REBOA for Trauma or Ruptured AAA: Is There a Role for IVUS Guidance to Facilitate Placement by Non-Interventionalists

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Adoption of REBOA and imaging ability

- Concept of REBOA has been around a long time but adoption has been slow
- New devices make this simpler but application limited to surgeons with some interventional training
- Lack of imaging during placement in real time in most settings
- This lack of imaging has been a deterrent in adoption
- Imaging could add confidence in placement as well as provide for specificity and/or adjustment of the location of balloon placement
- Can IVUS provide imaging guidance for REBOA?
- Can non-interventionalists be trained in IVUS?

REBOA Training

- 31 General Surgery Residents in 2 training sessions
  - Each obtained percutaneous femoral access
  - Measure balloon length needed to reach the xiphoid process as the target landmark
  - Insert the catheter and ask for an “x-ray” (i.e. look inside the simulator for placement)
  - Inflate balloon to the appropriate pressure

IVUS Training Session

- Video reviewed of IVUS of aorta with branch identification from the thoracic aorta to the external iliacs
- Live IVUS images using a cadaver specimen through femoral artery access
- Identification of the Celica, SMA, Right renal, left renal and aortic bifurcation were defined
- Medical student participants then repeated the task with independent manipulation and identification of the branches
- A total of 16 second year medical students trained
- 31 general surgery residents were trained on REBOA simulator and IVUS cadaver model
IVUS Training Model

- Cadaver torsos with open vessels in the neck and extremities fully ligated
- Catheter in the aortic arch for mechanical pump infusion of normal saline using to pressures adequate for aortic distension
- Femoral artery access with sheath and IVUS imaging with the Volcano Visions PV 0.035 IVUS catheter

Medical Student Training Results

- Medical students were tested one month later with independent observers not involved with the training doing the assessment of ability to map the aorta
- 6/15 (40%) students were independently able to fully map the aorta and all branches from the descending thoracic aorta to the femoral including the celiac, SMA, both renal, aortic bifurcation and iliac bifurcation
- 9/15 (60%) students were able identify the aorta and at least one branch accurately
- Limitation in success was primarily a problem with misidentifying the iliac bifurcation as the aortic bifurcation

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General surgery resident survey

- 10 question survey based on the introductory trainings on REBOA and with the IVUS catheter
- Defined that the training was only introductory and not meant to be definitive as a certification of the skill
- 19/31 participants responded to the survey

1. The review of the history and clinical data on REBOA was adequate for understanding the indications for its use.

2. The didactic review of the technical use of the Prytime Medical REBOA device was adequate to understanding the effectiveness and complications of REBOA.

3. The didactic review of the steps of deployment of the REBOA balloon was effective in prepping for use with the simulator.
4. The simulator provided a realistic and introductory experience of the deployment of the REBOA balloon.

5. I feel this exercise has prepared me to proceed to a test scenario with the simulator for certification in the use of this REBOA device in a clinical setting.

1. I have prior experience with IVUS image interpretation in clinical practice.

2. The video demonstration of IVUS used in an aortic aneurysm was effective in providing an understanding of how IVUS allows mapping of the aorta and its branches.

3. The cadaver was useful in providing training in the use of IVUS mapping of the aorta and its branches.

4. IVUS is a tool that non-interventional trained physicians could become adept with in mapping the aorta and its branches in the placement of REBOA.
5. IVUS is a useful adjunct in placement of a REBOA balloon to guide in locating the balloon to a specific level in the aorta.

Conclusions

- IVUS training of non interventional specialists is feasible
- Imaging using IVUS may add confidence in REBOA balloon placement
- Need for development of a combined or complementary device to provide for IVUS imaging of REBOA