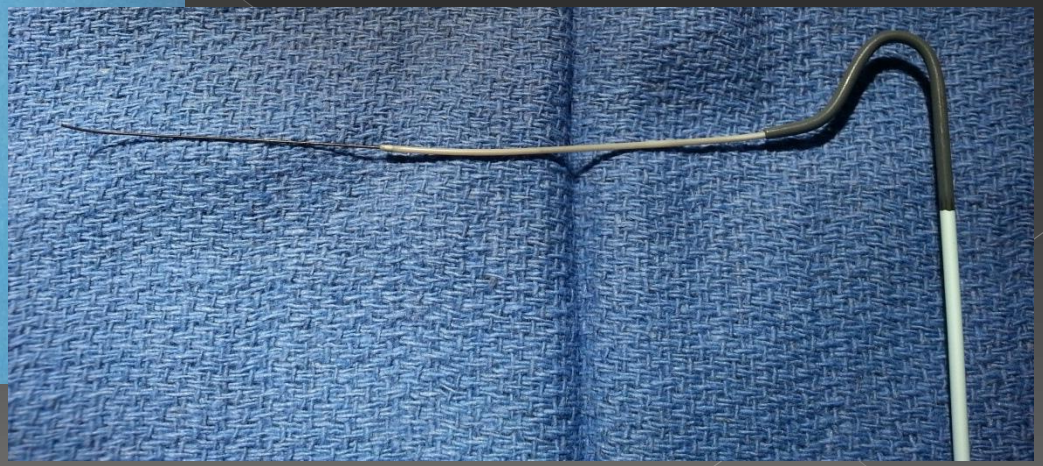
- Radial or femoral artery access
  - Radial is preferred for patient comfort
- DSA performed in IR suite
- Moderate sedation
- Non-selective aortic injection
- Selective and superselective angiography

Radial Artery Access



Angiographic catheters

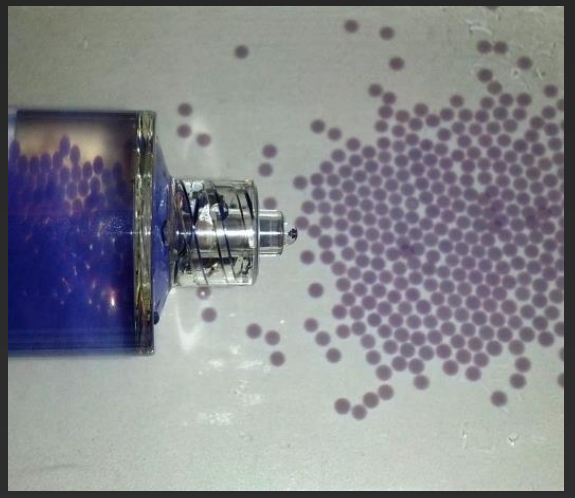




Embolization techniques

- Embolic agents
  - Permanent – Microspheres, PVA, liquid polymers, coils, plugs
  - Temporary – Gelfoam (1-2 weeks)
- Permanent
  - Progressive disease – tumors
- Temporary
  - Self-limited process – trauma, iatrogenic

Gelfoam



Microspheres

Coils

Amplatzer plug

Complications of Embolization

- 6-9%
- Related to angio procedure – hematoma, dissection, allergy, nephrotoxicity
- Related to embolization
  - Postembolization syndrome (self resolving in 48-72hrs)– pain, fever, leukocytosis 50%
  - Vaginal discharge, fibroid passage, uterine necrosis, sepsis, non-target embo, sexual dysfunction
  - Ovarian failure due to unintended embo via utero-ovarian anastomoses – amenorrhea 15% if over 45

Gynecologic Indications

- Uterine Fibroids
  - Adenomyosis
- Gynecologic Malignancies
- Iatrogenic due to surgical procedure
- Uterine vascular lesions (AVMs)
- Pelvic venous disorder

Uterine Fibroids

- Common
- Menorrhagia, dysmenorrhea, pain, bulk symptoms
- Preserves uterus and recovery is short
- Excellent clinical results - >90%
  - Best if menorrhagia is dominant sx
- MR for both workup and follow-up
- % fibroid tissue perfused, not volume is best predictor of clinical outcome
- ?durability especially in younger women

Long-term Outcome and Pre-interventional Predictors for Late Intervention After Uterine Fibroid Embolization – Retrospective Review

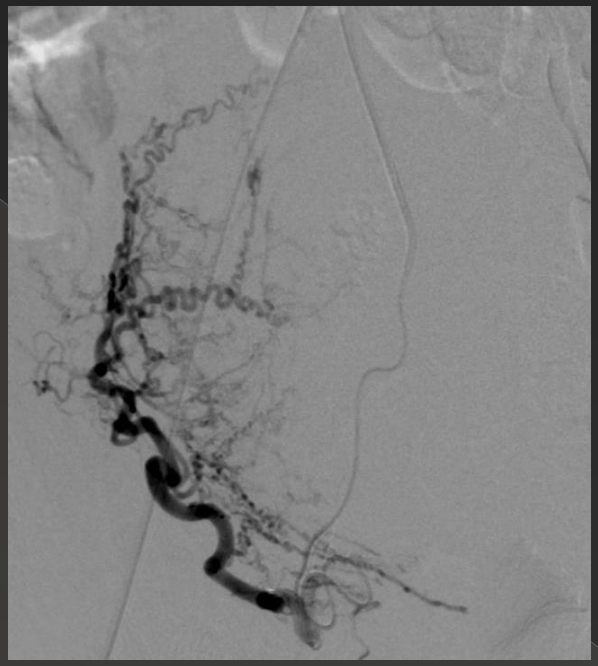
- Freedom from treatment failure showed a cumulative rate of 72.9 % after 10 years and stable until end of follow-up.
- Uterine volume >500ml correlated with 5x increase in re-intervention
- Patients with a baseline dominant leiomyoma volume <200 ml were up to nine times less likely to undergo a subsequent intervention, compared to women with leiomyomata <500 ml, or more than 4x less likely than patients with leiomyomata between 200 and 500 ml.
- 9 out of 23 patients (39.13 %) with child-bearing wish became pregnant and conceived one or more children after UFE.
  - Higher rate of C-section

Tom D'hoore, Dirk Timmerman, Annouschka Laenen, Geert Maleux, Long-term outcome and pre-interventional predictors for late intervention after uterine fibroid embolization, European Journal of Obstetrics & Gynecology and Reproductive Biology, Volume 247, 2020, Pages 149-155.

Fertility after Embolization

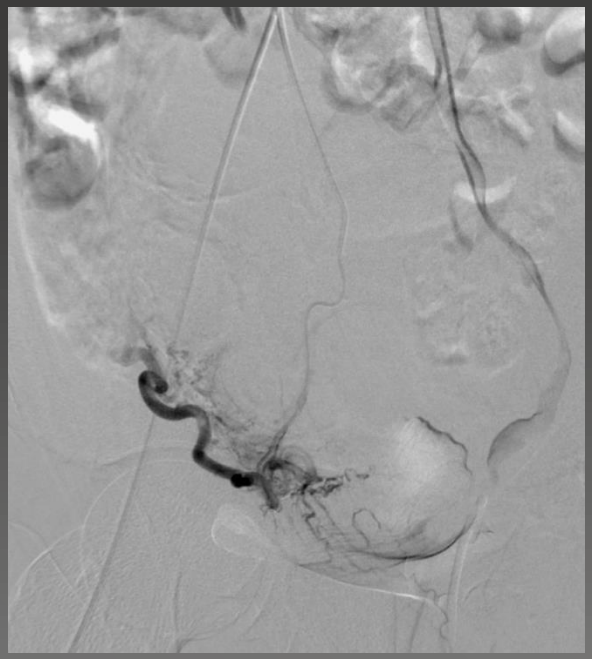
- Pregnancies carried to term
- Some reports of increased pregnancy complications
- No reported negative effects on menses/fertility after UAE for PPH (post partum hemorrhage)
- UFE associated with a small risk of ovarian failure if perimenopausal
- Fertility is not guaranteed
- Infertility with hysterectomy
- Some reports of increased rates of pregnancy with intracavitary fibroids

Pre



Pre

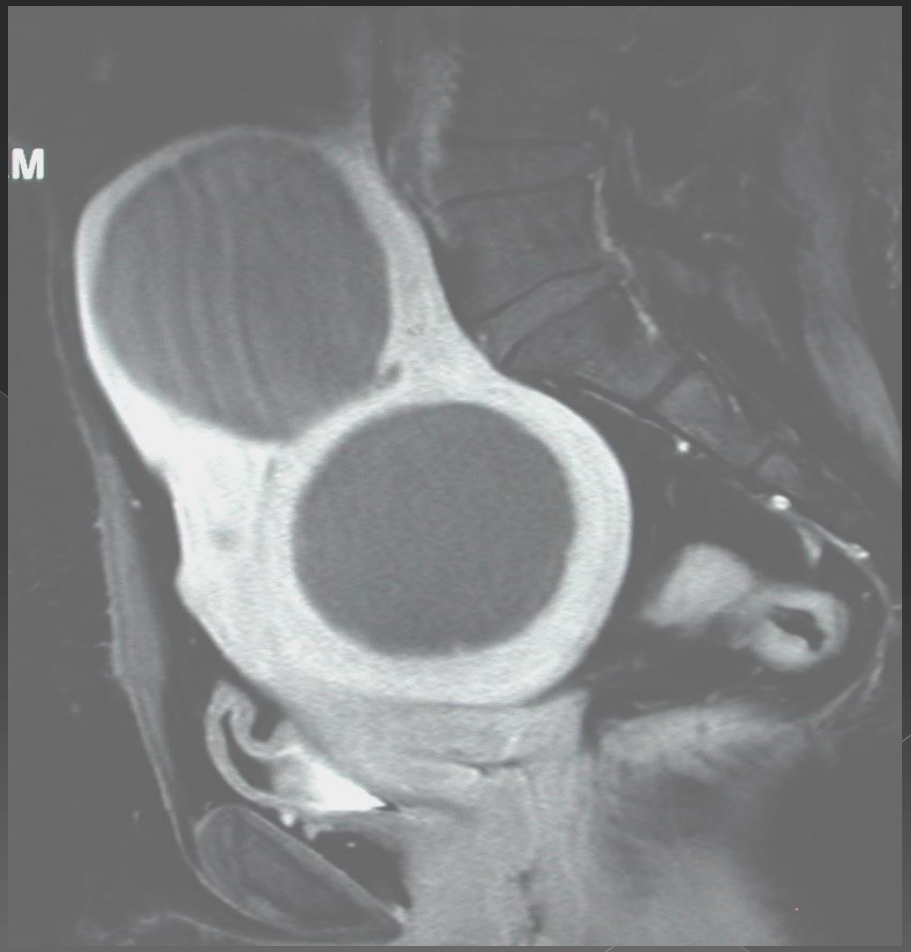
Post



Post

MR pre and post embo

Pre



Post

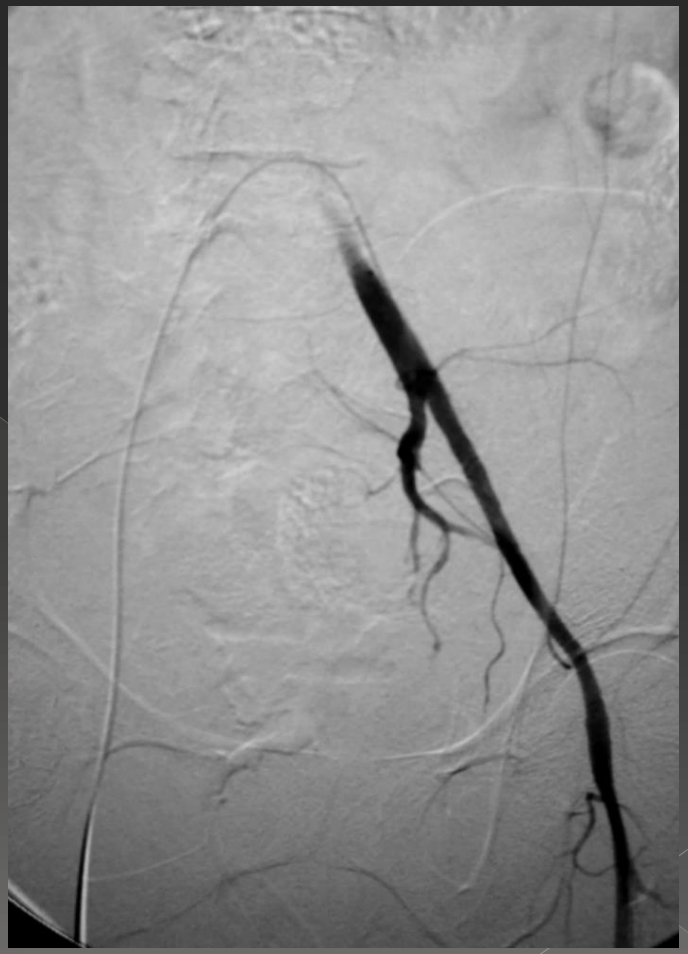
Gynecologic malignancies

- Managed surgically
- Hemorrhage in advanced stage disease
  - Vaginal packing, transfusions, radiation, chemotherapy
  - Intractable bleeding – transcatheter embolization
- Cervical, endometrial, choriocarcinoma, gestational trophoblastic disease, vulvovaginal

49 y.o. with massive vaginal bleeding from stage III cervical carcinoma

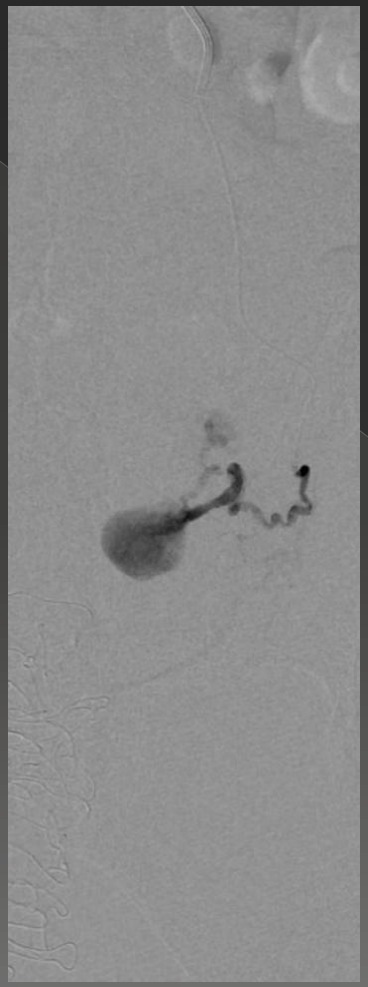
Embolization with gelfoam

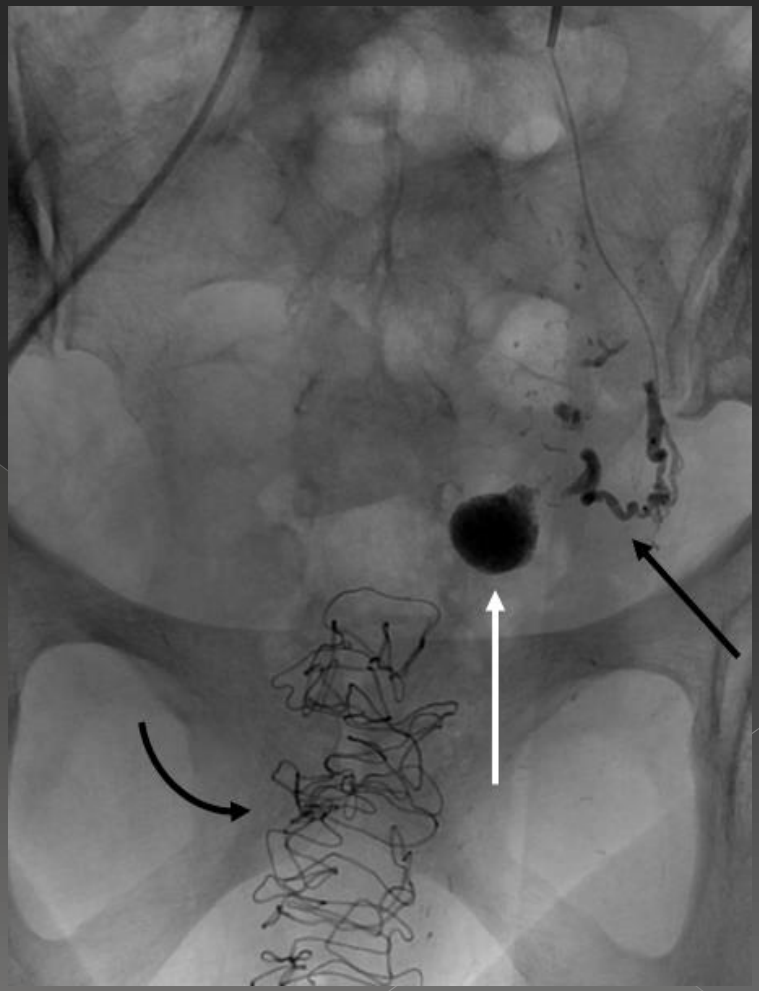
Pre



Post

42y.o. on XRT for advanced cervical carcinoma





Embolization with NBCA and microspheres

Pre

Post

54 y.o. with advanced cervical cancer

Early

Late

Embolization with gelfoam and Onyx

Pre

Post

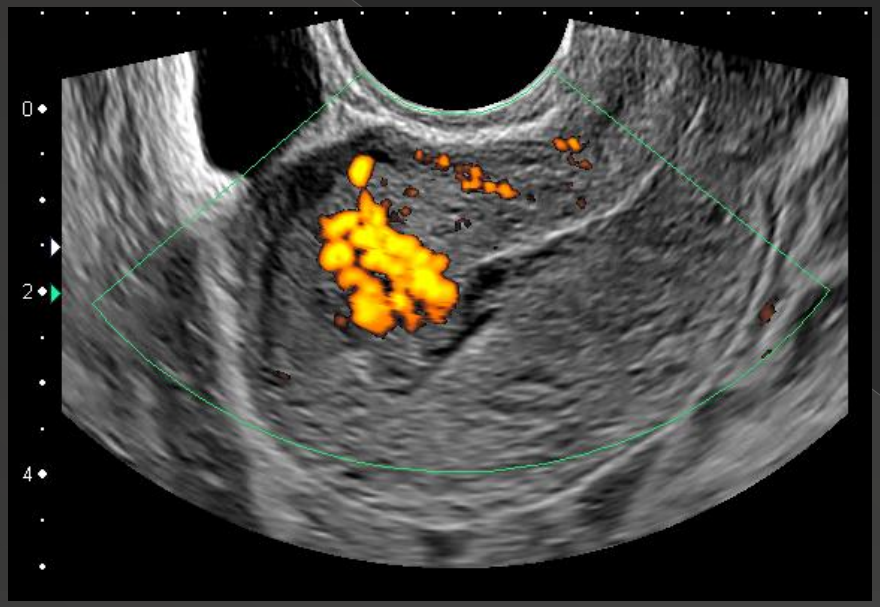
Gynecologic hemorrhage NOT associated with malignancy

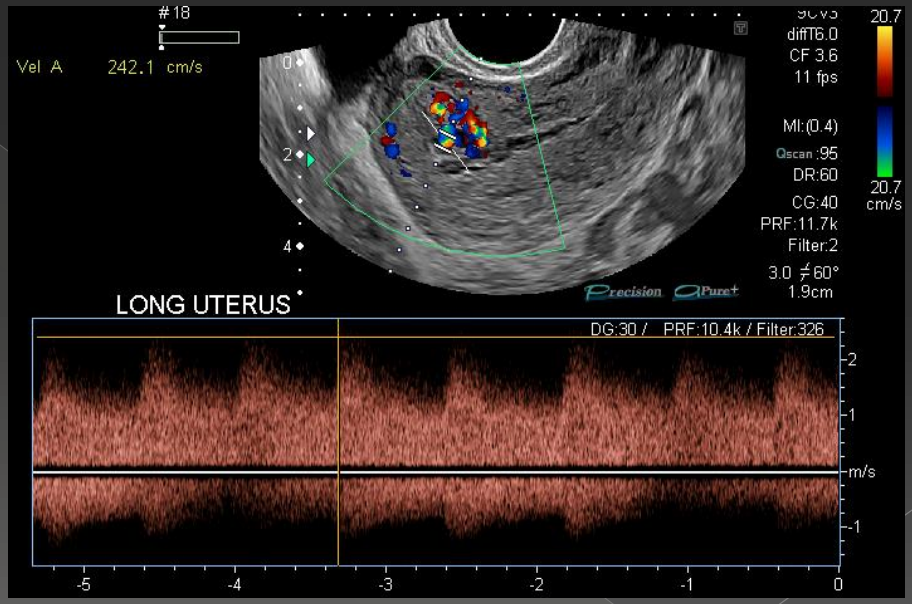
- Pelvic surgery – iatrogenic
- Uterine vascular lesions (AVMs)
- Adenomyosis
- Bleeding diathesis

Uterine Vascular Lesions

- Rare, congenital or acquired
- Congenital – often involve adjacent pelvic structures
- Acquired – surgical instrumentation, pregnancy
- Nomenclature: Uterine AVM, Uterine AVF, RPOC
- Heavy vaginal bleeding
- Diagnosis by ultrasound prior to further intervention essential to avoid catastrophic hemorrhage
- Hysterectomy or embolization
  - Multiple sessions
  - Liquid agents

23 y.o. asymptomatic woman

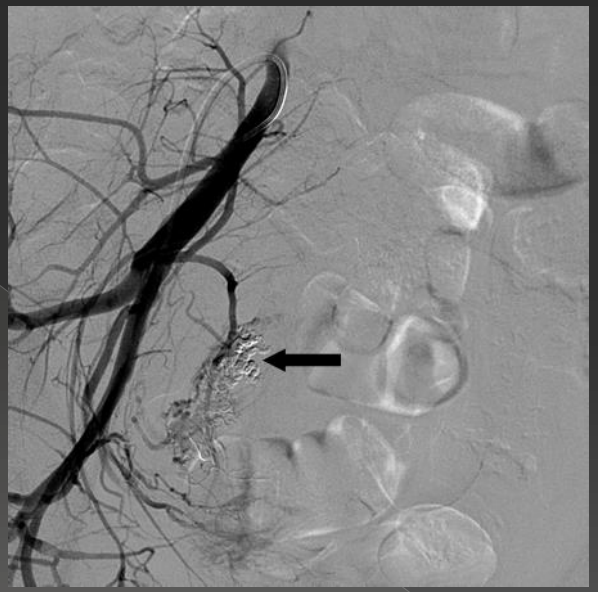




Low resistance high velocity

Embolization with PVA and Onyx

Pre



Post

Adenomyosis

- Hysterectomy
- TCE -- Symptomatic patients
  - 83% reported improvement at 9 months
  - 65% at 40 months

Pelvic Venous Disease (PeVD)

- No longer called Pelvic Congestion Syndrome
  - Spectrum of venous disease in the pelvis including May-Thurner, Nutcracker, etc.
- > 6 months non-cyclic pelvic pain
- Ovarian and pelvic venous distention
- Ovarian vein valvular insufficiency
- Deep pelvic ache, dyspareunia, dysmenorrhea, postcoital pain
- Sxs worse at end of day, improved by lying down
- Varicose veins in vulva, buttocks, legs
- Ovarian point tenderness
- Late 20s and 30s
- Multiparity

The Symptoms-Varices-Pathophysiology classification of pelvic venous disorders: A report of the American Vein & Lymphatic Society International Working Group on Pelvic Venous Disorders

Mark H. Meissner, MD, Neil M. Khilnani, MD, Nicos Labropoulos, PhD, Antonios P. Gasparis, MD, Kathleen Gibson, MD, Milka Greiner, MD, PhD, Lee A. Learman, MD, PhD, Diana Atashroo, MD, Fedor Lurie, MD, PhD, Marc A. Passman, MD, Antonio Basile, MD, Zaza Lazarshvilli, MD, Joann Lohr, MD, Man-Deuk Kim, MD, PhD, Philippe H. Nicolini, MD, Waleska M. Pabon-Ramos, MD, MPH, Melvin Rosenblatt, MD

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The Symptoms-Varices-Pathophysiology (SVP) Classification of Pelvic Venous Disorders

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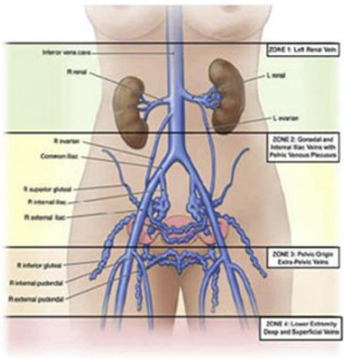


(S) SYMPTOMS		(V) VARICES		(P) PATHOPHYSIOLOGY	
S_0	No symptoms	V_0	No abdominal, pelvic, or pelvic origin extra-pelvic varices	**Anatomy**	IVC Left renal vein Gonadal vein Common iliac vein External iliac vein Internal iliac vein Pelvic escape vein
S_1	Renal symptoms of venous origin	V_1	Renal hilar varices		
S_2	Chronic pelvic pain of venous origin	V_2	Pelvic varices		
S_3	Extra-pelvic symptoms of venous origin	V_3	Pelvic origin extra-pelvic varices	**Hemo dynamics**	Obstruction (O) Reflux (R)
a	Localized symptoms associated with veins of the external genitalia	a	Genital varices (vulvar varices and varicocele)		
b	Localized symptoms associated with pelvic origin non-saphenous leg veins	b	Pelvic origin lower extremity varicose veins arising from pelvic escape points, extending into the thigh.	**Etiology**	Thrombotic (T) Non-thrombotic (NT) Congenital (C)
c	Venous claudication				

JVS-VL Journal of Vascular Surgery Venous and Lymphatic Disorders

Meissner et al, *J Vasc Surg Venous Lymphat Disord. May 2021*

Journal of Vascular Surgery: Venous and Lymphatic Disorders 2021 9568-584DOI: (10.1016/j.jvsv.2020.12.084)

S_2V_2 PeVD -- Diagnosis

- Mainly clinical
- Ultrasound, CT, MR
  - Tortuous, dilated pelvic veins, slow or reversed flow
- Selective ovarian venography
  - Ovarian vein 10mm or more
  - Retrograde flow
  - Collateral pelvic venous pathways
  - Delayed or stagnant clearance

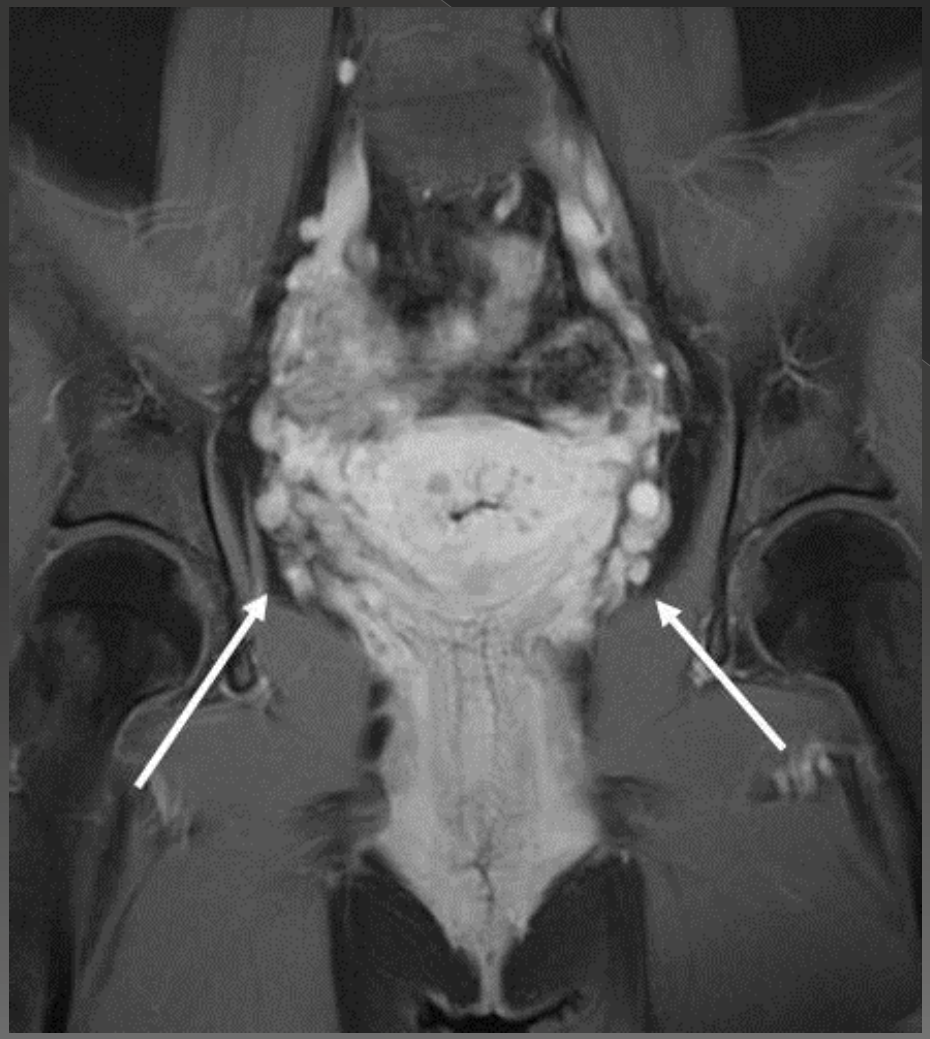
S_2V_2 PeVD -- Treatment

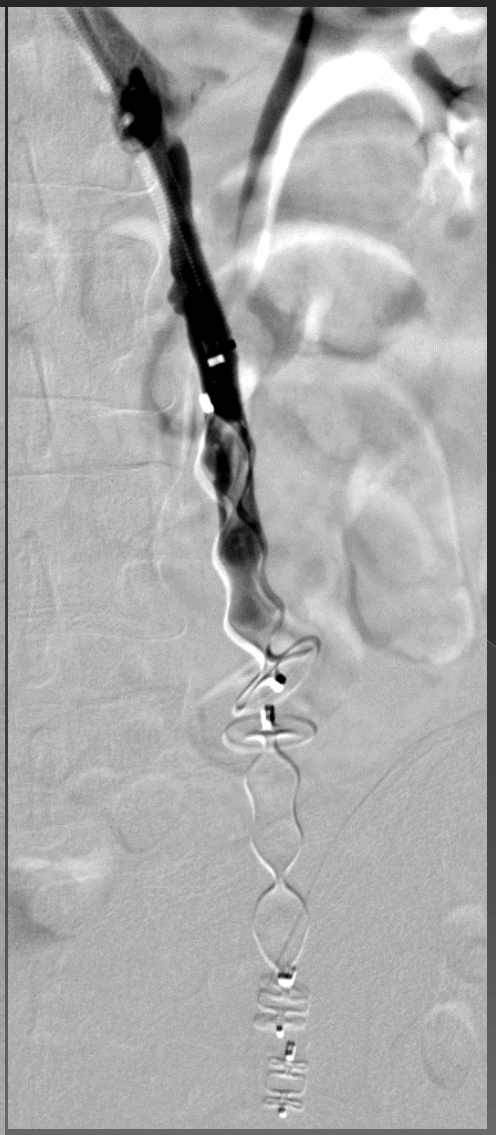
- Hormone, analgesics
- Ligation of ovarian veins
- Hysterectomy
- Transcatheter embolization

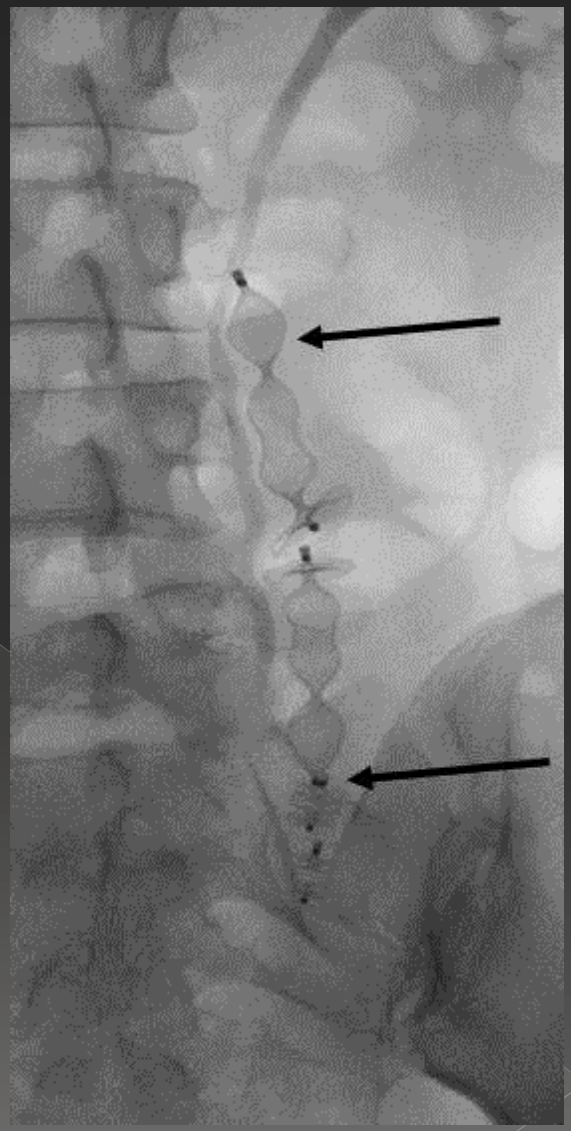
S_2V_2 PeVD – Transcatheter embolization

- Embolization of the ovarian veins with coils/plugs
- Occlusion of the uterine and pelvic veins with sclerosant or gelfoam
- Sometimes embolization of internal iliac vein tributaries with sclerosing agent
- Clinical success 70-85%
- No negative effects on menses or fertility

34 y.o. female with 3 year hx worsening pelvic pain and dyspareunia





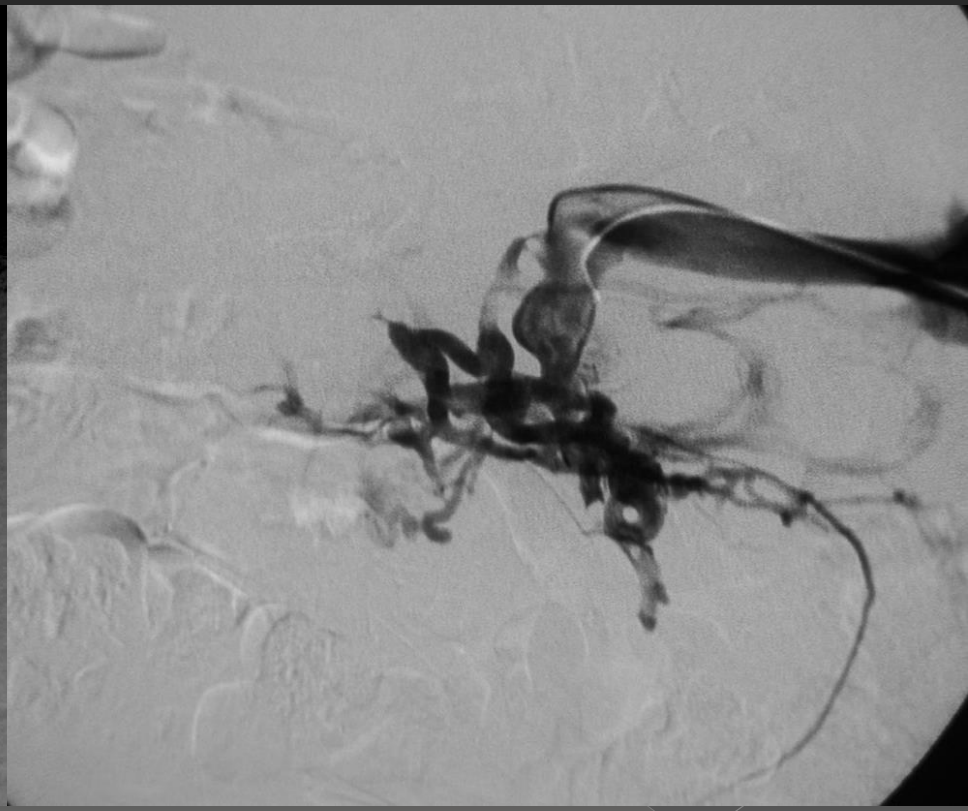


63 y.o. with chronic pelvic pain, s/p hysterectomy

Other PeVD -- Treatment

- Obstructive venous lesions such as renal vein stenosis/compression
  - Stent placement vs renal auto-transplantation vs renal vein transposition
- Varices of the external genitalia
  - Ovarian vein embolization +/- percutaneous sclerosis
- Lower extremity varicose veins
  - GSV and SSV ablation
  - Phlebectomy

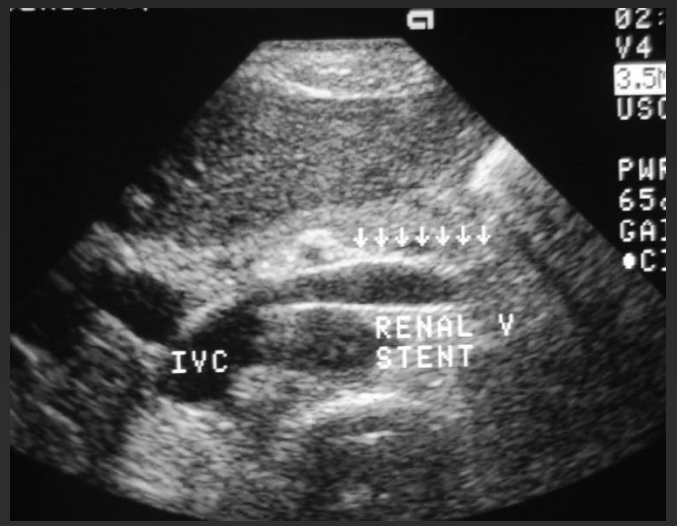
Left renal venogram

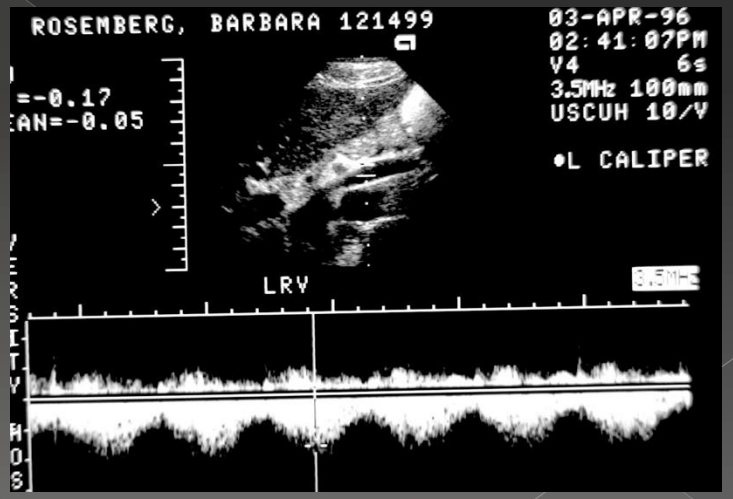


Early

Late

Renal vein stenting





Complete resolution of sxs

Obstetric Indications for TCE

- Postpartum hemorrhage
- Placental implantation abnormalities
- Cervical ectopic pregnancy

Postpartum Hemorrhage

- >500cc vaginal or 1 liter c-section
- Fluids, blood products, vasopressors, uterine balloon tamponade, vaginal packing
- Gelfoam embolization
- Effective in 83-95%
- May be repeated
- Does not preclude subsequent surgical intervention
- Consider collateral supply to uterus

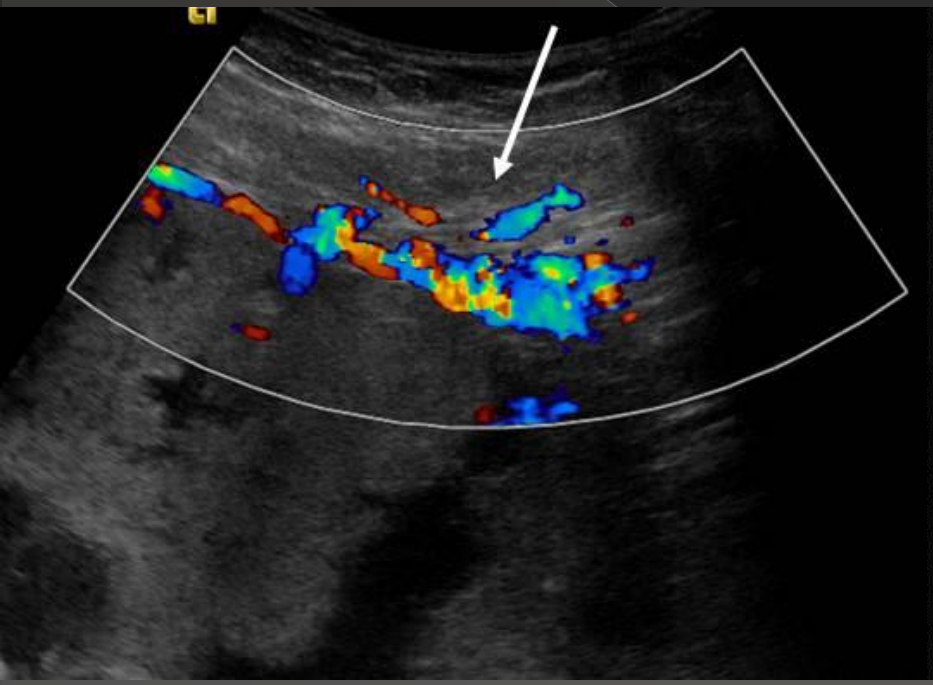
Placental Implantation Abnormalities

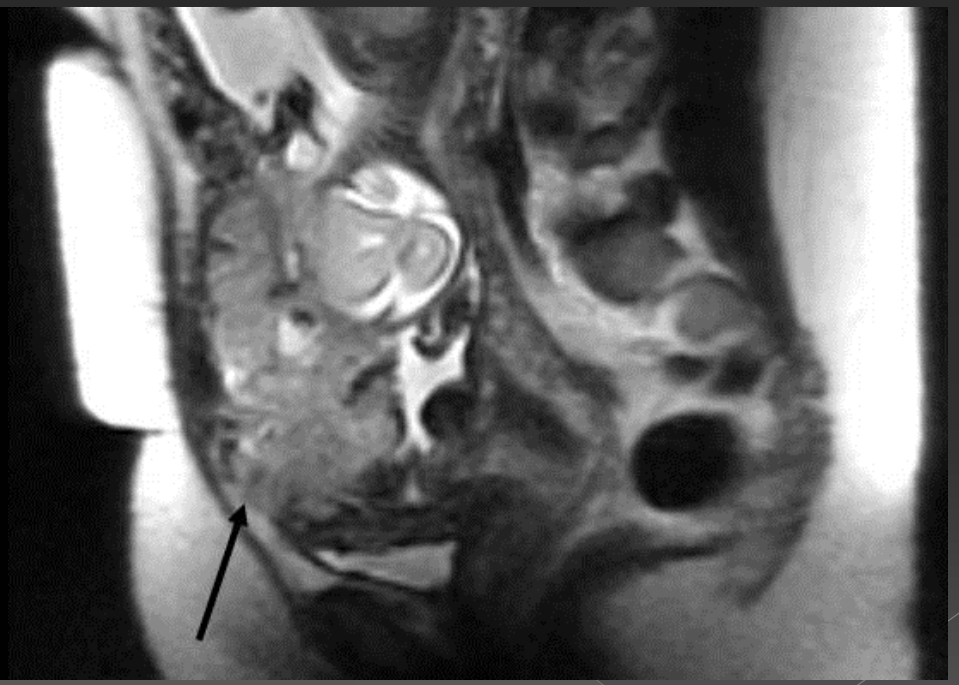
- Accreta (to myo), increta (into myo), and percreta (through myo)
- Associated with multiple C-sections, uterine surgery, placenta previa, advanced age
- US or MR diagnosis
- Early diagnosis essential to avoid uncontrollable peripartum bleeding and fetal loss

Placenta accreta -- treatment

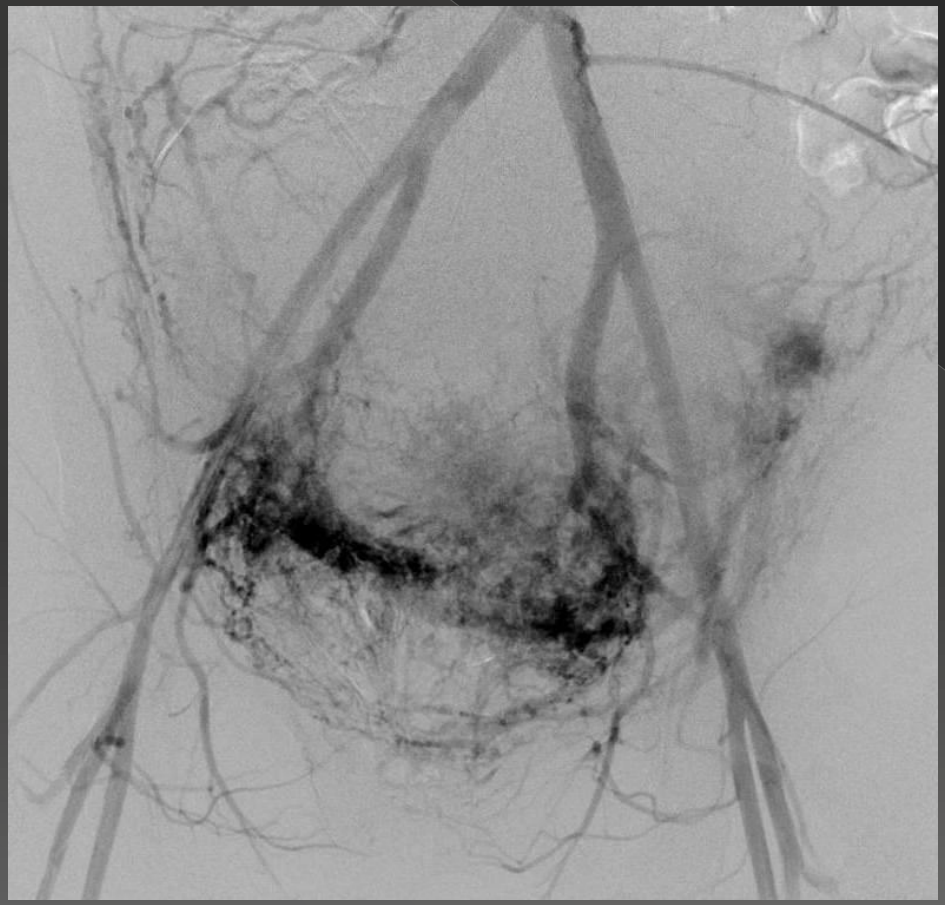
- Early delivery, C-section with hysterectomy
- TCE at time of delivery
  - Catheters or balloon occlusion catheters in both internal iliac arteries prior to C-section – bilateral approach
  - Embolization in OR with C-arm

25 y.o. with placenta percreta

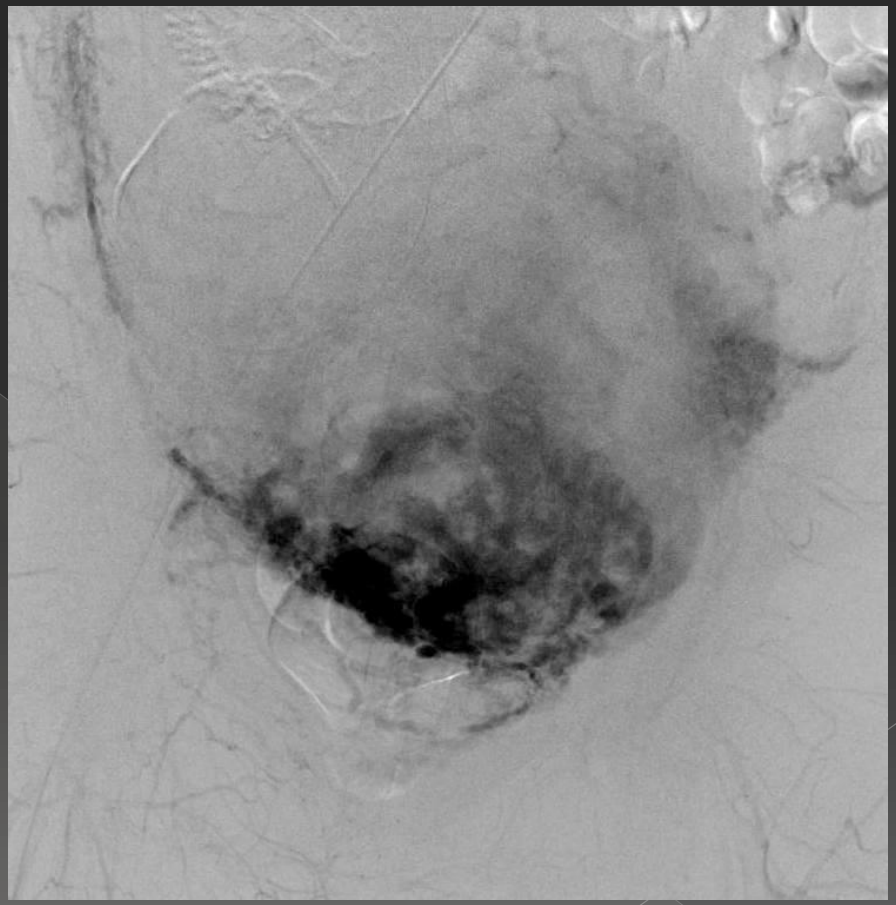




Hypervascular uterus



Early



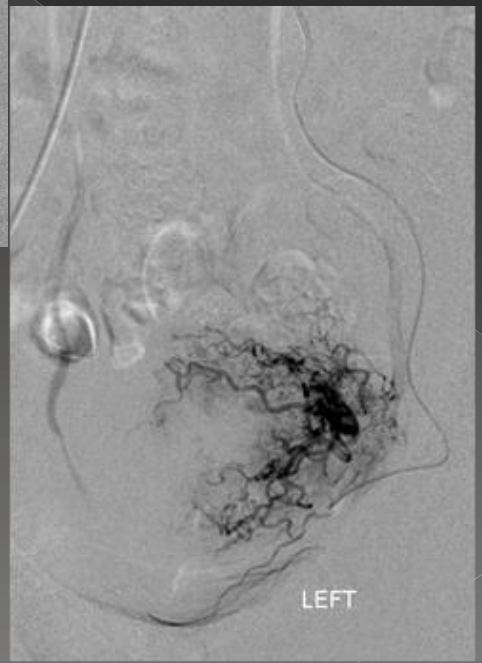
Late

Cervical Ectopic Pregnancy

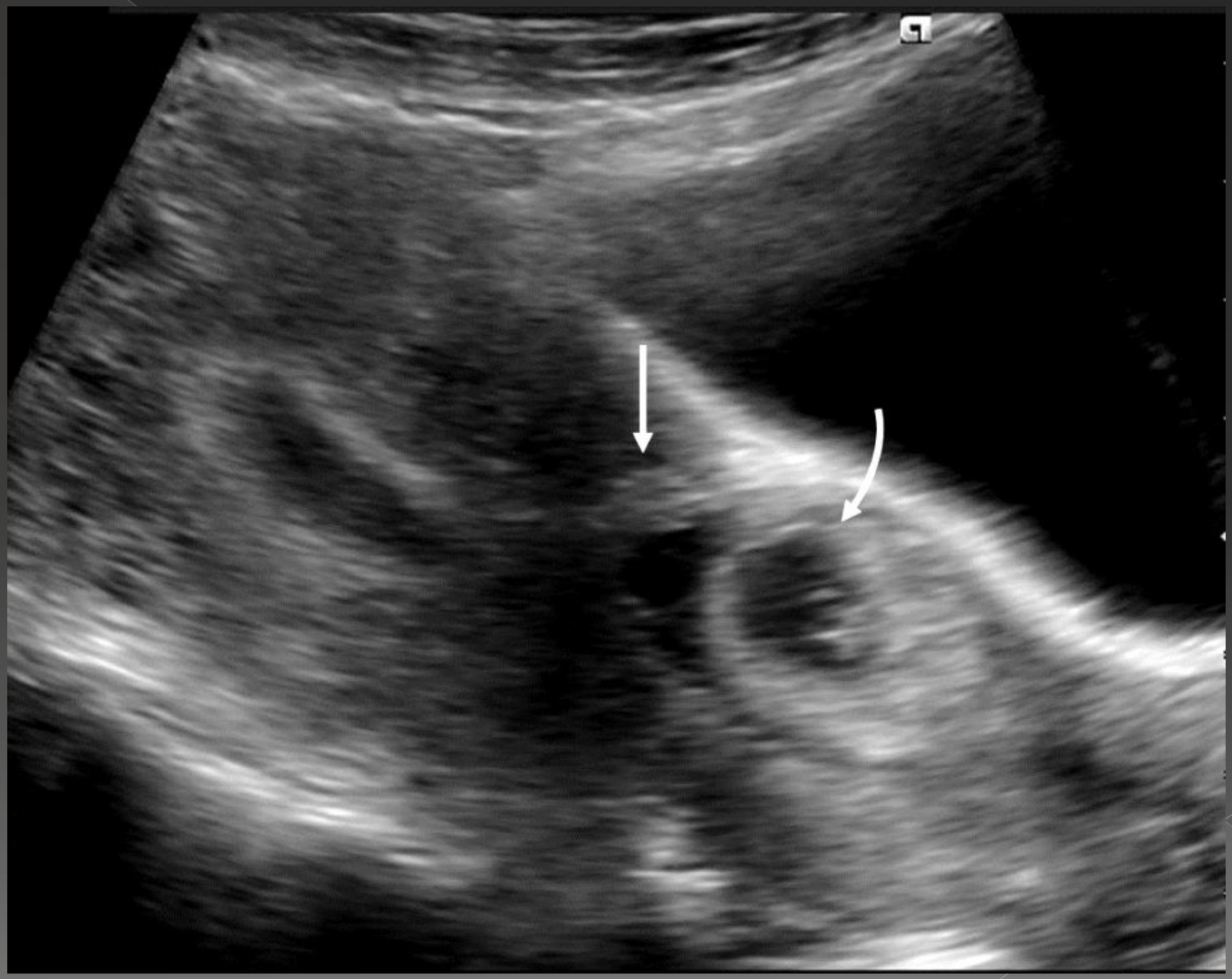
- 2%
- Systemic methotrexate
- US guided injection into the gestational sac of MTX, KCl or hyperosmolar glucose
- UAE
- UAE in combination with MTX

Cervical ectopic pregnancy,failed MTX

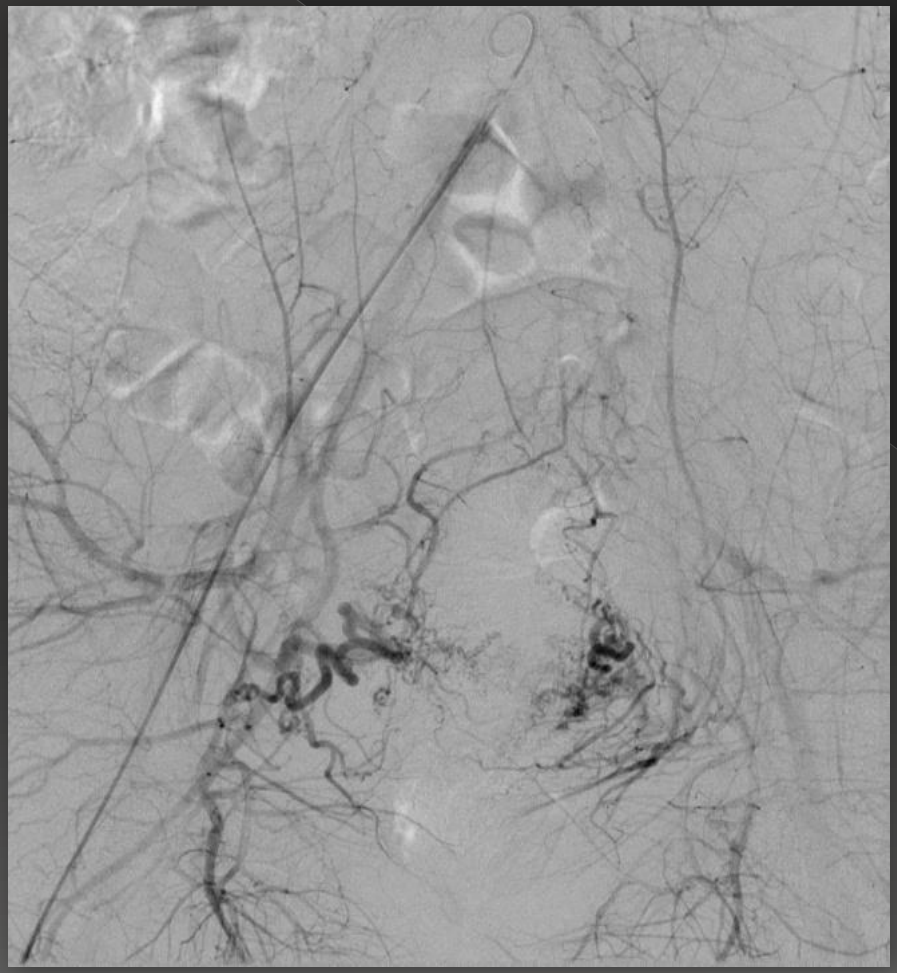
Pelvic Angiography
Pre and post Embo - pruned tree



Implantation at C-section scar



Pelvic Angiography

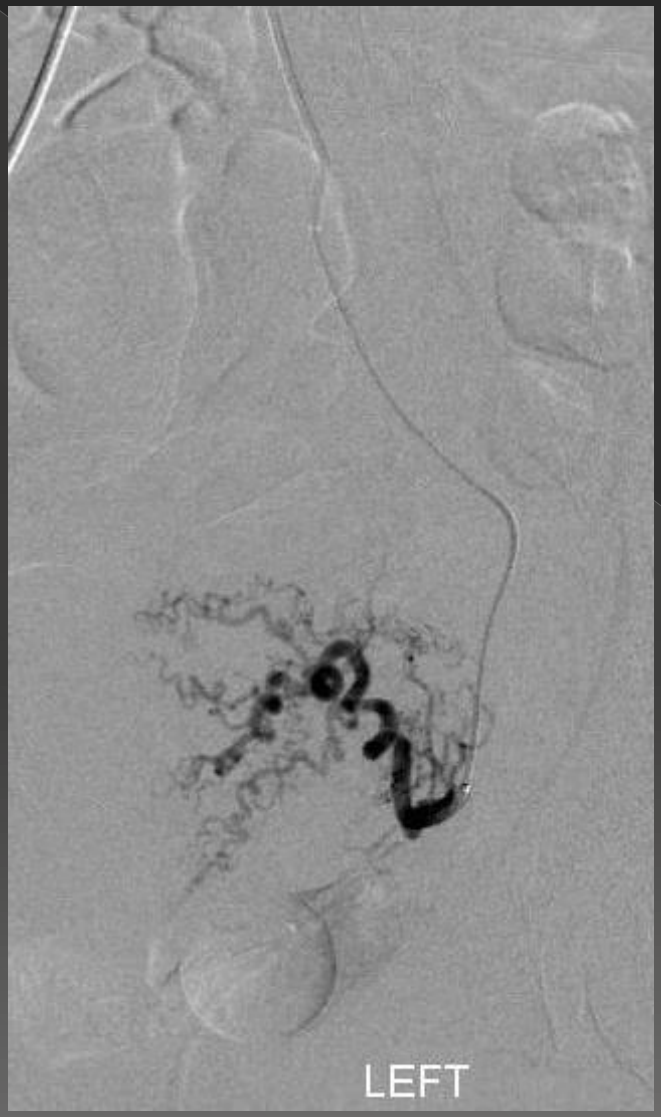


Pre

Post

Left Uterine Arteriogram

Pre



Post

Pelvic Pain Therapies

- Nerve Blocks – malignant and non-malignant pain
  - E.g. pudendal nerve block/neurolysis
- Bone tumor ablation for osseous metastatic disease
- Targeted drug delivery for GYN malignancies
  - Intrathecal pump placement with Ziconitide
    - Delivers medication directly to dorsal horn of spinal cord without side effects of systemic opioids
    - Non-opioid (N-type calcium channel blocker)
    - Blocks pain signal as opposed to opioids that increase threshold of pain
    - Excellent pain control of pelvic pain from malignancy

Conclusions

- With an experienced IR team, TCE can successfully treat both obstetrical and gynecological hemorrhage
- It is also useful to treat pelvic congestion syndrome and symptomatic uterine fibroids with appropriate screening

Contact Info – IR Clinic at Ridgeline

- George Zlotchenko, MD – (914) 420-8982
- Michael Sassman, DO – (303) 845-2771

- RLMC IR Clinic - (720) 516-0637

- Epic Referral to IR Clinic – "AMB REF TO INTERVENTIONAL RADIOLOGY – CU Ridgeline Medical Campus"