

# Junctional Hemorrhage

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# What are we talking about?

- **Junctional hemorrhage**, → bleeding from the areas at the junction of the trunk and its appendages
  - This is a difficult problem in trauma.
- These areas are not amenable to regular tourniquets as they cannot fit to give circumferential pressure around the extremity.



# The Areas in Question



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# What works well?

- Tourniquets on extremities control hemorrhage and stop bleeding very effectively
- So much so that it has reduced mortality in the combat theater
  - **Vietnam 9 %** of deaths were from exsanguinating extremity wounds
  - **Somalia 7%** of deaths were from exsanguinating extremity wounds
  - **Currently 2%** of deaths were from exsanguinating extremity wounds
- Note Israeli forces are the most aggressive with tourniquet placement and they sight a 0% mortality from limb exsanguination

• The Journal of Emergency Medicine, Vol. xx, No. x, pp. xxx, 2009. **BATTLE CASUALTY SURVIVAL WITH EMERGENCY TOURNIQUET USE TO STOP LIMB BLEEDING**  
John F. Kragh, Jr, COL, MC, USA,\* Michelle L. Littrel, CPT, AN, USA,† John A. Jones,\* Thomas J. Walters, PHD,\* David G. Baer, PHD,\* Charles B. Holcomb, MD

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# Tourniquets on extremities



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# CLASSIFICATION OF JUNCTIONAL TRAUMA

## Type 1

Wound encroaches on a junctional zone but surgical control can be gained without entering adjacent body cavity.

Proximal control requires surgical incision extending across the joint flexure.

- EXTREMITY, JUNCTIONAL, AND PELVIC TRAUMA  
RICHARD REED, FRCA\*; PAUL MOOR, BMedSci (Hons), FRCA†; and VICTORIA PRIBUL, FRCA



# CLASSIFICATION OF JUNCTIONAL TRAUMA

## Type 2

Wound encroaches on a junctional zone requiring surgical access to gain hemorrhage control.

Body cavity may need to be entered, eg, laparotomy/thoracotomy.

Potential for occult blood loss.



- So what can be done to temporize bleeding in the “field” to get patients to definitive care?



# Abdominal Aortic Junctional Tourniquet (AAJT)

- It has 510(k) clearance from the FDA for difficult to control inguinal and pelvic hemorrhage
- It can be applied to the mid-abdomen, tightened and inflated and may remain on for up to an hour safely. It is also FDA cleared for all junctional hemorrhage sites (axilla and inguinal placements) and can remain on for up to 4 hours in these locations.

• <https://www.chinookmed.com/05246/abdominal-aortic-junctional-tourniquet-aajt.html>



# Abdominal Aortic Junctional Tourniquet (AAJT)



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# Instructions for Use

- **WAIST - WINDLASS - WEDGE**

1. Buckle device around patient's waist
2. Position bladder over umbilicus (belly button)
3. Tighten belt
4. Tighten and secure windlass
5. Inflate bladder (wedge) until green indicator shows

# Steps 1-3 Position at umbilicus and tighten the belt around patient



# Step 4 Tighten the Windlass

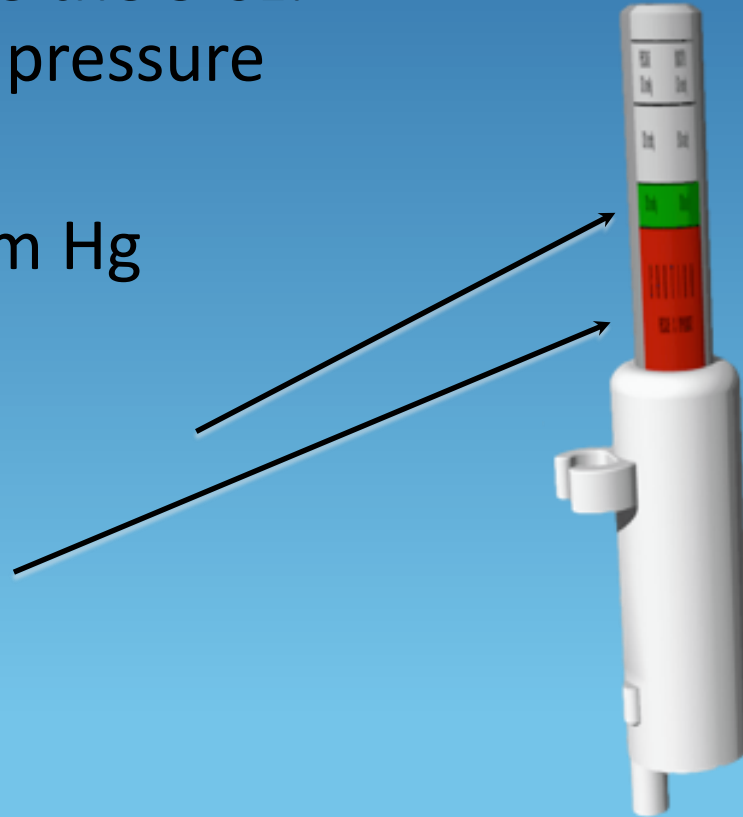


# Step 5 Inflate the center balloon



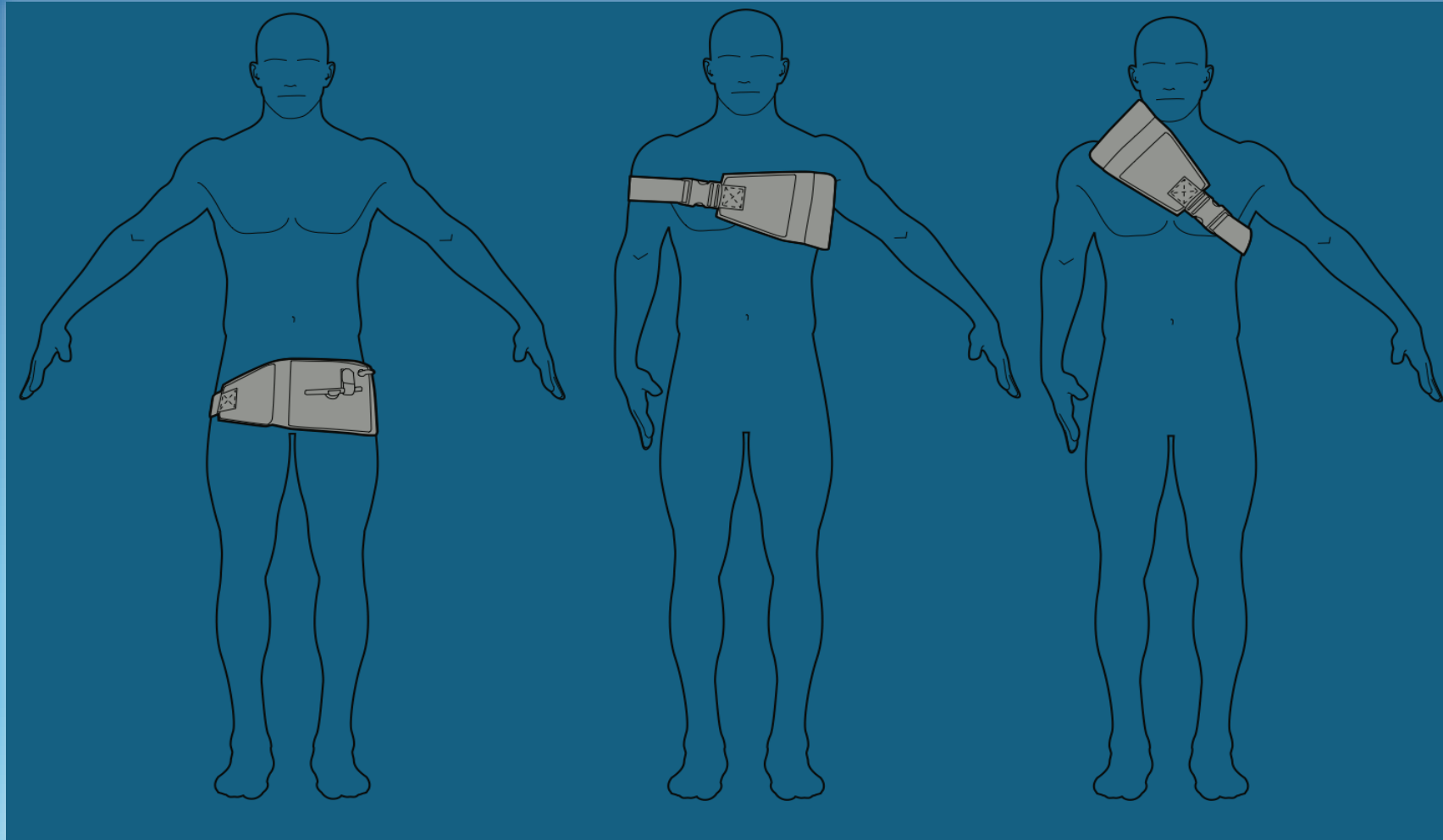
# Inflating the Bladder

- Continue to squeeze the 5 oz. hand bulb until the pressure gauge shows green
- GREEN: 250-300 mm Hg
- RED: > 300 mm Hg



# New Application Sites

There are three new sites of application for the AAT. The Groin, the axilla and the neck.



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# SAMS Tourniquets

- The Target Compression Device (TCD) is placed at or near the injury site and pumped up until the bleeding stops.
- Two TCDs can be used to occlude blood flow bilaterally if needed.

- <https://www.chinookmed.com/05248/sam-junctional-tourniquet.html>



# SAMS Tourniquets



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# SAMS Tourniquets



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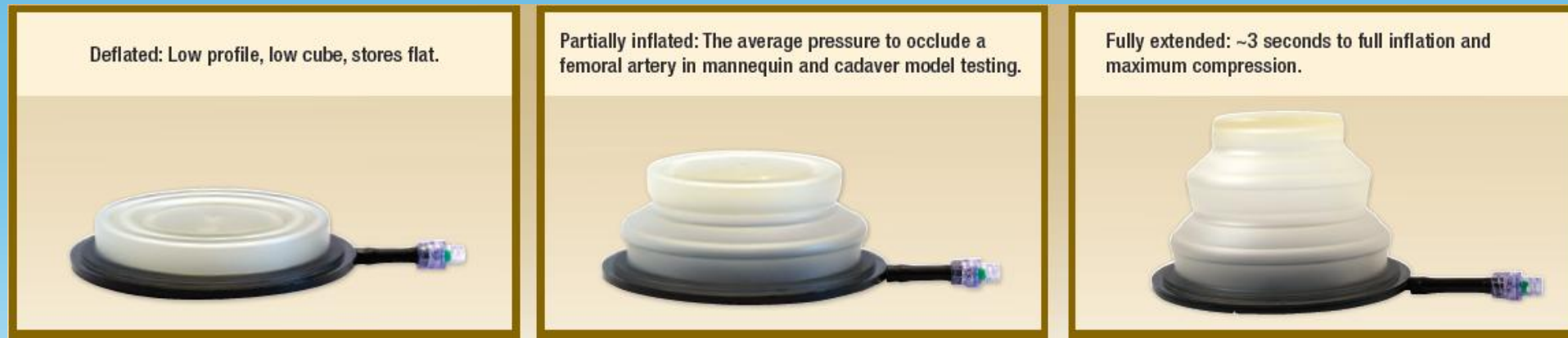
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# Target Compression Device (TCD)

- Pressure Relief Valve (PRV) – 17 PSI
- Burst Pressure ~70 PSI
- Inflates to 3.2” high
- Body of TCD is made of Texin – material also used in protective eyewear, golf ball and whitewater raft protective coating products
- Base of TCD is Makrolon polycarbonate material, which is also used in bullet-proof glass and combat helmet products
- Body and base are welded, not glued



**SAM** MEDICAL  
PRODUCTS®

**SAM Junctional Tourniquet**

00:00:15:14



Tourniquet placed at the sight of hemorrhage



# XSTAT-12



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# Syringe filled with sponges that expand to fill wound



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# Place Syringe in Wound



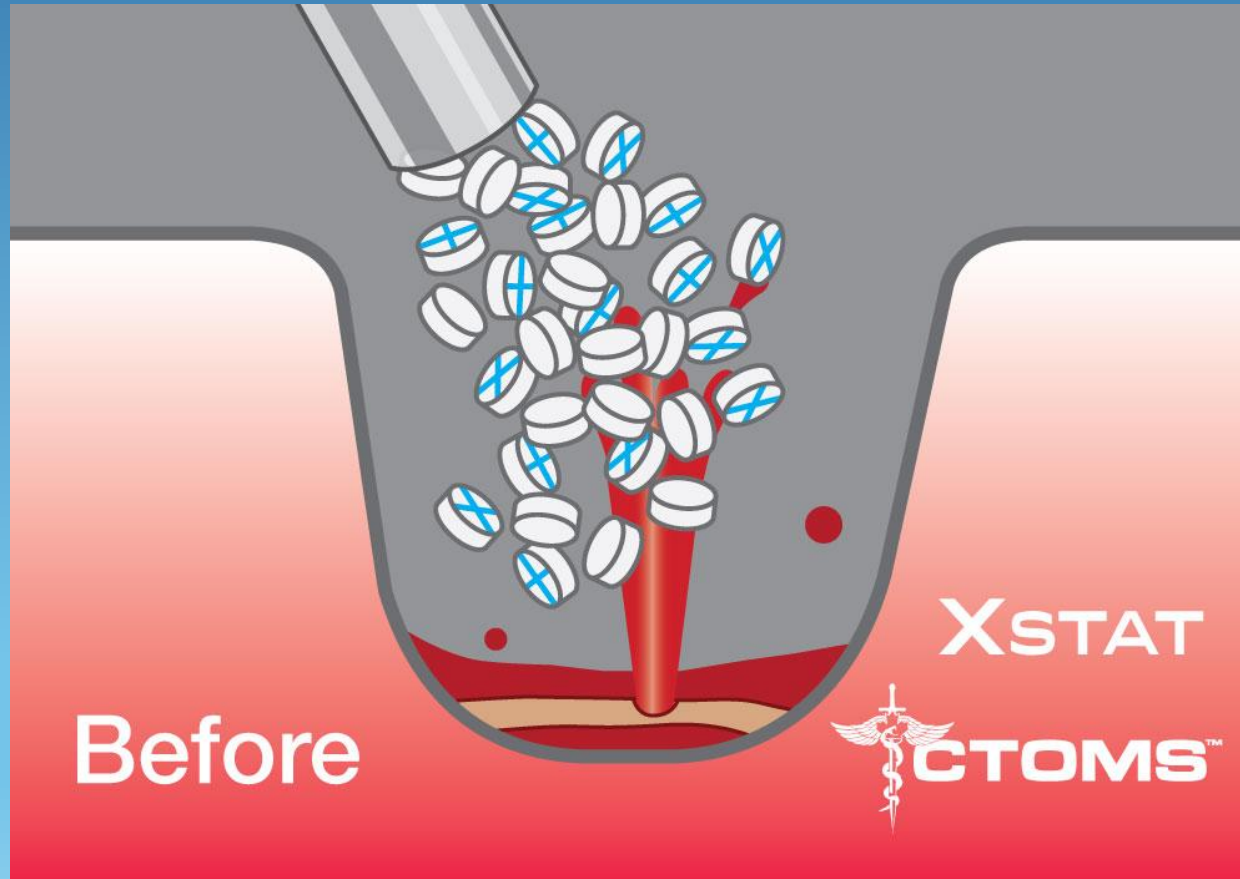
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# Inject sponges



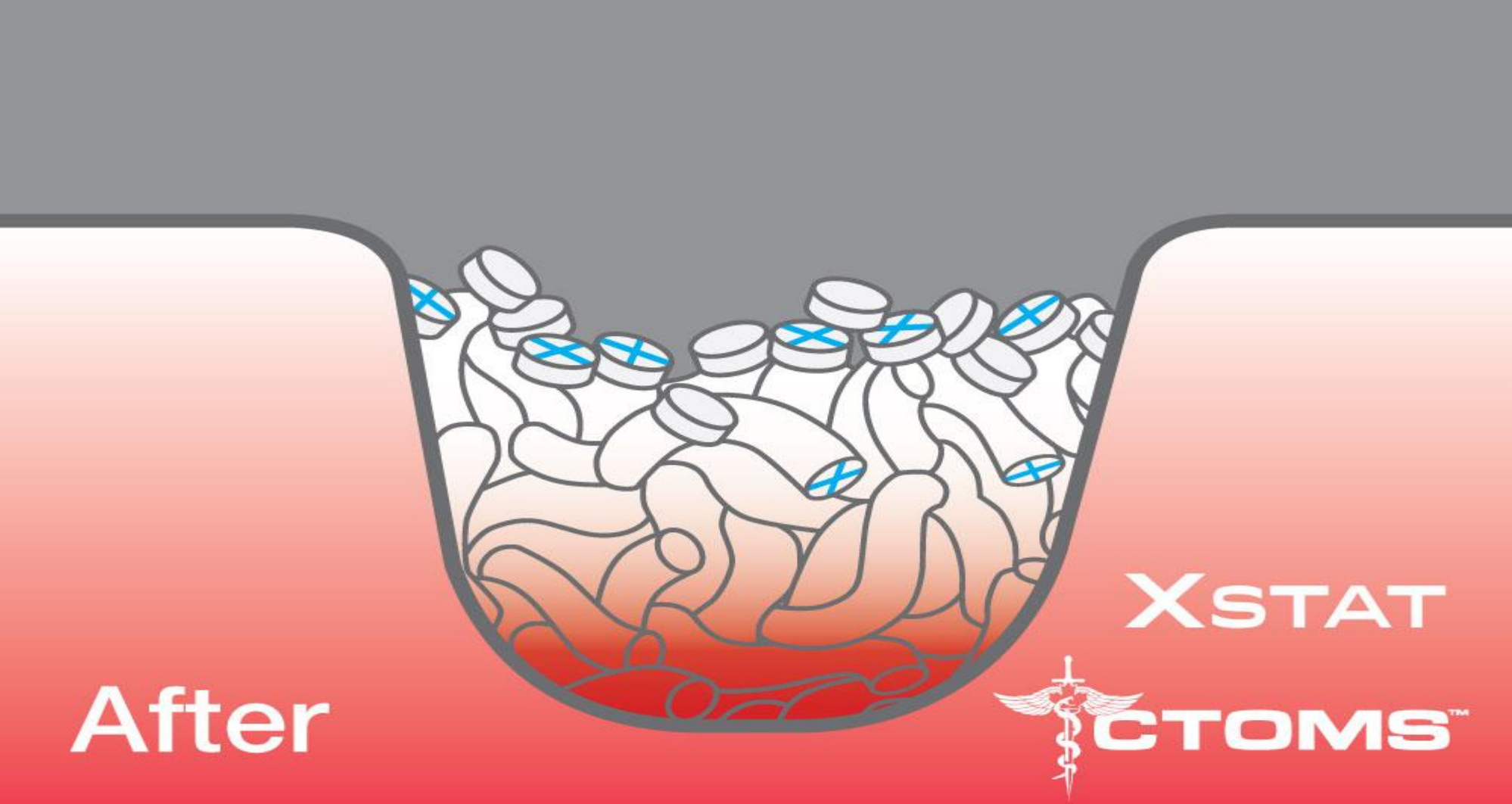
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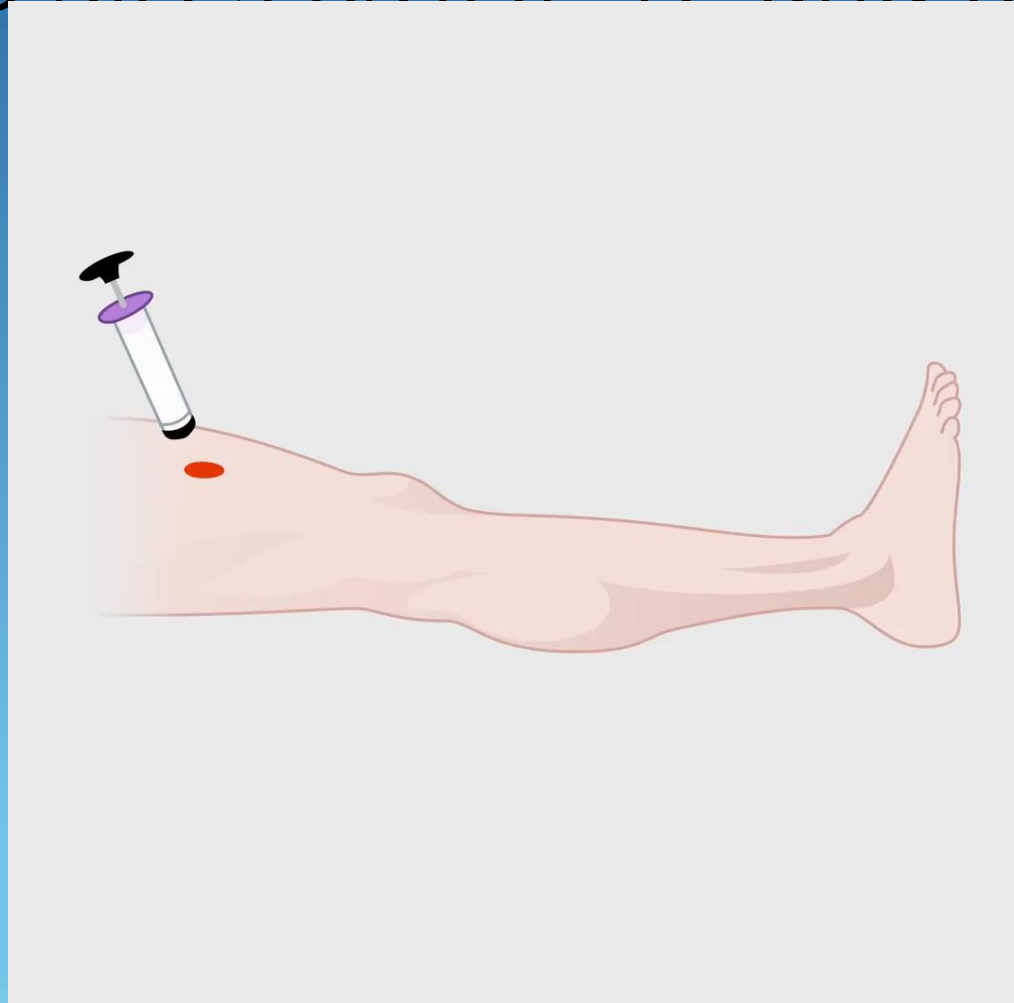
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# Sponges expand to tamponade bleeding



# Two Sizes XSTAT-12 and XSTAT-30



<https://www.revmedx.com/xstat/>  
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# Combat Ready Clamp



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# FDA-Approved CRoC Application Points

- The Combat Ready Clamp is indicated for use on the battlefield to control difficult bleeds in the inguinal area.  
(FDA approved indication)
- **Note: The CRoC should NOT be applied above the inguinal ligament.**
- There are two modes of use for the CRoC:
  - Direct pressure: Use directly on the site of external hemorrhage for bleeding sites below the inguinal ligament
  - Proximal Pressure: Use at or just below the inguinal ligament to compress the external iliac/femoral artery





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# When all else Fails?

- Surgical Exposure and control



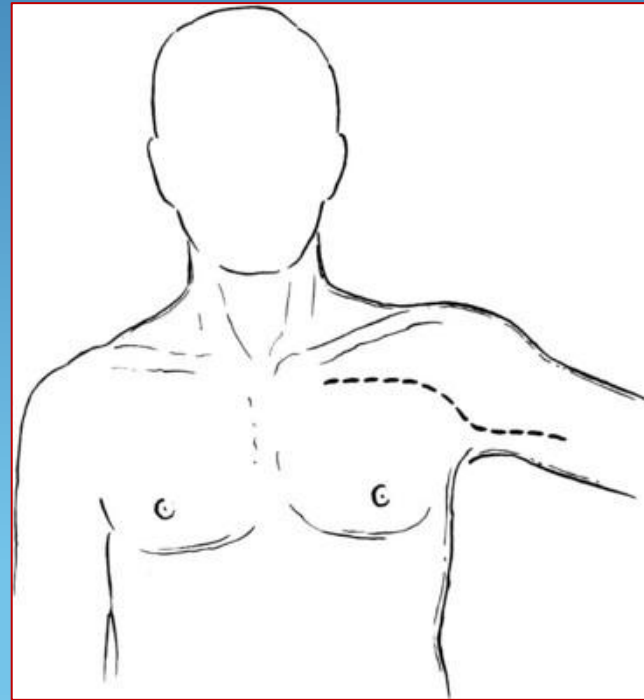
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# Surgical Exposure of the Axillary Artery



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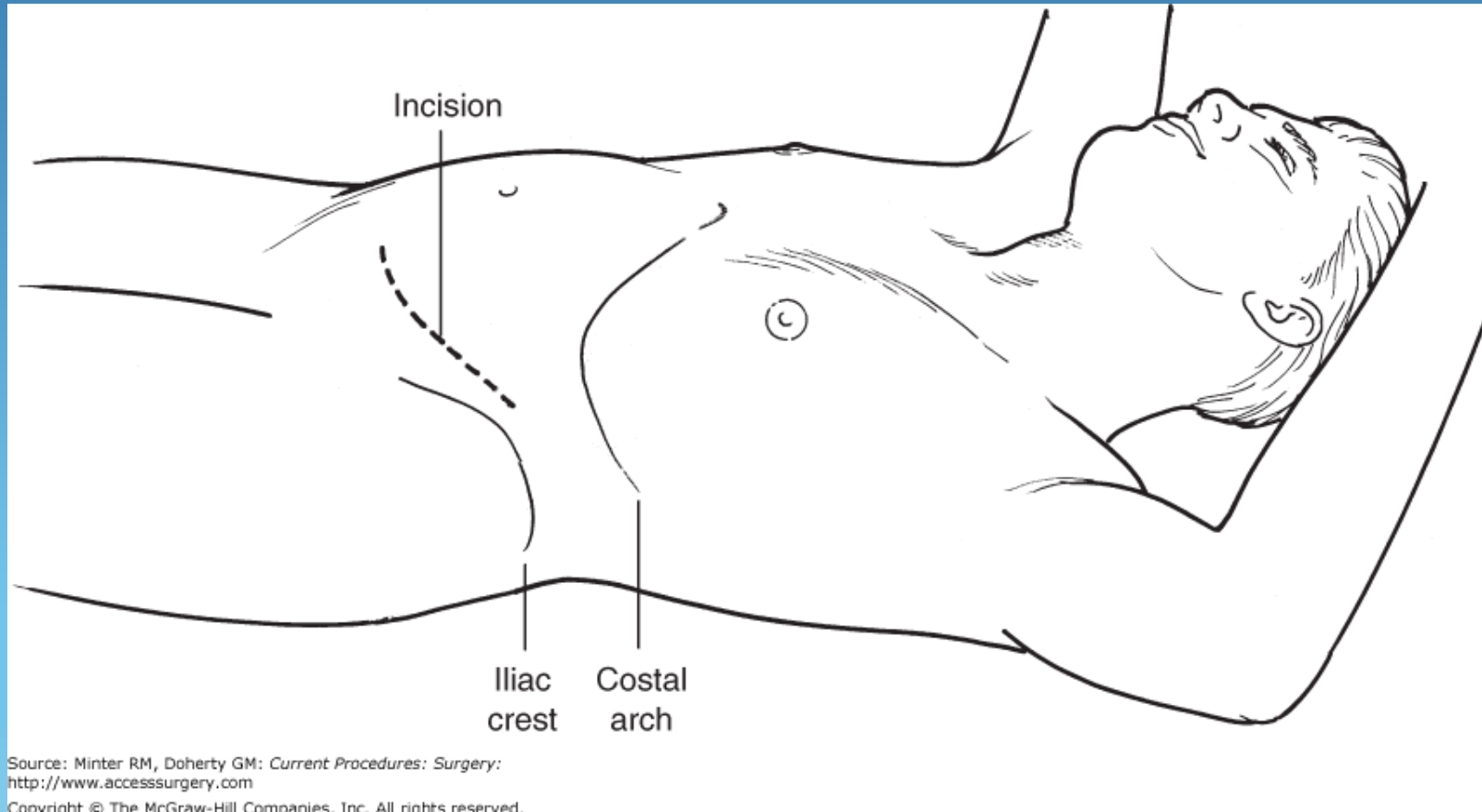
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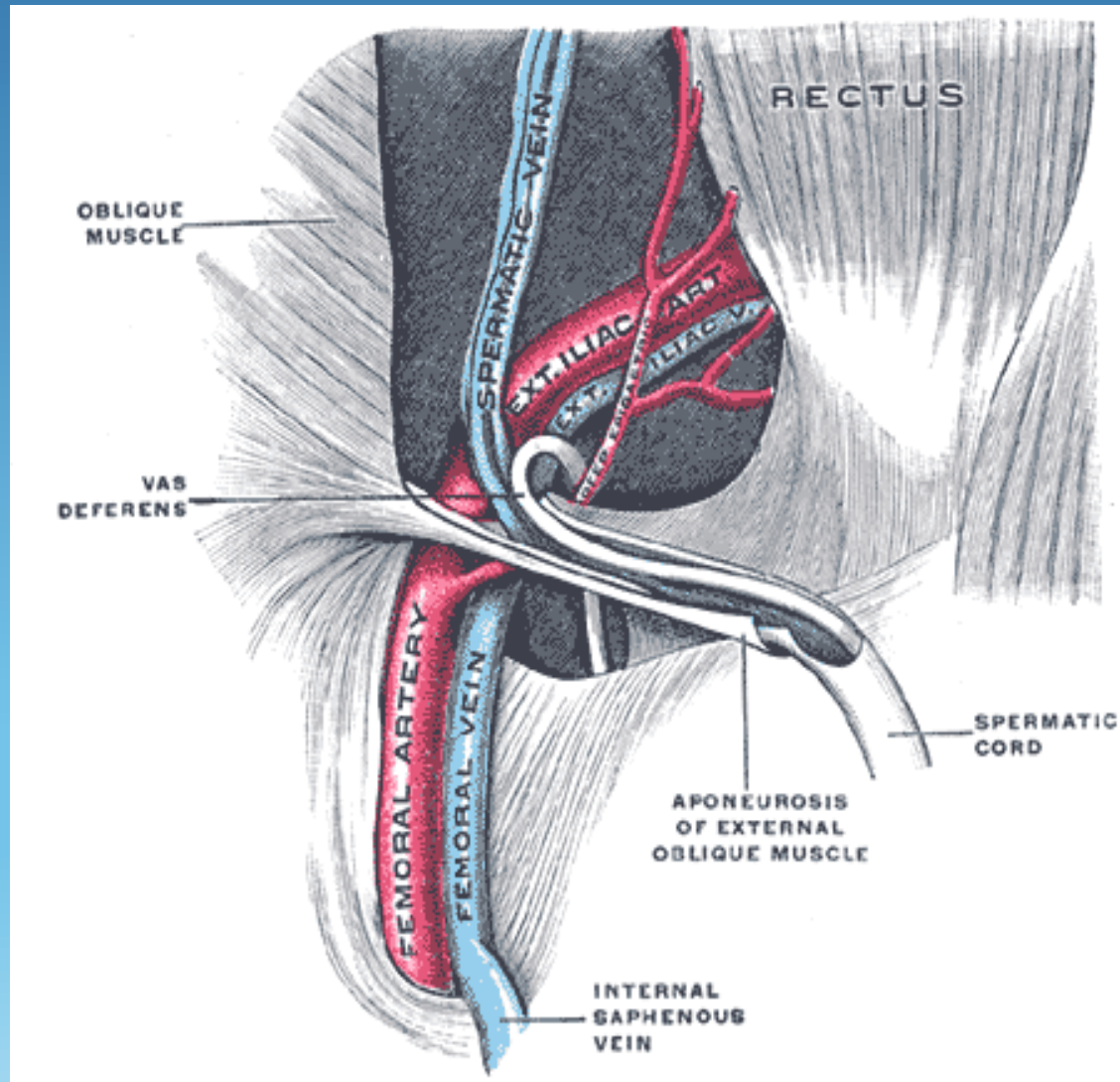
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# Surgical exposure of the Iliac artery





# What about REBOA??

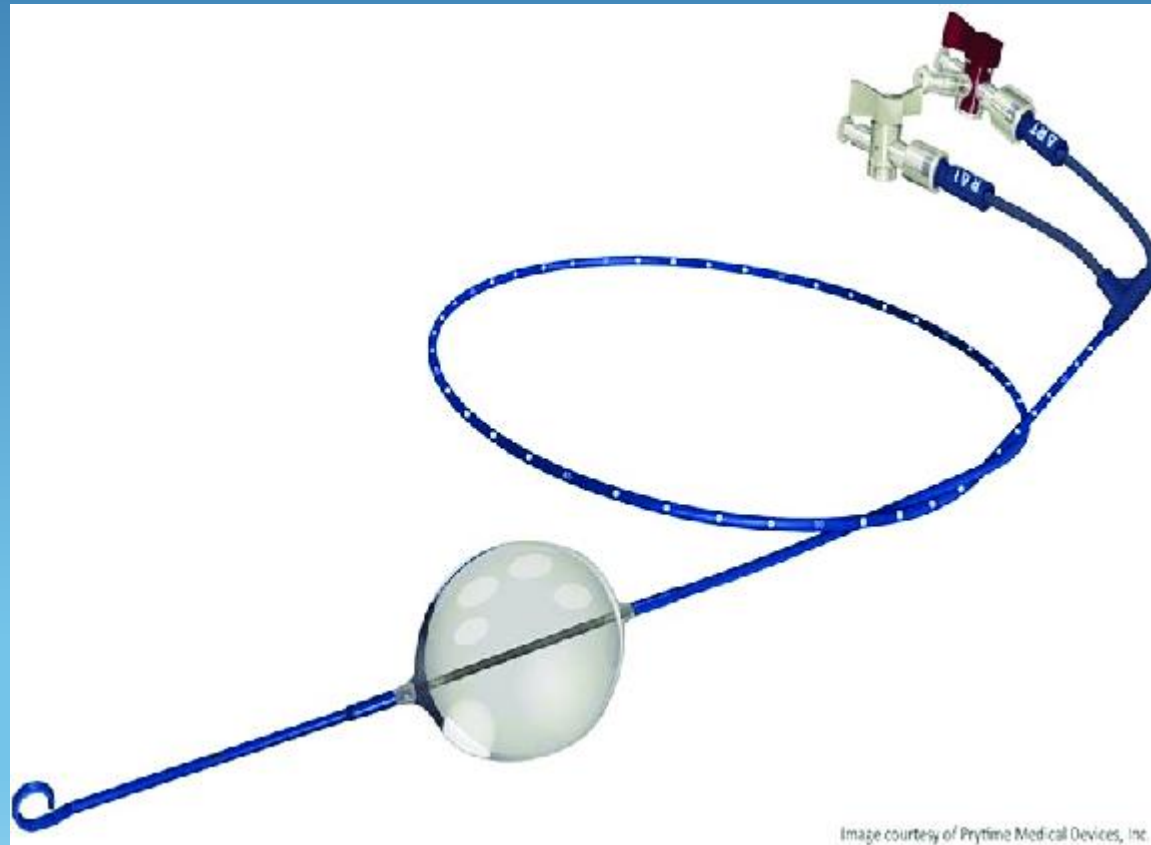


Image courtesy of Prytime Medical Devices, Inc.

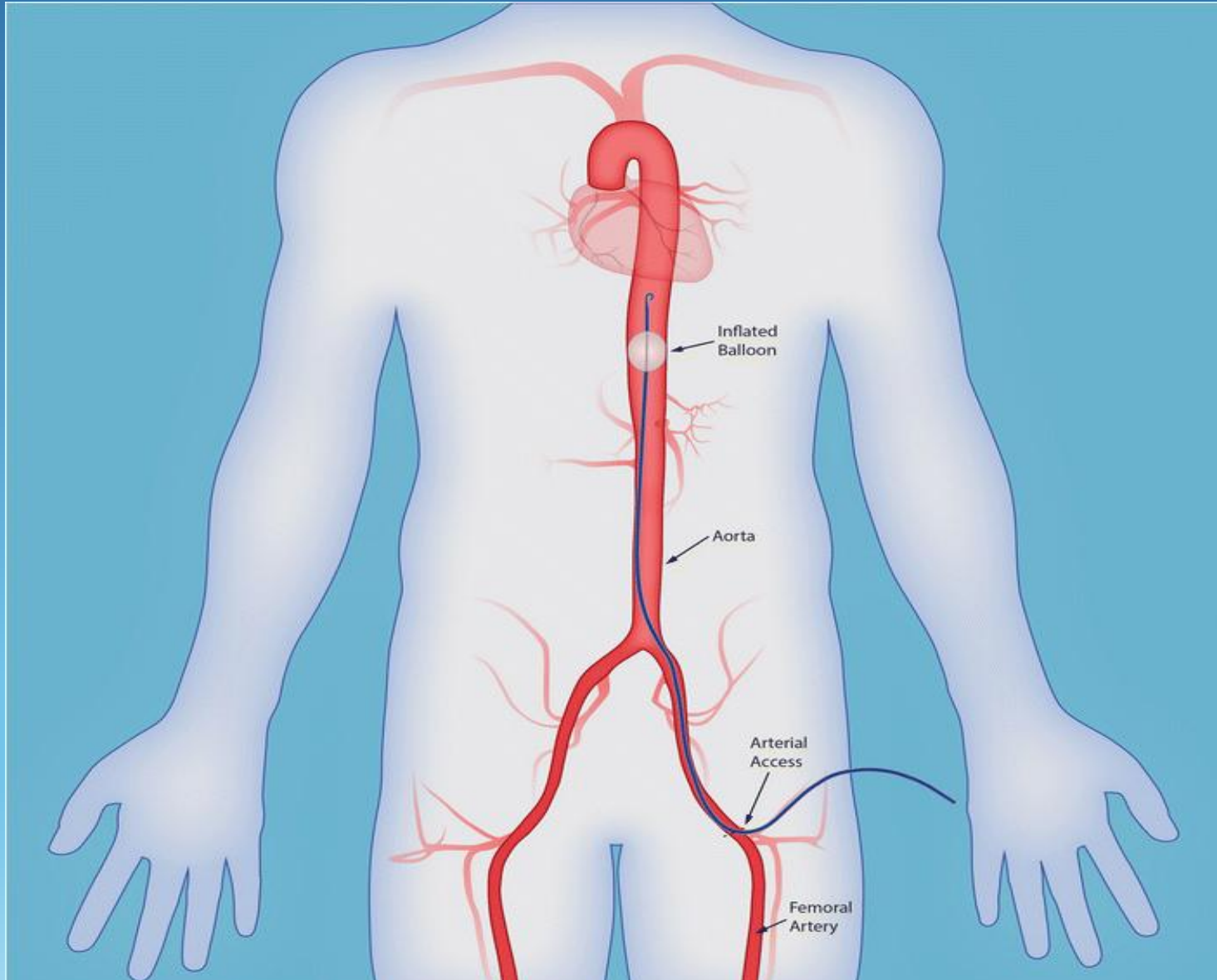
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# ZONE 1 REBOA



# Summary

- Junctional Hemorrhage is a difficult problem to manage in the civilian and military settings.
- There are multiple new devices commercially available no one device has proven itself superior at this time
- Surgical exposure and control is the only tested and definite treatment for there injuries
- Reboa may be of some use for iliac hemorrhage, but could potentially make axillary hemorrhage worse

