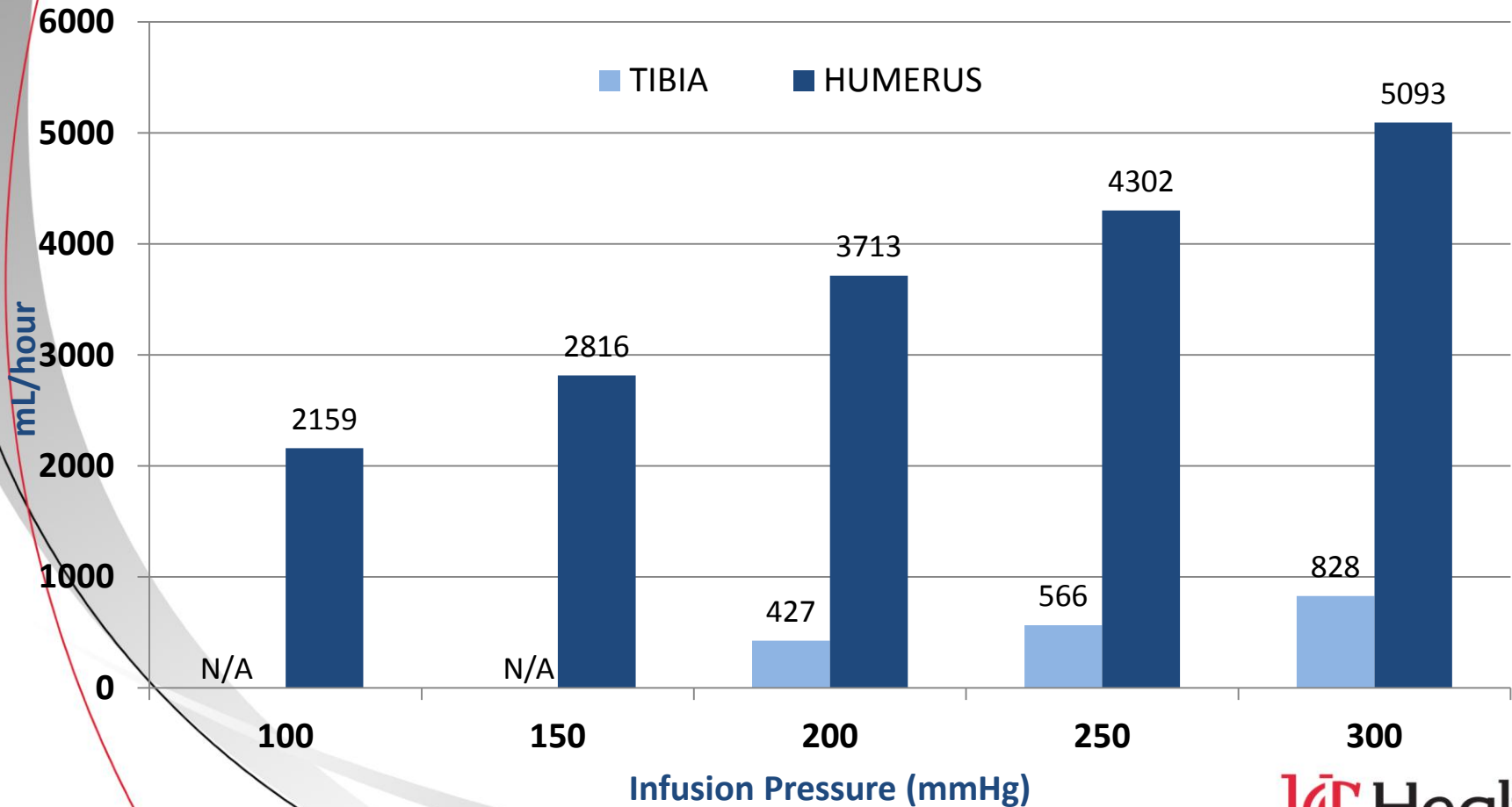


Infusion Flow Rates – Humans (mL/hr)

At Different Infusion Pressures (mmHg)



Note: For tibial IO, not enough cases at 100 and 150mmHg to calculate means.

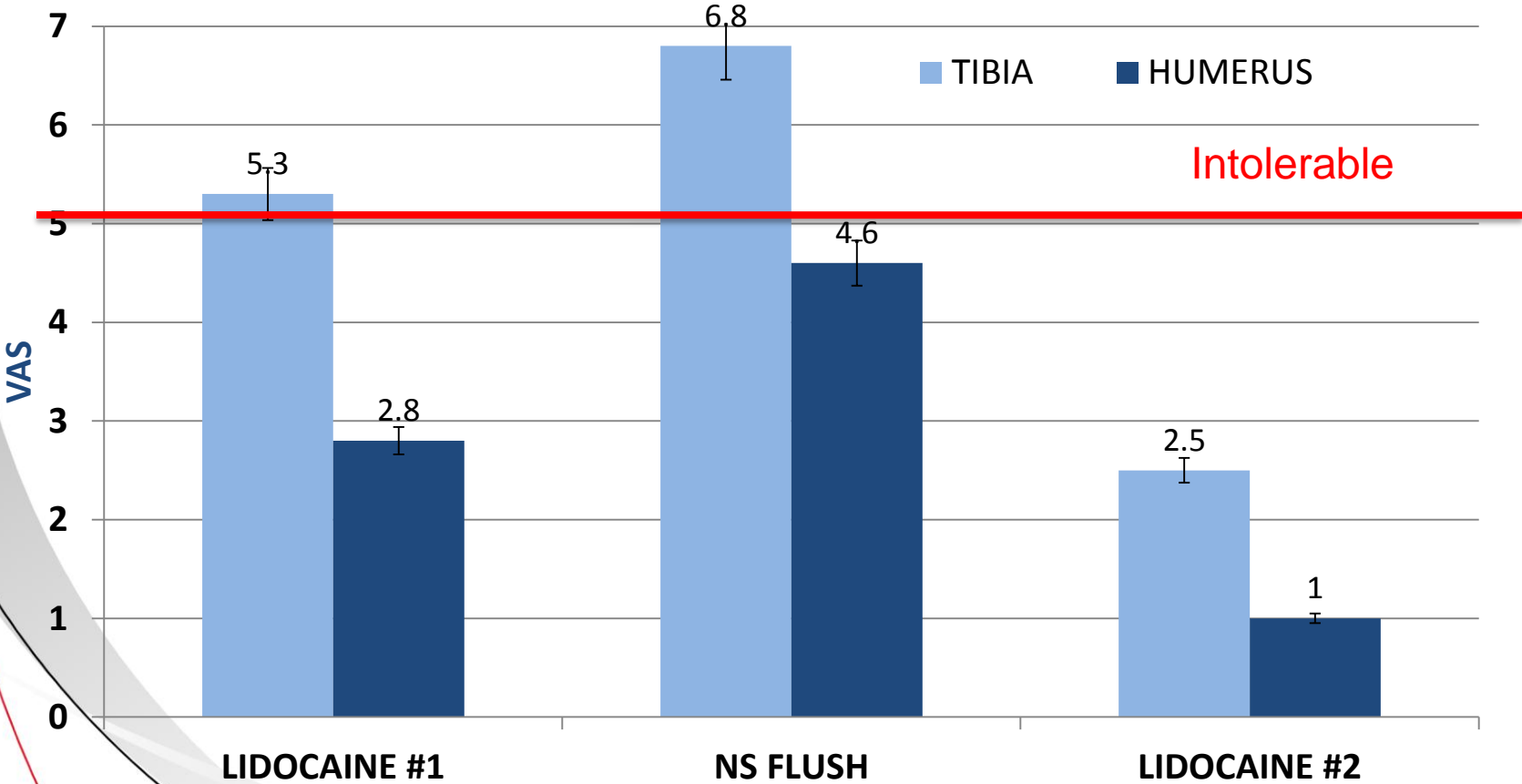
Pressure and Flow Rates

- With a pressure bag or infusion pump, IO flow rates are similar to IV
 - Tibia – is similar to a 21 gauge catheter
 - Humerus & Sternum – is similar to a 16 gauge catheter
- Flow rates for infusions given IO with a *300 mm pressure infuser
 - Tibia - average 900 cc per hour (15 cc / minute)
 - Humerus – average 5,000 cc / hour (83 cc / minute)
 - Unit of blood in approximately 10 minutes (humerus)
- Syringe bolus infusions - completed in seconds (average 10 cc / 3 sec)
- Initial rapid 10 cc syringe bolus dramatically increases IO flow rates

NO FLUSH = NO FLOW

VAS Pain Scores

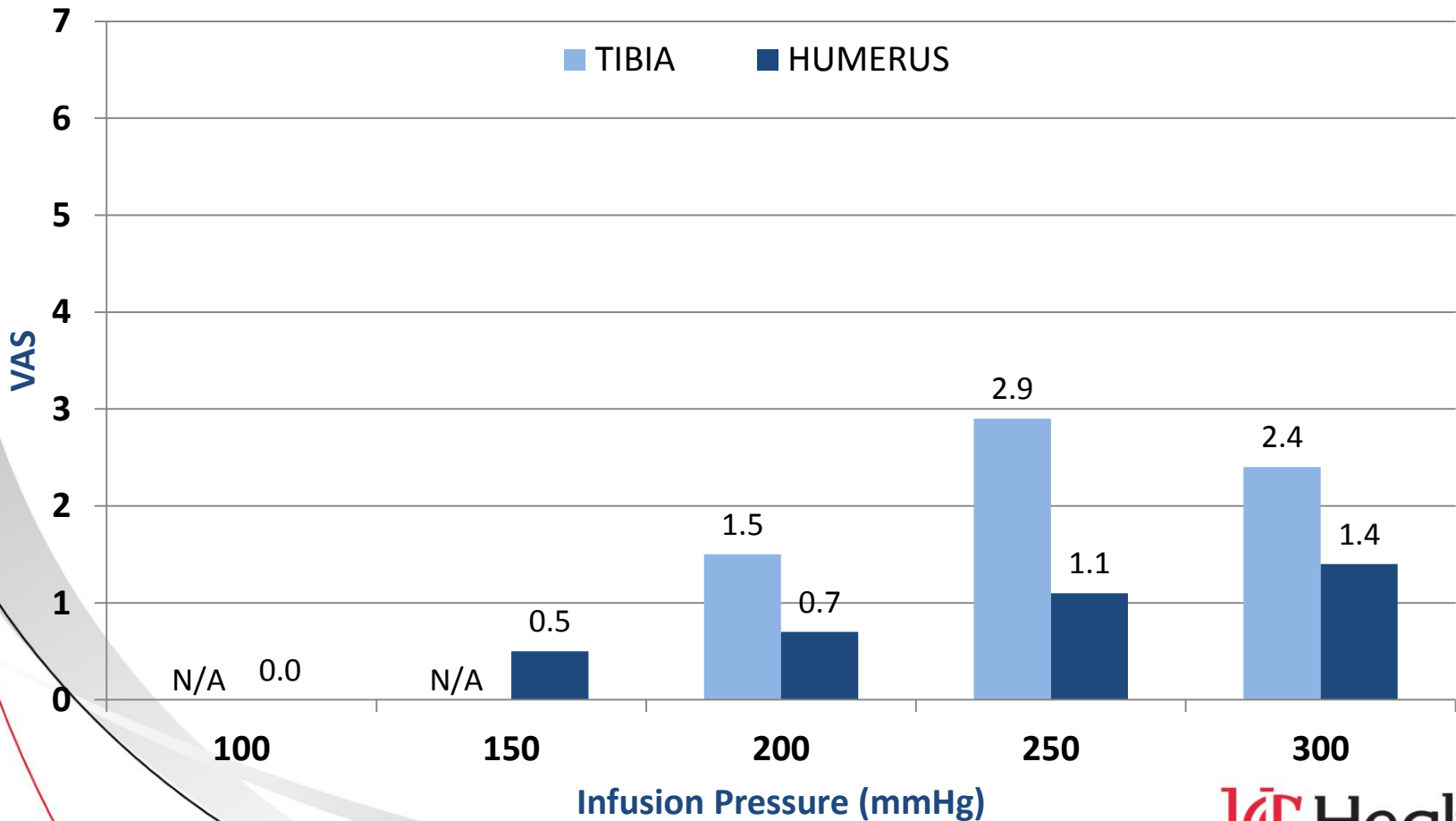
IO Injections



Note: Any pain above 5 is considered intolerable by most subjects

VAS Pain Scores

At Different Infusion Pressures (mmHg)



Note: For tibial IO, not enough cases at 100 and 150mmHg to calculate means.

Lidocaine Administration

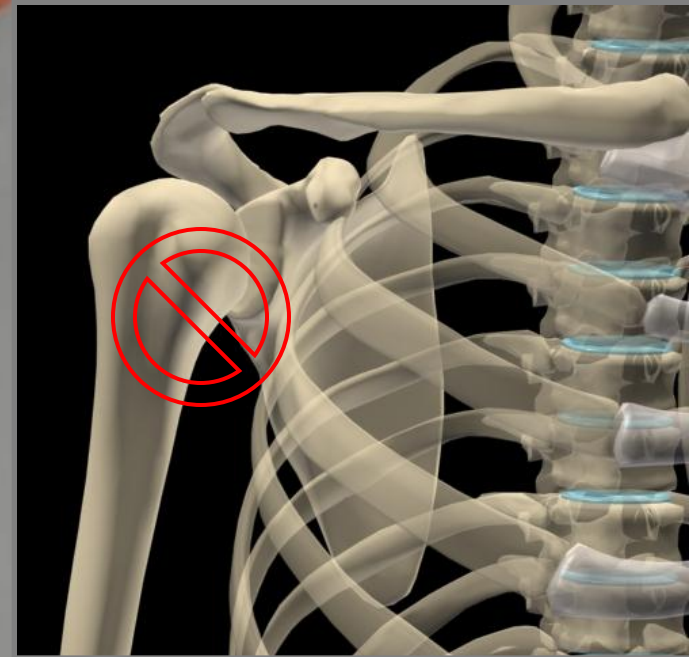
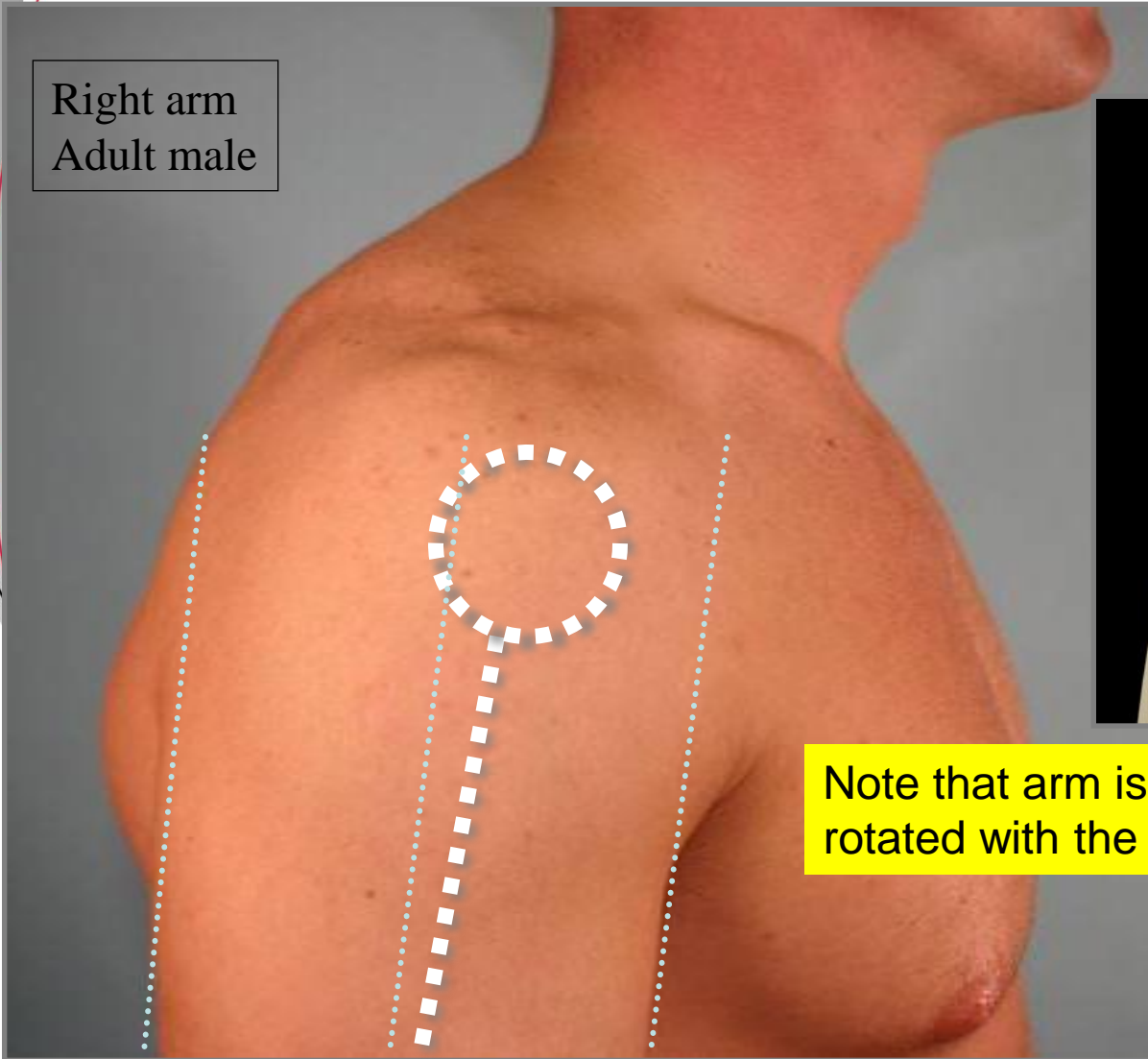
- 2 % (preservative free) Lidocaine given IO has been shown to provide effective local anesthesia in most awake patients
- Prime the EZ-Connect® with 2% Lidocaine
- Adult dosage 40 mg IO (titrate to effect)
- Pediatric dosage 0.5 mg /kg IO (titrate to effect)
- Infuse Lidocaine slowly (0.2cc increments)
- Allow 15 seconds for anesthetic effect
- Flush hard to get flow (may cause brief pain)
- Repeat 20 mg after the flush
- DO NOT exceed 3 mg/kg



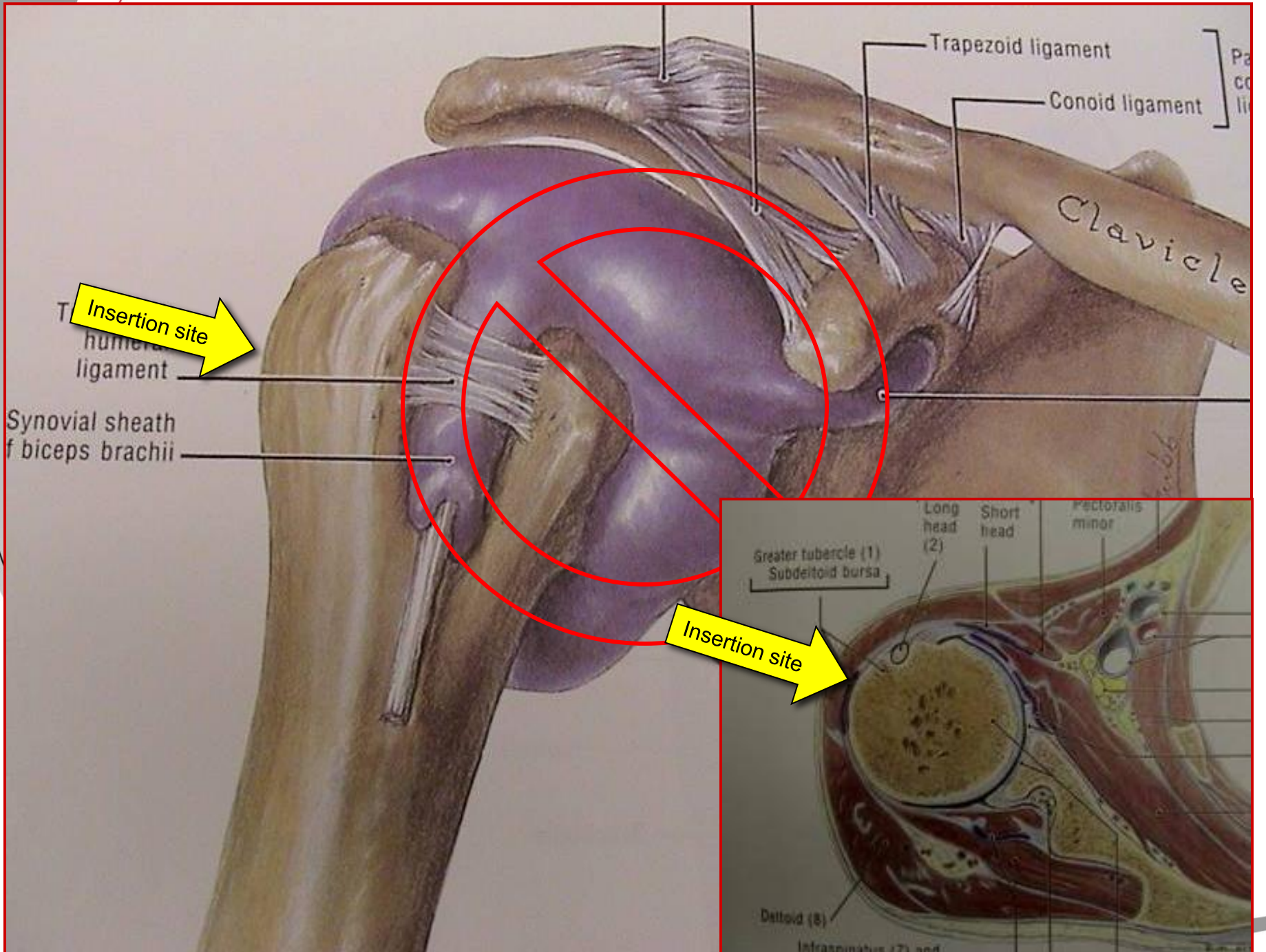
Some patients may require repeated administration to achieve desired effect

The Proximal Humerus insertion site is found “slightly anterior to the arm’s lateral midline”

Right arm
Adult male



Note that arm is adducted and internally rotated with the elbow posterior



Insertion site

Insertion site

Humerus is EZIO site of choice

- Accessible
- Meds immediately get to heart
- Vastly better flow rates
- Significantly less pain

EZIO Success in the humerus

- Palm on navel
- LD needle for **any** adult
- Feel the pop, and then go another 1cm
- Secure the wrist
- Secure the EZIO
- No raising arm over head (CT)