12th UMEM Critical Care Symposium
Wednesday, May 21, 2025
Presentation by Dr. Jessica Downing

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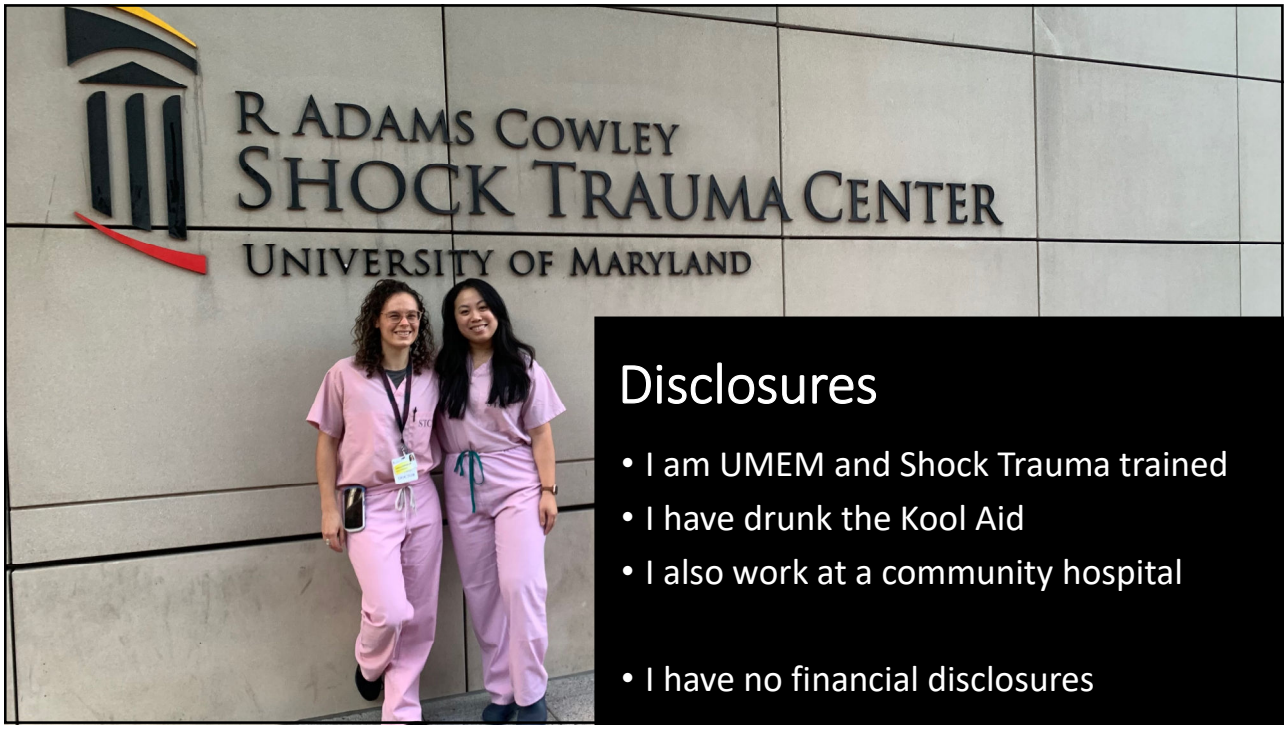


2

Learning Objectives

1. Identify sources of hemorrhage in post surgical patients
2. Discuss options for hemorrhage control in noncompressible, non-traumatic bleeding
3. Review immediate postpartum emergencies
4. Discuss hemodynamic support in amniotic fluid embolism

3

Learning Objectives

1. Quickly identify resources in your department, hospital, and network to stabilize patients with rare life-threatening emergencies
2. Recognize unusual applications for advanced support devices

4

TC

- 45yo M with recent kidney-pancreas transplant
- Discharged 2 weeks ago
- Weak and tired with 2 presyncope events
- Bloody output from JP drain today

5

Hypotensive

"Cold, Clammy, Distended Abdomen"

Brief Syncope

6

OSH ED Course

BP

HR

RR

OK SpO2

CRISP

45M hx ESRD 2/2 T1DM now POD 15 from SPK

- Post op course c/b hemorrhagic shock 2/2intra-abdominal bleeding requiring MTE and RTOR POD 1
- Found to have mesenteric bleeding at transplanted pancreas requiring redo pancreaticojejunostomy
- Recovered well, DC POD 5

better BP

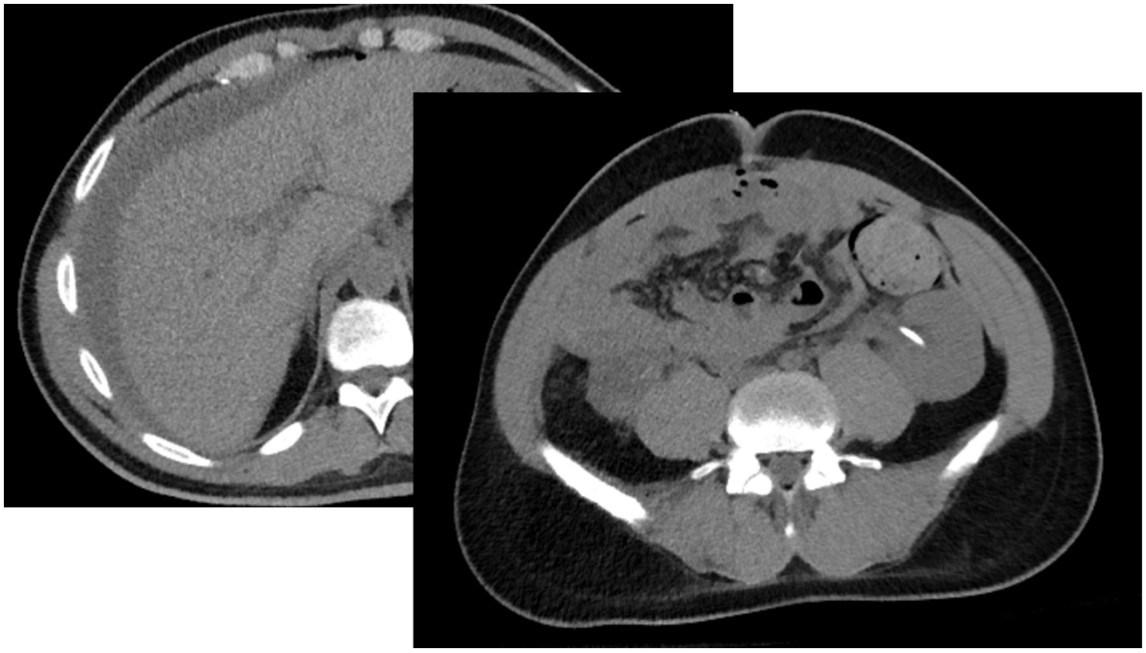
better HR

better RR

OK SpO2

UNIVERSITY of MARYLAND EXPRESS CARE Critical Care Transport

7



8

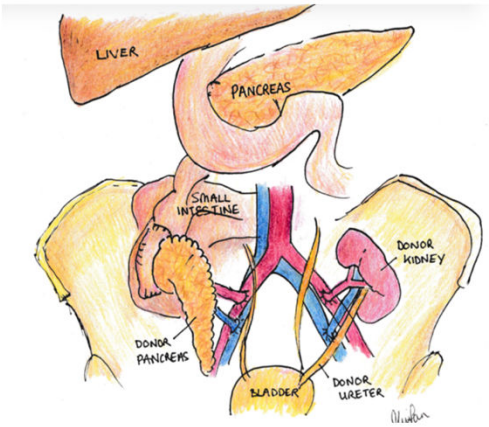
Awaiting Transport

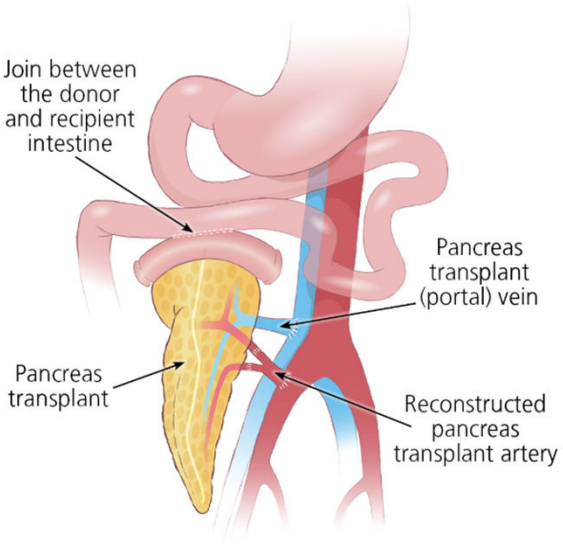
"Increasingly diaphoretic, pale, writhing in bed now complaining of abdominal pain, tachypneic complaining of difficulty breathing" and more lethargic

- MTE started
- Pressors started
- Patient intubated
- Transported with blood hanging, on norepinephrine

9

SPK Anatomy





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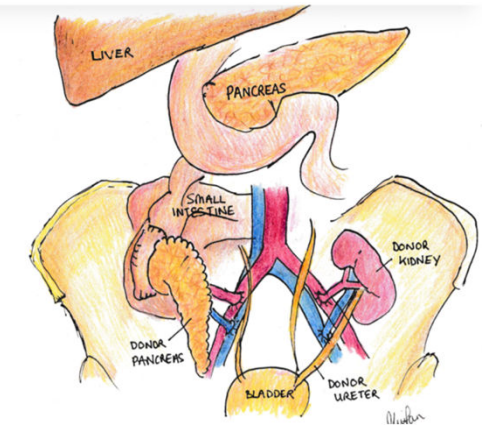
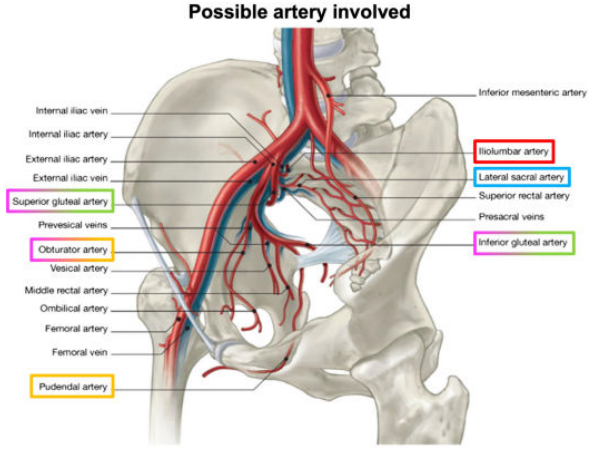


Fracture site

- Sacroiliac joint
- Sacrum
- Iliac bone
- Acetabulum
- Pubic rami

Possible artery involved



11

ORIGINAL ARTICLE

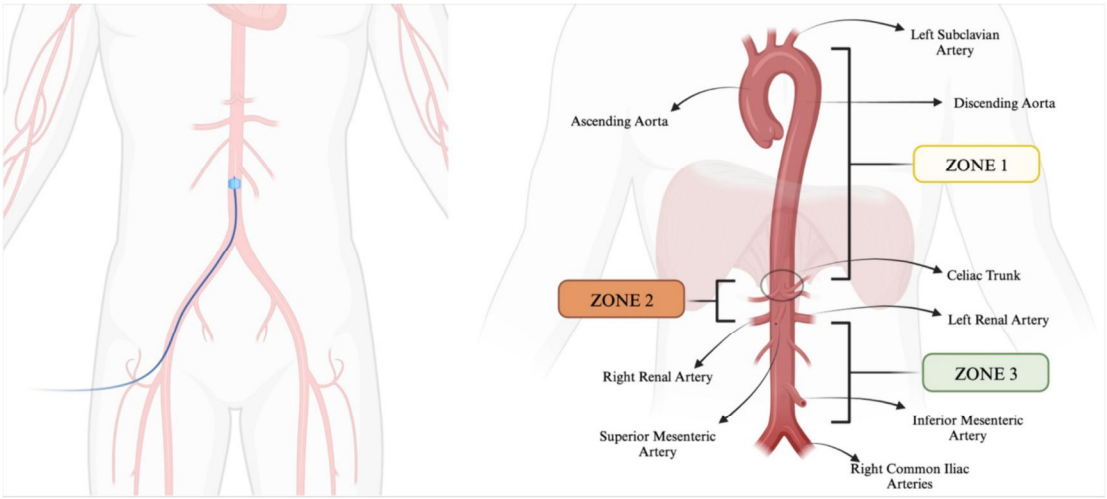
Patterns and outcomes of zone 3 REBOA use in the management of severe pelvic fractures: Results from the AAST Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery database

Melike Harfouche, MD, Kenji Inaba, MD, Jeremy Cannon, MD, Mark Seamon, MD, Ernest Moore, MD, Thomas Scalea, MD, *and* **Joseph DuBose, MD**, *Baltimore, Maryland*

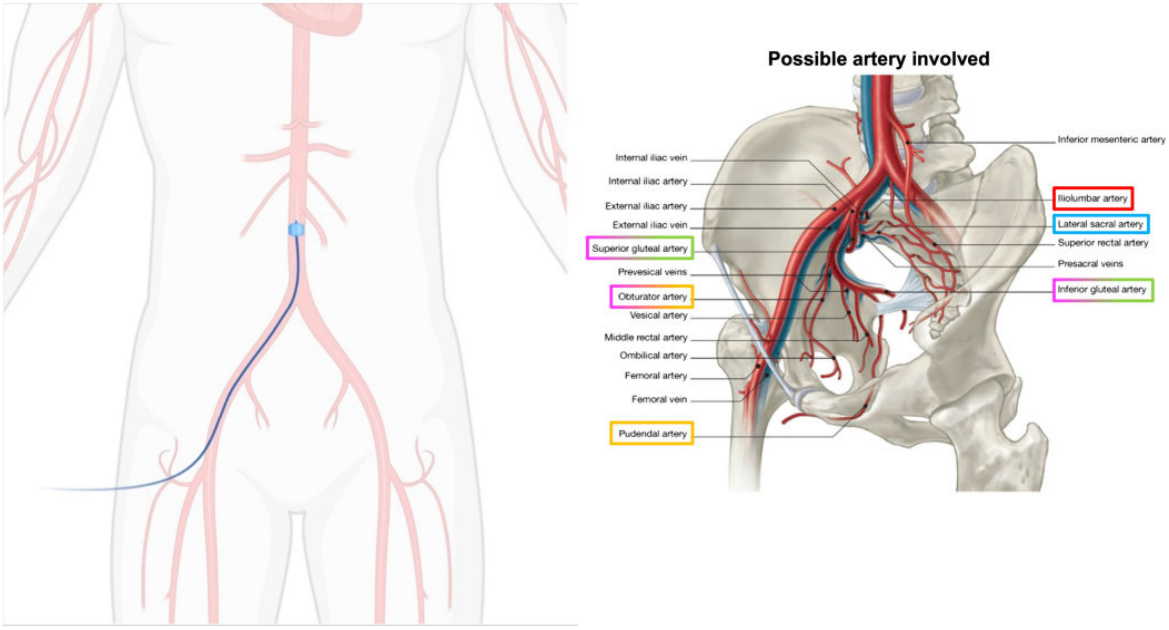
CONCLUSION: Zone 3 REBOA can be used as a standalone hemorrhage control technique and as an adjunct in the management of severe pelvic fractures. The only additional intervention associated with a mortality reduction was EF. The benefit of increasing number of interventions must be weighed against more harm. Heterogeneity in practice patterns for REBOA use in pelvic fracture management underscores the need for an evidence base to standardize care. (*J Trauma Acute Care Surg.* 2021;90: 659–665. Copyright © 2021

12

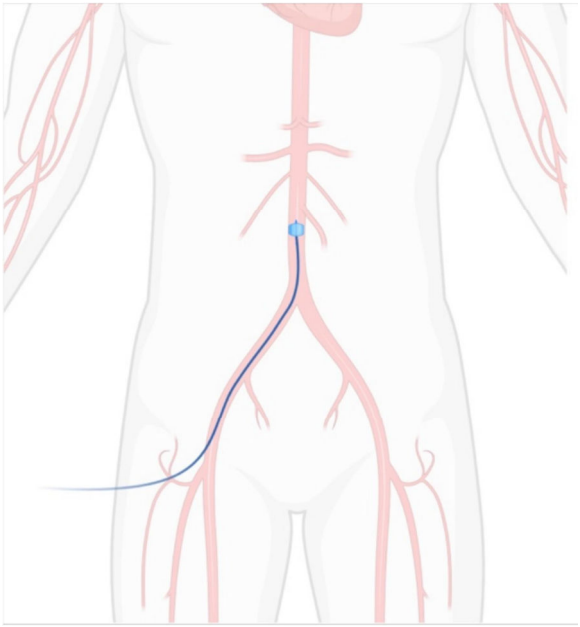
REBOA

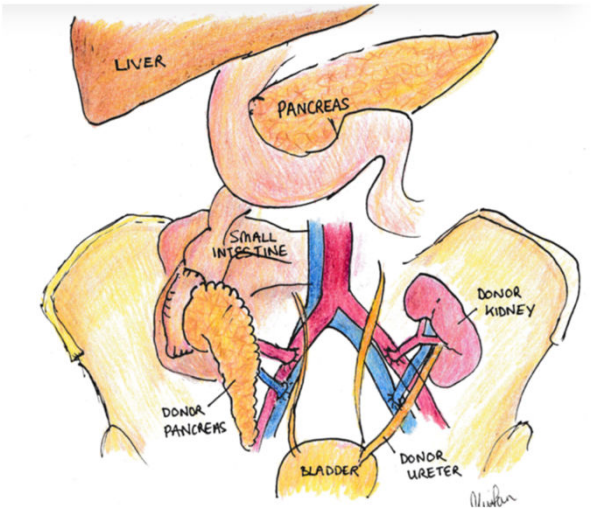

Left Subclavian Artery
Ascending Aorta
Discending Aorta
ZONE 1
Celiac Trunk
ZONE 2
Left Renal Artery
Right Renal Artery
ZONE 3
Inferior Mesenteric Artery
Superior Mesenteric Artery
Right Common Iliac Arteries

13


Possible artery involved
Internal iliac vein
Internal iliac artery
External iliac artery
External iliac vein
Superior gluteal artery
Prevesical veins
Obturator artery
Vesical artery
Middle rectal artery
Ombilical artery
Femoral artery
Femoral vein
Pudendal artery
Inferior mesenteric artery
Iliolumbar artery
Lateral sacral artery
Superior rectal artery
Presacral veins
Inferior gluteal artery

14





15

European Journal of Trauma and Emergency Surgery (2019) 45:713–718
https://doi.org/10.1007/s00068-018-0973-0

ORIGINAL PAPER

Resuscitative endovascular balloon occlusion of the aorta for non-traumatic intra-abdominal hemorrhage

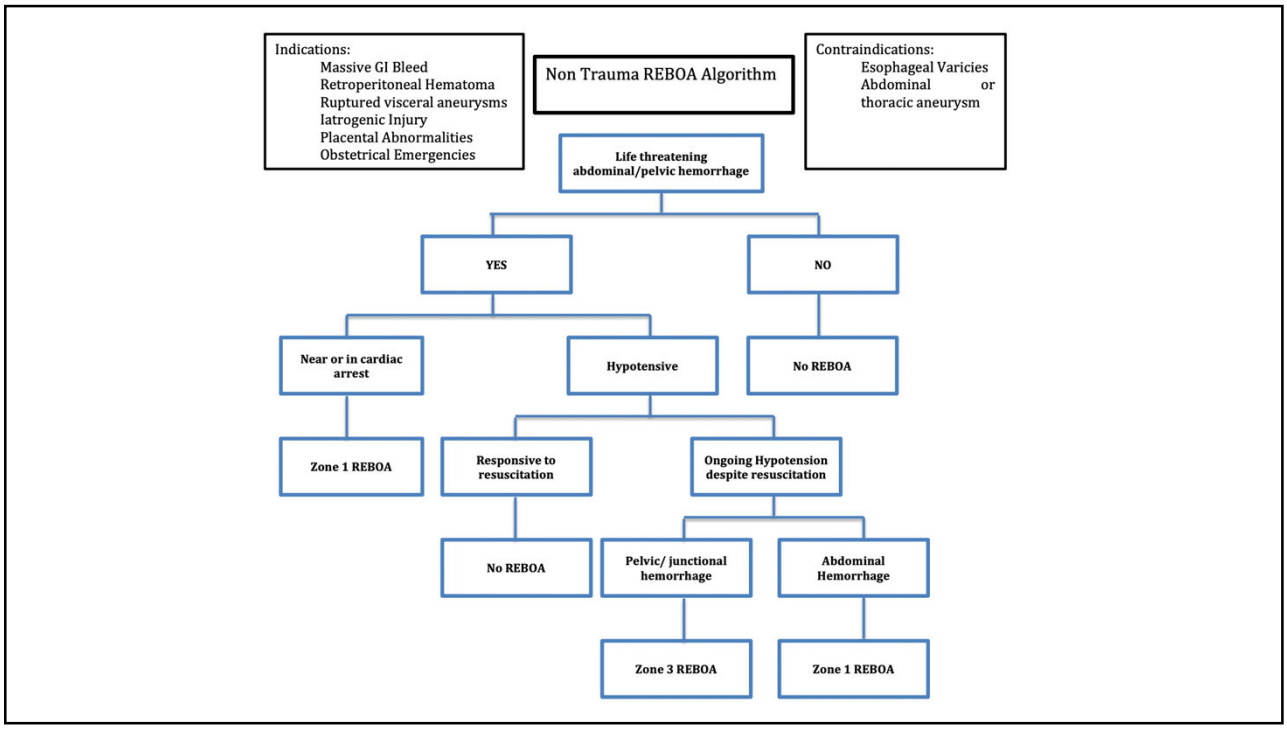
Melanie R. Hoehn[1] · Natasha Z. Hansraj[1] · Amelia M. Pasley[1] · Megan Brenner[1] · Samantha R. Cox[1] · Jason D. Pasley[1] · Jose J. Diaz[1] · Thomas Scalea[1]

- 11 patients underwent REBOA for hemodynamic instability from non-traumatic abdominal hemorrhage
- Mean shock index 1.29, 6 patients with cardiac arrest
- Bleeding source:

Ruptured visceral aneurysm	Liver laceration
GI bleed	Renal artery hemorrhage
Necrotizing pancreatitis	Right iliac artery hemorrhage

- Time to REBOA placement: 177 min, 82% placed in OR, 90% in Zone 1
- No complications, 36% mortality, one death due to uncontrollable hemorrhage

16



17

Review article

Resuscitative balloon occlusion of the aorta in the modern era: Expanding indications, optimal techniques, unresolved issues, and current results

Joanna Shaw, Me

Department of Surgery, UC
California, 90024

DOI: 10.1590/0100-6991e-20192334 Artigo de Revisão

Indicações e resultados para o uso expandido da oclusão ressuscitativa por balão endov orta - REBOA.

Expanding indications and results fo occlusion of the aorta - REBOA.

Marcelo Augusto Fontenelle Ribeiro Júnior[1,2]; Andress Samara de Souza Augusto[3]; Salomone Di-Saverio[4]; Mega

Research Letter | Pacific Coast Surgical Association

August 30, 2023

Resuscitative Endovascular Balloon Occlusion of the Aorta for Nontraumatic Gastrointestinal Hemorrhage in the US

Matthew Ashbrook, MD, MPH[1]; Vincent Cheng, MD[1]; Nathan Kohrman, BA[1]; et al

» Author Affiliations | Article Information

JAMA Surg. 2023;158(11):1214-1215. doi:10.1001/jamasurg.2023.2771

18

CCRU course: Pt arrived to the CCRU @ 2043. Pt with rigid, distended abdomen, difficult to palpate pulses on moderate dose vasopressors. R femoral MAC was placed by myself and we immediately began transfusing via Ranger through the R femoral vein. L CFA sheath was placed by the fellow. Given the vasopressor requirement, the REBOA was inserted and 4 mL saline for balloon inflation a 2053. We were able to come entirely off vasopressors and able to give some propofol/ fentanyl. By the time the patient left the CCRU a 2101, pt had received 2u PRBC, 2u FFP, 2g calcium chloride, 1 amp bicarb and had a normal blood pressure.

19

Clinical use of resuscitative endovascular balloon occlusion of the aorta (REBOA) in civilian trauma systems in the USA, 2019: a joint statement from the American College of Surgeons Committee on Trauma, the American College of Emergency Physicians, the National Association of Emergency Medical Services Physicians and the National Association of Emergency Medical Technicians

Eileen M Bulger,[1] Debra G Perina,[2] Zaffer Qasim,[3] Brian Beldowicz,[4] Megan Brenner,[5] Frances Guyette,[6] Dennis Rowe,[7] Christopher Scott Kang,[8] Jennifer Gurney,[9] Joseph DuBose,[10] Bellal Joseph,[11] Regan Lyon,[12] Krista Kaups,[13] Vidor E Friedman,[14] Brian Eastridge,[15] Ronald Stewart[15]

REBOA should only be placed by a surgeon or interventionalist responsible for definitive hemorrhage control or by a physician trained and qualified in REBOA in direct consultation with the physician who will provide definitive hemorrhage control. In all circumstances, these trained clinicians should be integrated within an appropriate system of care.

- Zone 1 REBOA should not be used if patients cannot proceed expeditiously to a definitive hemorrhage control procedure within 15 min. Total aortic occlusion times greater than 30 min are associated with increased ischemic complications and risk of mortality.[15 23 29 30]
- Zone 3 REBOA may be tolerated for longer periods of time and may be used as an adjunct to management of pelvic fracture bleeding including angioembolization and/or pelvic packing, and/or stabilization. Once Zone 3 occlusion has been performed, patients should proceed expeditiously to definitive hemorrhage control. Although the maximum acceptable occlusion time for Zone 3 is unknown, the system should target less than 30 min, but no greater than 60 min of total occlusion time.

20

OR Course

- Midline incision reopened and old blood evacuated; no bleeding with REBOA up
- With REBOA deflated, brisk arterial bleeding from pancreas mesentery with 1.5cm defect
- Y graft doubly ligated, portal vein doubly ligated, pancreas vasculature divided
- Hemostasis > REBOA removed
- Pancreas explanted

Hospital Course

- Pressors off and extubated POD 1
- Transferred to floor POD 3
- Resumed pre-transplant insulin regimen
- Course complicated by AKI (since resolved) and RUE DVT

21

22

LC

26F G1P0 @ 37+5, pregnancy c/b polyhydramnios, GBS+ and LGA presented to L+D triage with headache with intermittent photophobia;
BP 130s/90s

- Admitted for induction of labor and treatment with Mag for pre-eclampsia with severe features
- Cervical ripening with Utah balloon, labor augmentation with Oxytocin
- Epidural placed HD1, persistent pain

23

Hospital Day 1

0043 SBP 50mmHg, patient unresponsive with seizure-like activity

BP improved spontaneously to 109/70

Patient apneic and then lost pulses

CPR started; OB, anesthesia, critical care at bedside

0046 ROSC; patient regained consciousness but remained unstable

0051 Bedside emergent C section; Intubation; Vasopressors

Ongoing hemorrhage; MTP (8 pRBC, 2 plt, 2 cryo, 2 FFP), TXA, oxytocin, uterotonics, JADA

Post ROSC POCUS:

EF seems preserved by visual estimation
RV somewhat dilated normal function by TAPSE
Possible McConnell sign.

24

Post Partum Hemorrhage

Causes

Tone
Uterine Atony

Trauma
Lacerations
Uterine Rupture

Tissue
Retained Placenta
Retained Clots

Thrombin
Clotting Deficiency

Meds

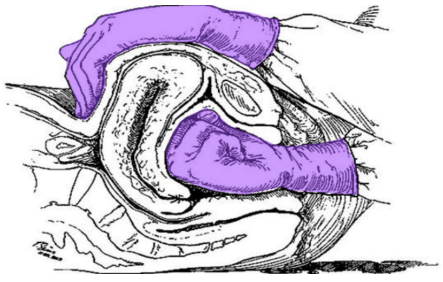
Medication	Administration	Interval	Contraindications
Oxytocin (Pitocin)	20-80U IV (in 1L NSS) or 10U IM	Once (IM) or Continuous infusion	None
Misoprostol (Cytotec)	1000 mcg rectal	Once	None
Methylergonivine (Methergine)	0.20 mg IM	Every 2-4 hours	Hypertension
Prostaglandin F2α (Hemabate)	0.25 mg IM	Every 15 minutes (maximum 2 mg or 8 doses)	Asthma

25

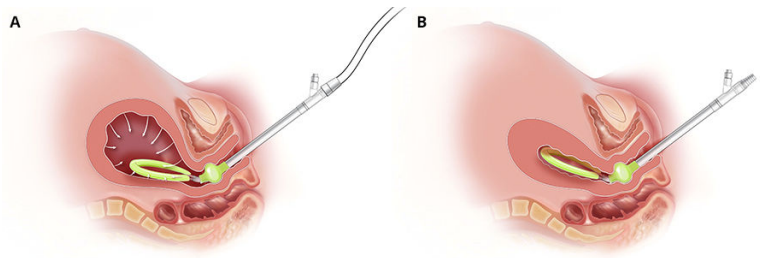
Post Partum Hemorrhage

Maneuvers

Bimanual Massage

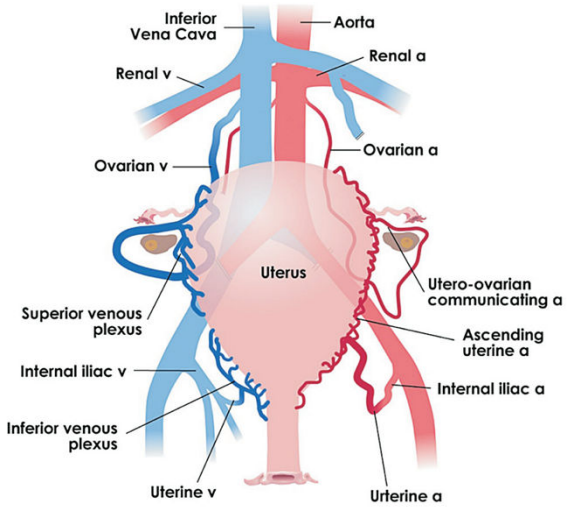


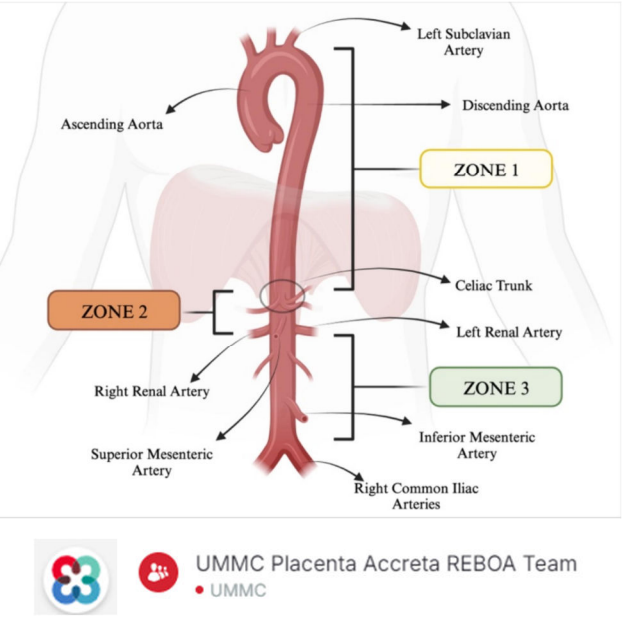
JADA



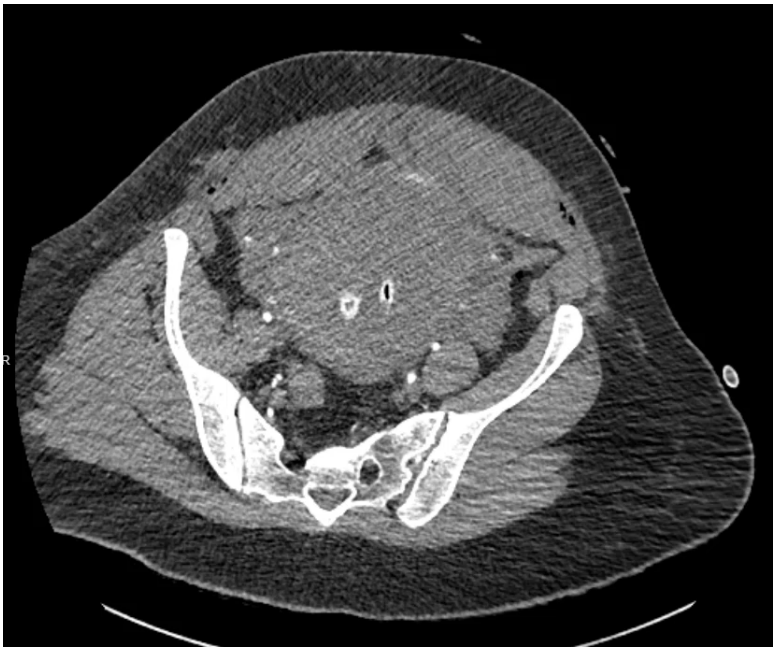
26

Post Partum Hemorrhage





27



➡ To IR

Pelvic angiogram

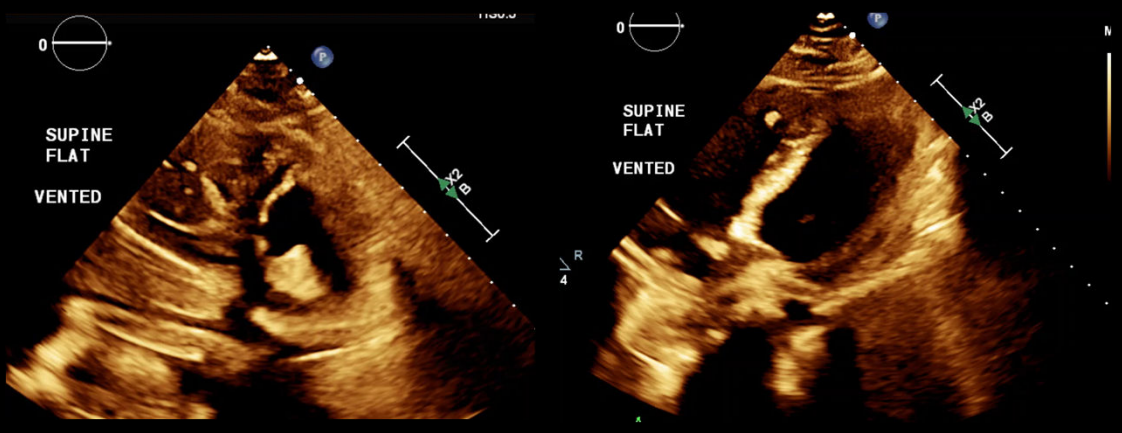
Gelfoam embolization of anterior division, L internal iliac artery

28

CCRU Course

Transferred following IR embolization with ongoing bleeding

Arrived on norepi 0.4mcg/kg/min, vaso 0.06, hypotensive



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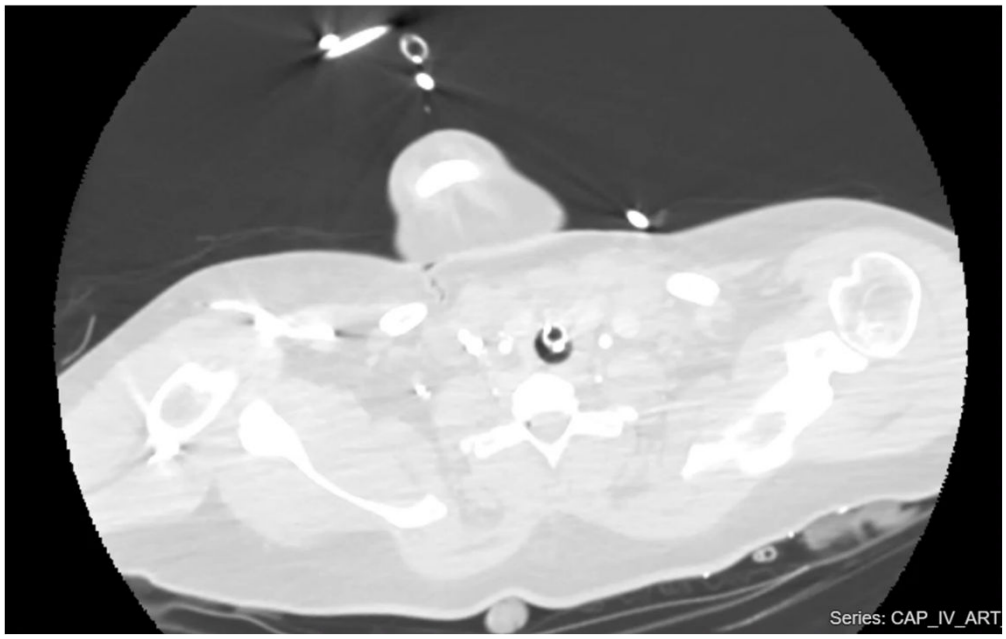


30

Amniotic Fluid Embolism

Second leading cause of peripartum maternal death in US, primary cause of peripartum maternal cardiac arrest

Affects 2.2 to 7.7 in 100,000 deliveries in the US

Presentation

- Dyspnea
- Right heart failure
- Cardiovascular collapse
- Neuro changes
- DIC, PP Hemorrhage
- Fetal Distress

Timing

- During labor
- During C section
- Immediately post-partum
- Following intrauterine procedures

Risk Factors

- Induction of labor
- Premature ROM
- Trauma
- C section
- Placenta previa, accreta, abruption

31

Pathophysiology

Disruption of placental-amniotic interface

Amniotic and fetal elements enter maternal circulation

Maternal anaphylactoid reaction

Release of histamine, endothelin, leukotrienes

Systemic vasodilation

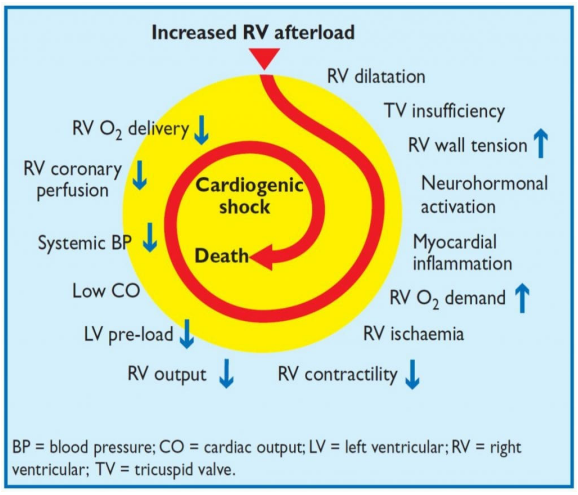
Pulmonary vasoconstriction

Coagulation and Fibrinolytic Activation

Fibrinolysis

DIC

Uterine atony and hemorrhage



32

AFE: Treatment

Aggressive Supportive Care

Vasodilation

Pressors

Caution with IVF

Hypoxia

Oxygenation

Resuscitate before you intubate

RV Failure

Caution with IVF

Inotropic Epi

Pulm vasodilators

Pressors

Hemorrhage

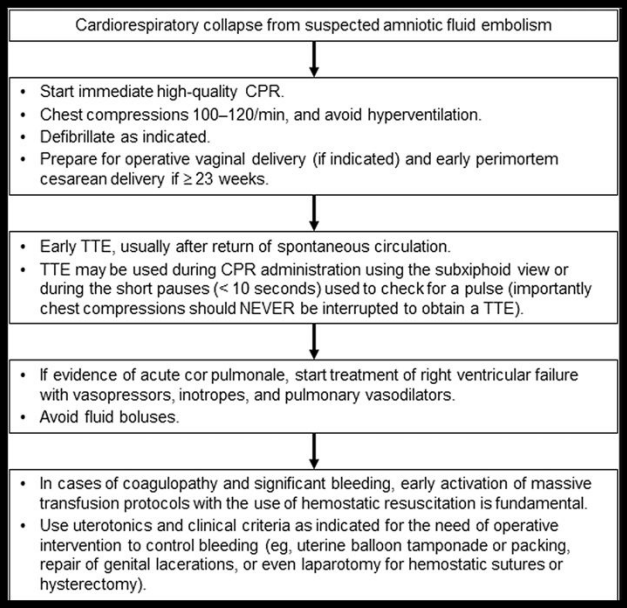
TXA

MTE (1:1:1)

Delivery

Uterotonics

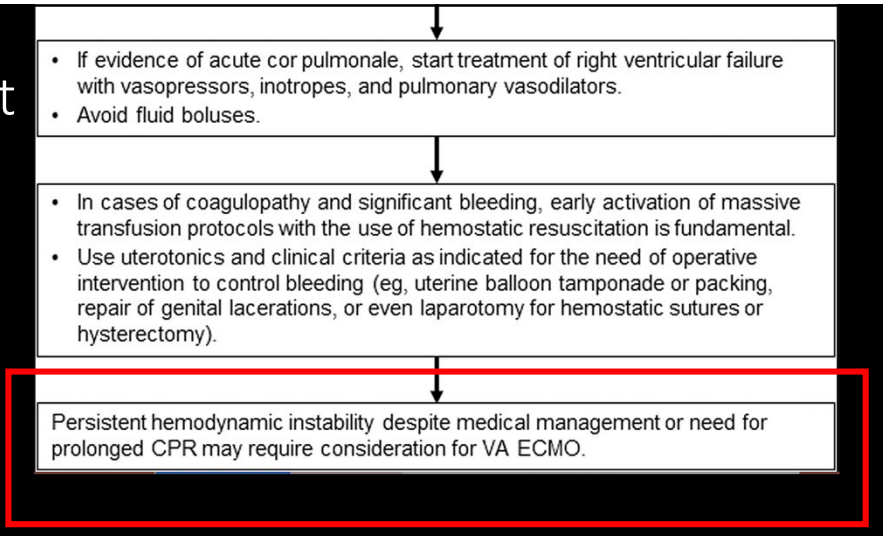
Hemorrhage control



33

AFE: Treatment

Aggressive Supportive Care



34

Amniotic fluid embolism rescued by venoarterial extracorporeal membrane oxygenation

Sarah Aissi James[1], Thomas Klein[2], Guillaume Lebreton[3,4], Jacky Nizard[5], Juliette Chommeloux[1,3], Nicolas Bréchot[1,3], Marc Pineton de Chambrun[1,3], Guillaume Hékimian[1,3], Charles-Edouard Luyt[1,3], Bruno Levy[2], Antoine Kimmoun[2], Alain Combes[1,3,6] and Matthieu Schmidt[1,3,6,7*]

Amniotic fluid embolism rescued using venoarterial extracorporeal membrane oxygenation without initial anticoagulation

A case report and literature review

Hiroshi Araki, MD[a], Motohiro Sekino, MD, PhD[a,*], Yuri Hasegawa, MD, PhD[b], Masaya Kurobe, MD[c], Tetsufumi Motokawa, MD, PhD[c], Akihiko Tanigawa, MD[d], Takashi Egashira, MD[a], Naoya Iwasaki, MD[a], Miki Suzumura, MD[a], Rintaro Yano, MD, PhD[a], Sojiro Matsumoto, MD[a], Taiga Ichinomiya, MD, PhD[a], Ushio Higashijima, MD, PhD[a], Naohiro Kanayama, MD, PhD[e], Kiyonori Miura, MD, PhD[b], Tetsuya Hara, MD, PhD[a]

35

Prepping for VA ECMO Cannulation

Equipment

- Ultrasounds (2, ideally)
- Arterial line
- Central (or good peripheral) access NOT at right IJ

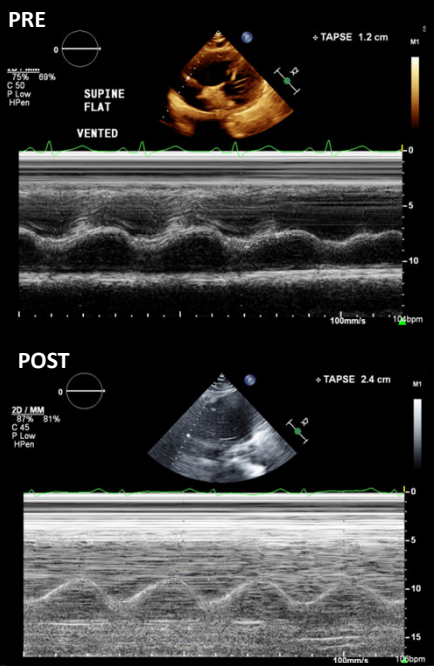
Rescue Meds

- IV Fluids
- Vasopressors
- IV Calcium
- IV Sodium Bicarb

36

Hospital Course and Outcome

HD 1	Decannulated Baby discharged home
HD 2	Ongoing transfusion requirement, CT with no source of bleeding Persistent hypoxia, thick bloody secretions on bronchoscopy Awake and following commands, engaging with lactation
HD 3-4	Weaning inhaled epoprostenol Echo with recovered RV function Diuresis
HD 5	Extubated Worked with PT
HD 6	Transferred from ICU to L+D
HD 9	Discharged home



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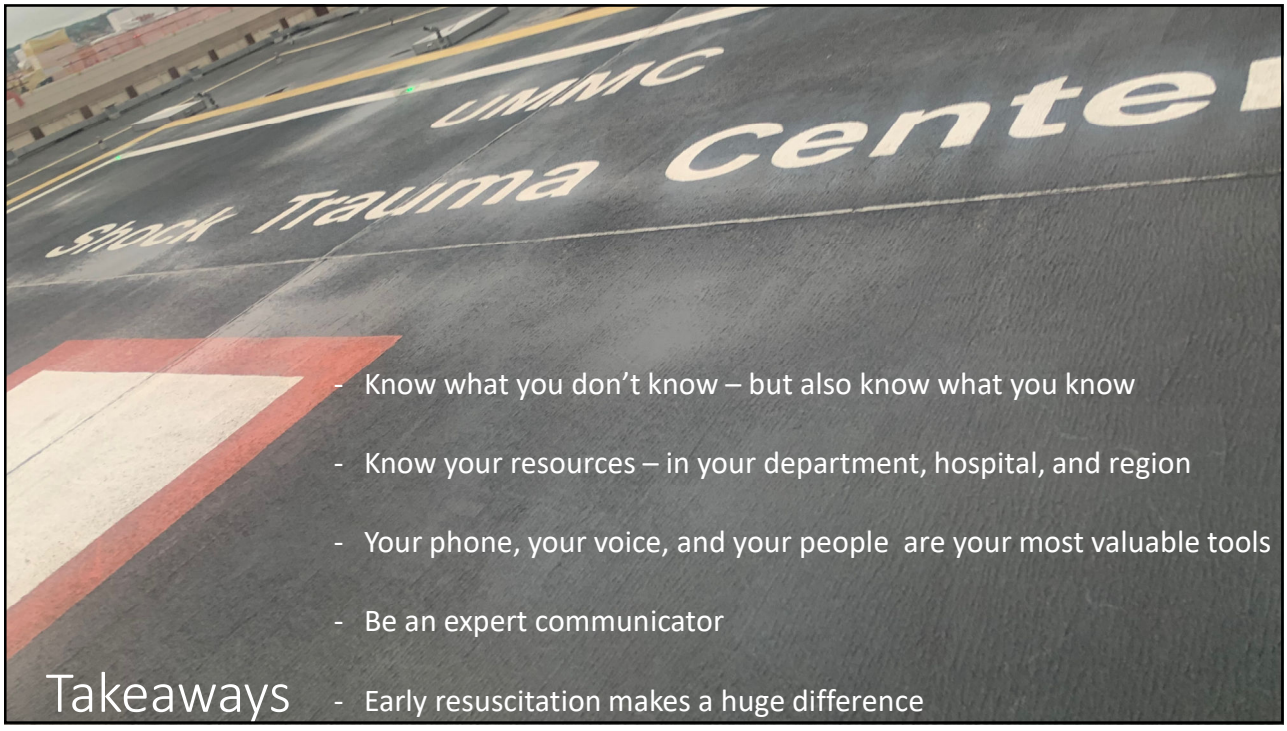

38