SUBJECT: Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) **PAGE:** 1 of 4
REVIEWED/UPDATED: 3/23 **EFFECTIVE: 3/16/23**

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CONCURRENCE(S): Trauma Faculty

PURPOSE:

- To describe the indications for REBOA and provide institutional guidelines for its insertion
- To describe the insertion technique of REBOA for aortic occlusion

PROCEDURE:

Introduction

- The acute management of the critically ill trauma patient is focused on providing rapid resuscitation with blood, correction of coagulopathy, identification of injuries, and hemorrhage control.
- REBOA is an adjunct tool to assist in the control of non-compressible torso hemorrhage.
- There is no current, high level quality evidence to guide the use of REBOA
- REBOA use is variable across institutions dependent on experience and resources. The following guidelines are recommendations for this institution.

Indications for use

- REBOA is indicated for life-threatening traumatic hemorrhage below the diaphragm in patients unresponsive or transiently responsive to resuscitation
- Aortic occlusion (AO) may provide improvement in central aortic pressure, cerebral and myocardial perfusion, and halt ongoing hemorrhage
- REBOA **must** be accompanied by definitive hemorrhage control

Contraindications to use

- Non-compressible hemorrhage proximal to proposed zone of occlusion—thoracic aortic injury or arterial injury within superior mediastinum, axilla, neck or face
- Inability to obtain safe femoral arterial access

Complications

- Most common complications are related to femoral access
    - Arterial disruption/hemorrhage, dissection, pseudoaneurysm, hematoma, thromboemboli, extremity ischemia
- Aortoiliac injuries are reported involving intimal tear, dissection, thrombosis, and rupture
- Balloon rupture may occur with over-inflation
- Prolonged aortic occlusion may result in severe complications including fatality due to prolonged organ ischemia or spinal cord injury
- Air emboli

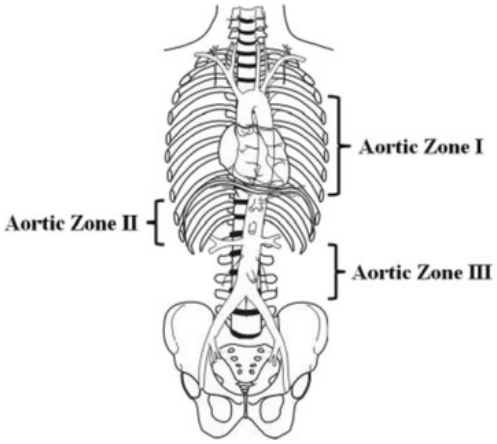
Use in select populations

- Although there is some literature support for REBOA use in non-trauma related hemorrhage (i.e. obstetrics and GI bleed), its routine use cannot be recommended

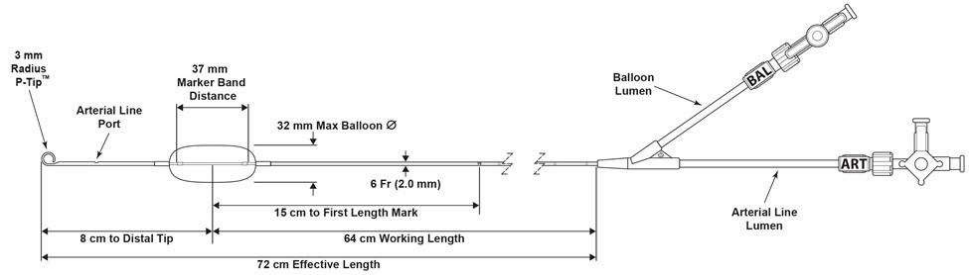
General recommendations

- Ultimately, decision for placement is at the trauma surgeon's discretion pending appropriate indications for use
- If performed this should be completed by the trauma attending or trauma fellow
- If source of hemorrhage is unknown or abdominal/pelvic hemorrhage, Zone 1 inflation is recommended

- Zone 1 extends from left subclavian artery to celiac trunk
- Zone 3 inflation is recommended for hemorrhage limited to pelvis or lower extremity hemorrhage
  - Zone 3 is comprised of infrarenal aorta
- REBOA inflation should be limited to as short as possible. Recommend to deflate at 15-30min intervals if able.
- Surgeons should be proficient in US guided and open cannulation of CFA. ACS-COT BEST Course is available for formal training.



REBOA Insertion Technique



http://prytimemedical.com/wp-content/uploads/2017/05/er-reboa-instructions-us.pdf)

Insertion Steps:

1. Access the common femoral artery (CFA) 2 cm below the inguinal ligament using the micropuncture kit and catheter. Ultrasound utilization is ideal, but landmarks, fluoroscopy, blind placement or cut- down on the CFA can be utilized.
   - An 18 gauge femoral arterial line catheter (18 Gauge Arrow® Femoral Arterial Line) can also be used as the 0.035 wire from the 7Fr introducer sheath (7Fr Cordis AVANTI®+ Introducer) kit will go through the catheter.
   - It is acceptable to place the 7Fr Cordis J-wire into the 18 gauge femoral arterial line catheter (and exchange for the 7Fr sheath immediately), but be aware of a smooth resistance as the wire passes beyond the catheter tip.
2. Once the microcatheter is confirmed in the CFA, remove the dilator, and insert the J-wire (from the 7Fr Cordis sheath package) into the microcatheter. Exchange the microcatheter for the 7 Fr sheath (w/dilator) over the J-

wire. Remove the dilator and J-wire. Ensure the dilator is locked into the sheath when advancing to prevent snow-plowing of the vessel wall.

3. Remove the ER-REBOA from the package. Fill the 30 cc Luer-lock syringe from the ER- REBOA kit with 24 cc of injectable saline and attach the 30cc syringe to the balloon port, apply negative pressure to 30cc to remove any remaining air from the balloon, and lock in place.

DO NOT PLACE MORE THAN 24 cc IN THE SYRINGE. The ER-REBOA balloons hold a MAXIMUM of 24 cc. Flush the arterial port in order to ensure a column of fluid in the arterial line portion of the REBOA.

4. Measure approximate distance of insertion using the white hash mark on the catheter:
    - Zone 1 external landmark – tip of ER-REBOA at sternal notch
    - Zone 3 external landmark – tip of ER-REBOA at xiphoid
5. Advance the orange peel away sheath over the balloon and P-tip. Insert the orange sheath tip into the 7Fr sheath to pop open the valve (barely 1cm). Insert the catheter through the peel-away sheath and 7Fr sheath to the desired distance. Retract or peel the orange sheath away in order to visualize the catheter markings. A chest or abdominal x-ray MUST BE obtained to confirm device placement prior to balloon inflation. While waiting for x-ray, attach the A-line port (flush optional) to the transducer to obtain a systemic arterial pressure before the balloon is inflated.
6. Once the catheter is confirmed in the desired location (2 radiopaque markers located at each end of the balloon will be visible on x-ray), hold the catheter at its insertion site into the sheath DURING and AFTER inflation (especially at Zone 1). Failure to secure the catheter during and after inflation may result in balloon migration and possible aortic intimal injury.
7. Inflate the balloon until an increase in the patient's blood pressure is seen or there is loss of pulse in the contralateral femoral artery. The balloon holds a max 24cc of saline and over inflation should be avoided. Once inflated to the appropriate volume lock in place.
    - Average balloon fill for Zone 1: 15 cc (unpublished data)
    - Average balloon fill for Zone 3: 11 cc (unpublished data)

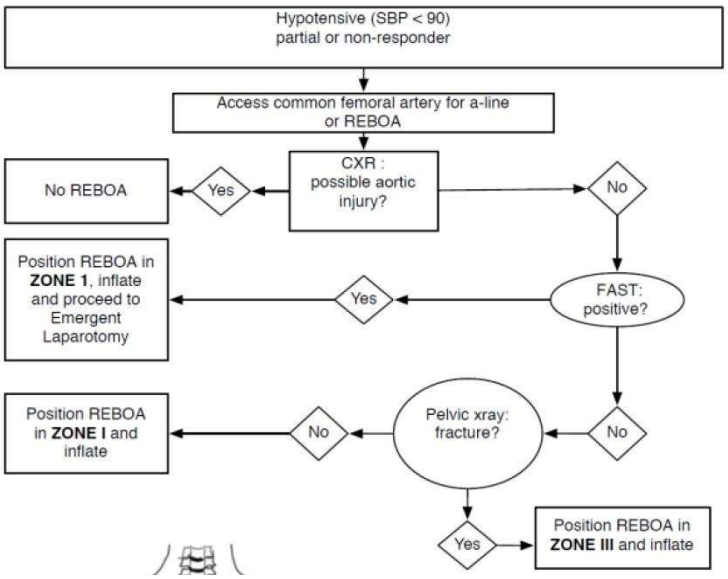
    Secure the catheter to the sheath, and sheath to the patient. Additional x-rays are optional but encouraged if time permits.

8. Once the need for the catheter has passed, deflate the balloon by attaching an empty syringe, retracting to 30cc, and lock in place. A few seconds is required to remove all fluid and air from the balloon and catheter. Disconnect the A-line transducer from the A-line port and lock.
9. Remove the catheter from the sheath.
10. Flush the 7Fr sheath with saline.
11. When coagulation parameters are improved/corrected and patient has stabilized, remove the sheath from the groin and apply manual compression for 30 minutes. No closure device has been found to be more effective than CORRECTLY APPLIED manual compression. The patient must be supine (no hip/knee flexion) for 6 hours after compression is completed. Preferentially this should be done prior to leaving the Operating Room with verification of pulses before and after removal. If there is any doubt about pulse examination, on table angiogram via a 7FR sheath should be completed prior to sheath removal.
12. A duplex arterial ultrasound of the arterial access site should be obtained 48 hours after sheath removal to assess for pseudoanuerysm formation or thrombus.
    - Any concern for vascular injury warrants immediate consultation with Vascular surgery.

NOTES:

- External landmarks for the inguinal ligament are the ASIS to superiolateral pubic tubercle.
- The duration of balloon occlusion should be limited as much as possible. If return of perfusion is obtained, expeditiously control hemorrhage (via angioembolization, ex-fix and/or surgery) and resuscitate to facilitate the earliest possible balloon deflation.

REBOA Algorithm



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