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E·QUAL | EMERGENCY QUALITY NETWORK

Opioid Initiative Wave I –
Medications and Blocks

Presenters

Sergey Motov, MD

Alexis LaPietra, DO

Andrew A. Herring, MD

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INTRAVENOUS LIDOCAINE FOR PAIN MANAGEMENT IN THE ED

PAIN REDUCTION

- Blockade of voltage-dependent Na channels
- Reduction of transmission in sensory pathways
- Inhibition of ectopic discharges from injured nerve and DRG
- Reduction in de-afferentation & central pain
- Anti-inflammation and anti-hyperalgesia

Anesth Pain Med. 2014;3(3):e15444

INDICATIONS

- Acute Pain:
  - Renal colic, MSK trauma, VOC SCD, Acute LBP, Acute Extremity Ischemia, Bowel Obstruction
  - Post-op pain
- Chronic Neuropathic pain:
  - Post-herpetic neuralgia, Central pain, Chronic headache, Malignant pain

Pain Physician. 2013;16(3):231–49

ADVERSE EFFECTS

- Periorbital/perioral numbness
- Dizziness and vertigo
- Dysarthria
- Severe AE (rarely):
  - cardiovascular collapse
  - cardiac dysrhythmia
  - anaphylaxis

DOSING

- 1-1.5 mg/kg preservative-free Lidocaine over 15 min (in 100 ml NS)
- Continuous infusion:
  - 100 mg over 30 min testing dose
  - 0.5-2.5 mg/kg/hr

RENAL COLIC

- Case series:
  - 1.5 mg/kg over 10 min, 7/8 patients with complete pain relief
- RCT: IV Lidocaine (1.5 mg/kg) vs. IV Morphine (0.1 mg/kg):
  - NRS >3 at 60 min: 90% IVL vs. 70% IVM
- RCT: IV Lidocaine (1.5 mg/kg) + IV Morphine vs. IV Morphine (0.1 mg/kg):
  - Combo: faster onset of pain, less nausea and vomiting

Soleimanpour 2011, Soleimanpour 2012, Firouzian 2016

ACUTE MIGRAINE HEADACHE

- RCT: IVL (1 mg/kg) vs. NS Placebo
  - No difference in pain score at 20 minutes
- RCT: IVL (50 mg x3 doses) vs. DHE vs. Chlorpromazine:
  - 29% of patients with acceptable pain relief

Reutens 1991 , Bell 1990

ACUTE BACK PAIN

- RCT: 100 mg IVL vs. 30 mg IV ketorolac:
  - VAS scores at 60 min: 8 IVL vs. 14 IVK
  - Rescue medication: 67% IVL vs. 50% IVK

Tanen 2012

ACUTE EXTREMITY ISCHEMIA

- RCT: IVL (2mg/kg) vs. IV Morphine (0.1 mg/kg):
  - NRS lower in IVL group at 15 and 30 min by 1.25 and 2.25 points

Vahidi 2015

VOC SCD

- 11 patients, 15 IVL administration, pre-and post-assessment:
  - NRS>20% post 24-h IVL administration in 53% of patients
  - MME reduction post 24-h IVL administration by 32%
  - Mean dosing: 1.3 mg/kg/hr

Nguyen 2015

UNDIFFIRENTIATED SEVERE PAIN

- Prospective pilot study-IVL vs. IVM
  - IVL at 75 mg, 100 mg, 150 mg loading dose
  - 50 min infusion of the same dose after
  - At 60 min: change in NRS: IVM>IVL
  - AE: 13% IVL vs. 37% IVM

SYSTEMATIC REVIEW

- Limited and Low quality evidence
- High % of missing data
- High heterogeneity
- Lack of safety data

Oliveira 2018

CONCLUSION

- Limited data to support IV Lidocaine use in the ED
- A need for more robust research
- A need for protocolized approach to IV Lidocaine use in the ED
- A need for research in larger and geriatric populations with underlying cardiac disease

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IV ACETAMINOPHEN FOR PAIN MANAGEMENT IN THE ED

IV ACETAMINOPHEN

- Weak Analgesic (PO, PR or IV)
- Advantage of IV-faster onset of analgesia
- Part of multimodal analgesia
- Adjunct to opioid analgesia
- Good safety profile
- Insane cost

PAIN REDUCTION

- Weak Cox-Inhibition (Cox-2, Cox-3)
- Serotonergic agonism
- Endogenous opioid stimulation
- TRPV-1 (capsaicin) agonism
- Cannabinoids/vanilloids agonism

INDICATIONS

- Mild/Moderate Acute Pain-single agent
- Moderate/Severe pain-adjunct to opioids:
  - Renal Colic
  - Acute Traumatic MSK Pain
  - Acute LBP
  - Acute Migraine

RENAL COLIC

- IV APAP 1g over 15 min vs. IV MS 0.1 mg/kg
- PO: comparative change in pain score at 30 min:
  - 4 trials: similar to MS pain relief
  - 2 trials: better than MS
  - 2 trials: worse than MS
- IV APAP: minimal rates of side effects

Bektas 2009, Grissa 2011, Serinken 2012, Azizkhani 2013, Masoumi 2014, Morteza-Bagi 2015, Kaynar 2015, Pathan 2016

ACUTE MSK PAIN

- 1g IV APAP vs. 10 mg MSO4 over 15 min
- No difference at 30 and 60 min in:
  - Pain score
  - Rescue Analgesia
- Less AE in IV APAP group

Craig 2012

ACUTE LOW BACK PAIN

- IV APAP 1g vs. IV dexketoprofen 50 mg vs. IV morphine 0.1 mg/kg
- At 30 min post-administration:
  - Similar change in pain intensity between 3 groups
  - Less side effects in APAP vs. Morphine

Eken 2014

ACUTE MIGRAINE

- IV APAP 1g vs. IV Dexketoprofen
  - *No difference in pain score at 15 min and 30 min*
- IV APAP +IV Prochlorperazine + IV Diphenhydramine vs. IV Prochlorperazine + IV Diphenhydramine
  - *Greater change in pain score (1.7) in IV APAP group, less rescue analgesia (38% vs. 53%)*
- IV APAP 1g vs. IV Metoclopramide 10 mg
  - *IV APAP better pain relief at 15 min (42% vs.0), similar pain relief at 60-120 min*

Turkcuer 2014, Meyering 2017, Faridaalaee 2015)

PROBLEMS WITH IV APAP

COST

- January-July 2014-300% price increase
- Current retail price: $26-32 per vial, about $110-140 per 24h
- Oral form: 500mg x2, $.48
- Rectal form: 650 mgx2, $ 1.70

FORMULARY

- Single vial (expensive unused residual
- Non-titratable
- Infusion over 15 min
- Glass vial (occupational hazard)

IATROGENIC OVERDOSING

- Pediatric population:
  - –calculating dosage in MG, administering in ML
- 10-fold dosing error

Dart 2012

NO LONG-TERM ANALGESIC SUPERIORTY OVER PO AND PR

- Rectal APAP 40 mg/kg- **longer analgesia** than 15 mg/kg IV APAP
- IV APAP vs. Oral APAP as adjunct to opioids:
  - No difference in pain scores at 30 min

Capici 2008, Furyk 2018

CONCLUSION

- **IV ACETAMINOPHEN IN THE ED**:
  - NOT warranted for routine analgesia
  - NOT w/o dosing errors
  - NOT affordable
  - NOT offering clear advantage over PO and PR routes

CONCLUSION

- **IV APAP IN THE ED-CASE BY CASE BASIS**

  WHEN:

  - PO/PR routes contraindicated
  - Other analgesics not tolerable
  - Risk of opioid and NSAID's-related AE
  - Multimodal analgesia desired

THANK YOU

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St. Joseph's Healthcare System, NJ

NITROUS OXIDE AND TRIGGER POINT INJECTION

Nitrous Oxide

Becker 2008

Benefits of Nitrous Oxide

Babl 2015
Zhang 1999
Becker 2008
Chapman 1979

Nitrous Oxide as an ANALGESIC

- Indicated for any and every painful condition
- All ages
- 3rd trimester pregnancy

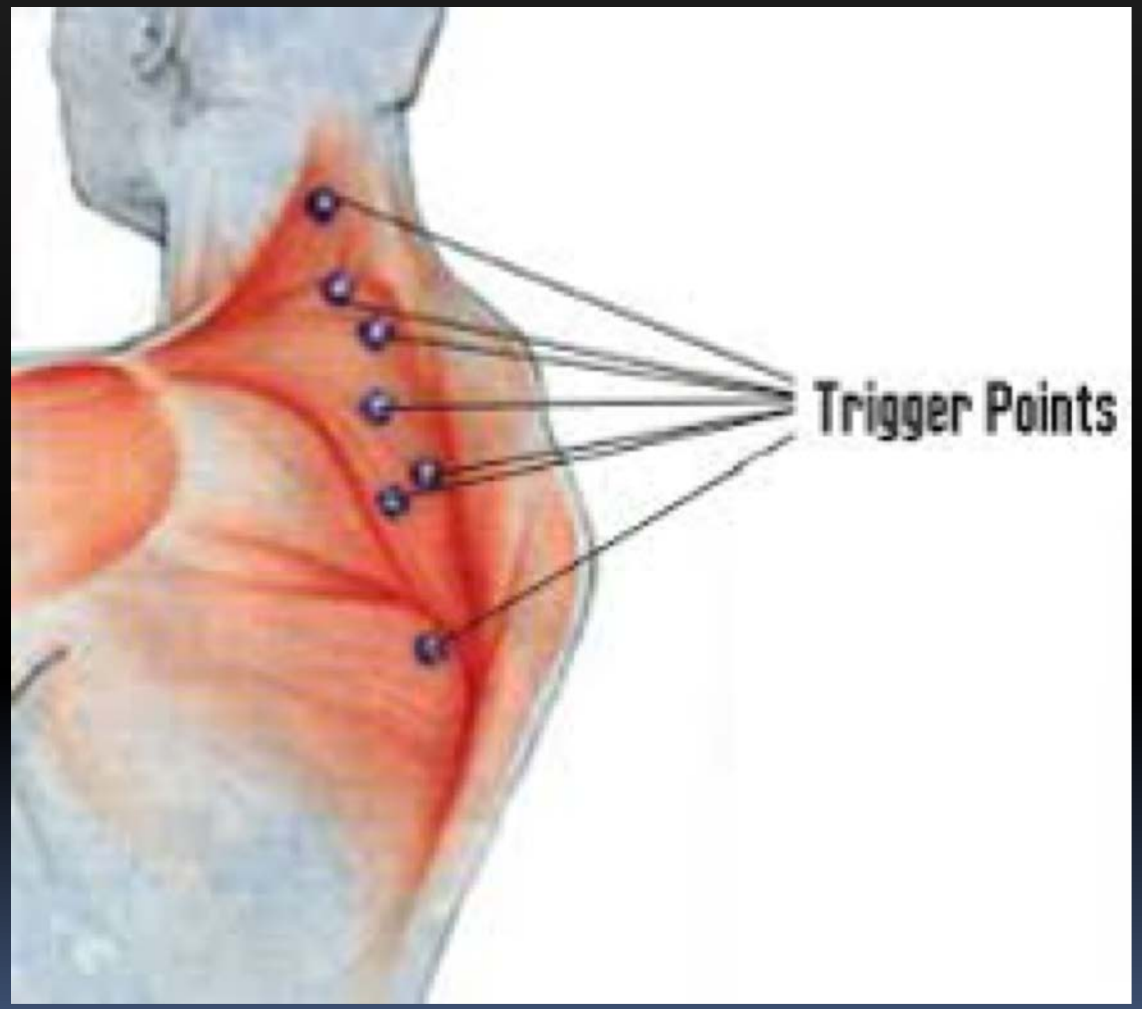
- Laceration repair
- Minor joint reduction
- Lumbar puncture
- Peripheral and central venous access
- Incision & Drainage
- FB removal
- Burn/Wound Care
- Fecal Disimpaction
- Cardioversion

Herres 2015 Ducasse 2013
Klomp 2012 Aboumarzouk 2011
Furuya 2009 Atassi 2005

Contraindications

- COPD or severe active asthma
- Otitis Media, Sinusitis
- Bowel Obstruction
- Altered level of consciousness
  - Psychiatric disease, EtOH, Head Injury
- 1st and 2nd trimester pregnancy

Alvarez 2002
Roldan 2015

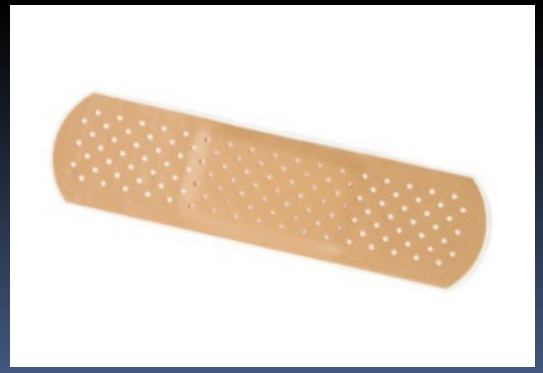


Fogelman 2015
Valdivelu 2011

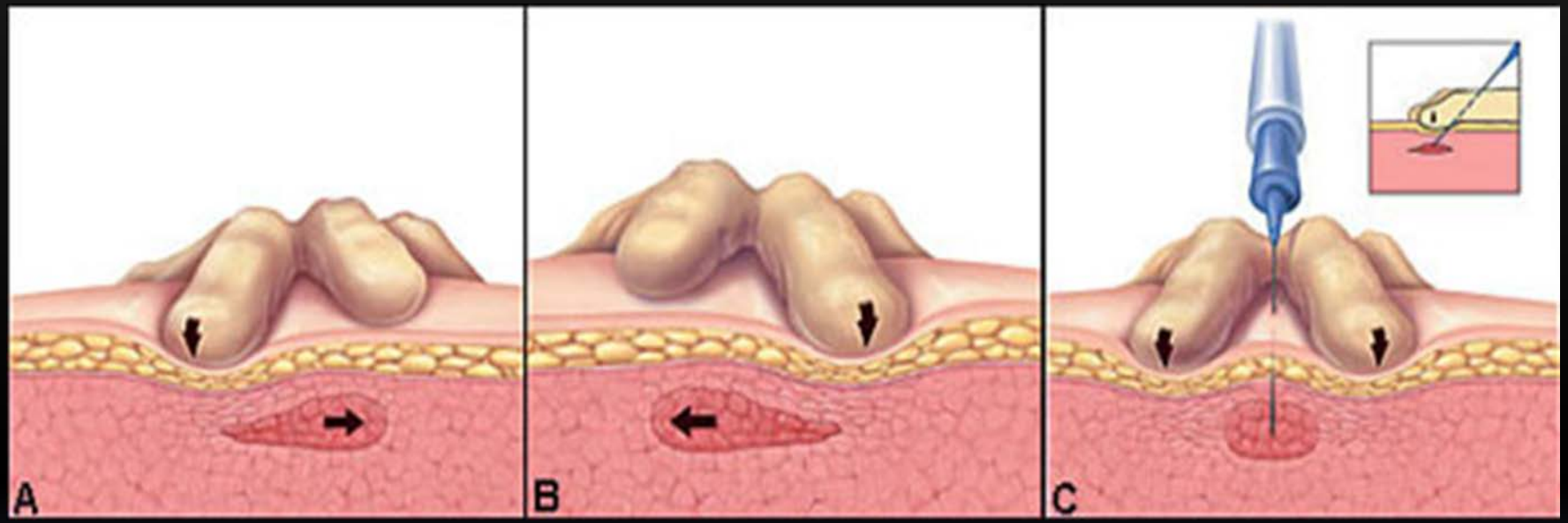
Roldan 2015
Gam 1998

Equipment

22 gauge 1.5 inch



2 mL



Alvarez 2002
Hopwood 1994
Simon 1999

- ✓ Presence of a trigger point
- ✓ Muscle group
- ✓ Needle size
- ✓ Local anesthetic
- ✓ Time Out

Take Home Points

- Trigger Point Injection is an easy and quick procedure for immediate pain relief secondary to severe localized muscle spasm
- Nitrous Oxide is a fast acting easily administered analgesic, ideal for the management of procedural pain in the ED

Learning Objectives

Upon completion of this learning module, learners will obtain:

1. Explain the indications, contraindications, and dosages for ketamine analgesia.

2. Describe the most common emergency nerve blocks and their applications.

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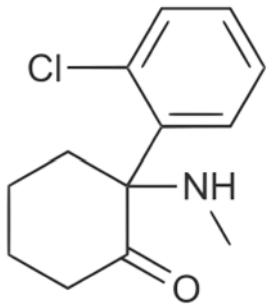
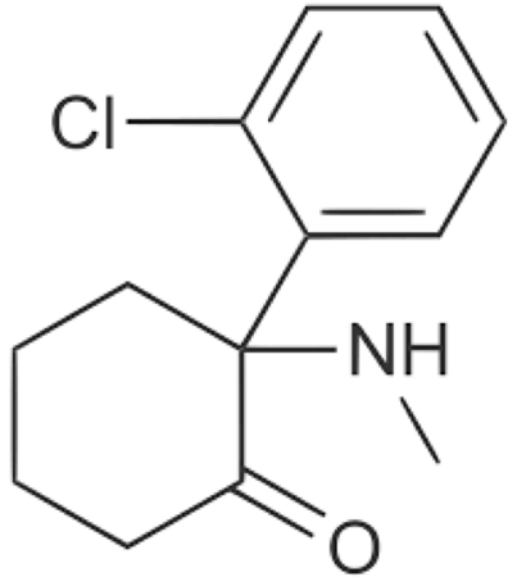


Ketamine

Andrew Herring MD

HIGHLAND EMERGENCY
DEPARTMENT OF EMERGENCY MEDICINE
ALAMEDA HEALTH SYSTEM - HIGHLAND HOSPITAL

Analgesics



Ketamine

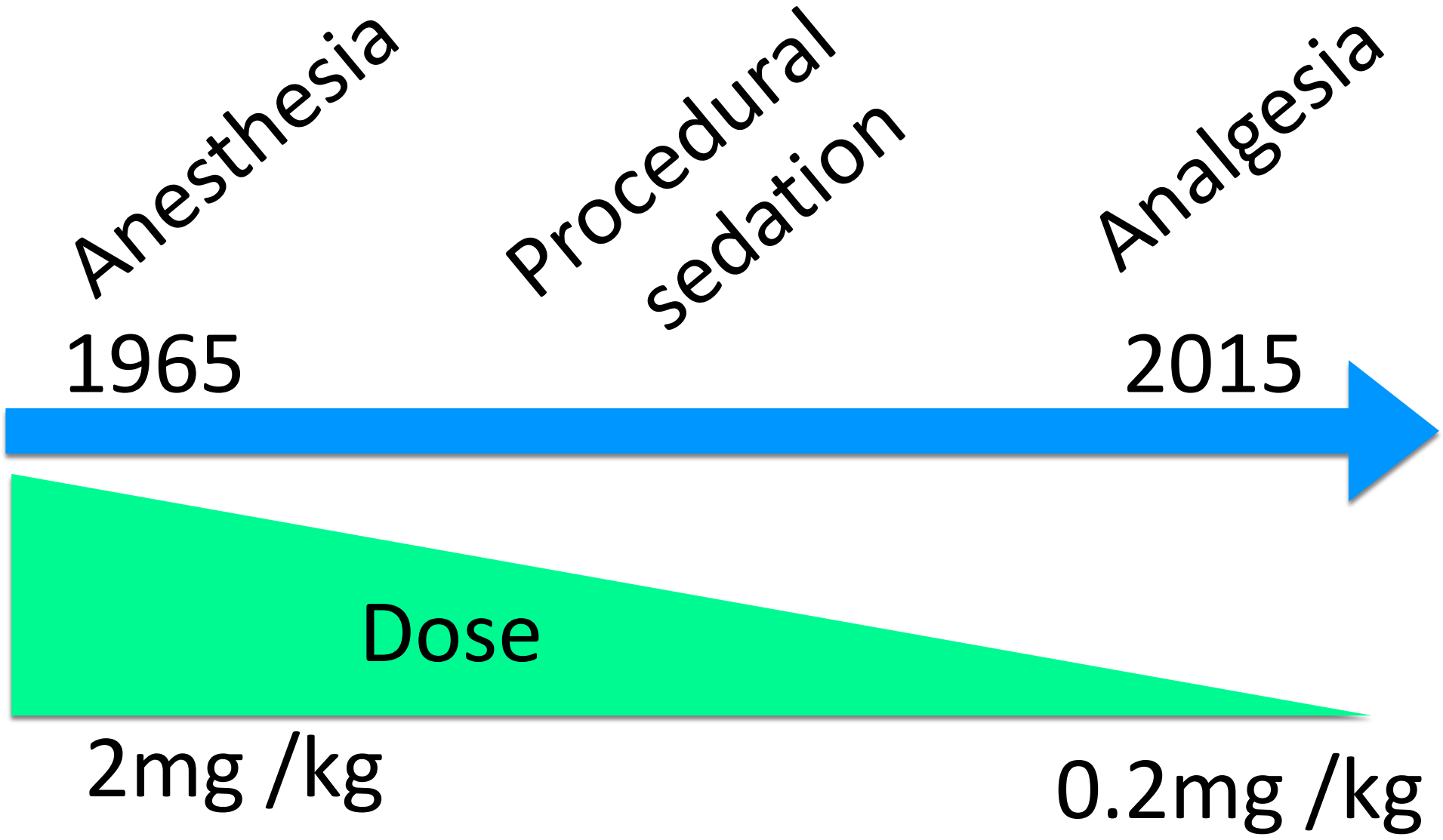
1965

Salycilates

2000 BC

Opium

4000 BC

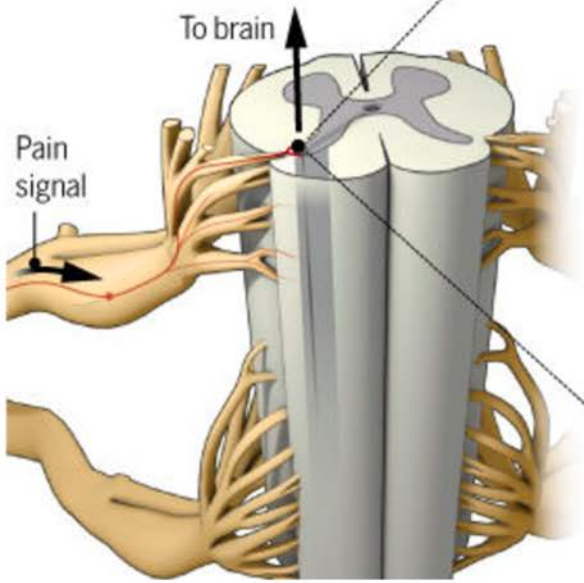

Anesthesia
Procedural sedation
Analgesia
1965
2015
Dose
2mg /kg
0.2mg /kg

Turning down the volume

Animal studies have revealed several ways in which opioids may amplify pain signals in the central nervous system, suggesting targets for drugs that could counter the effect.

Pain's waystation

In a column of gray matter of the spinal cord, chemical signals from nerves throughout the body excite neurons that project pain signals to the brain.



NMDA receptors

As opioids stimulate spinal cord neurons, their N-methyl-D-aspartate receptors may become more sensitive to incoming pain signals.

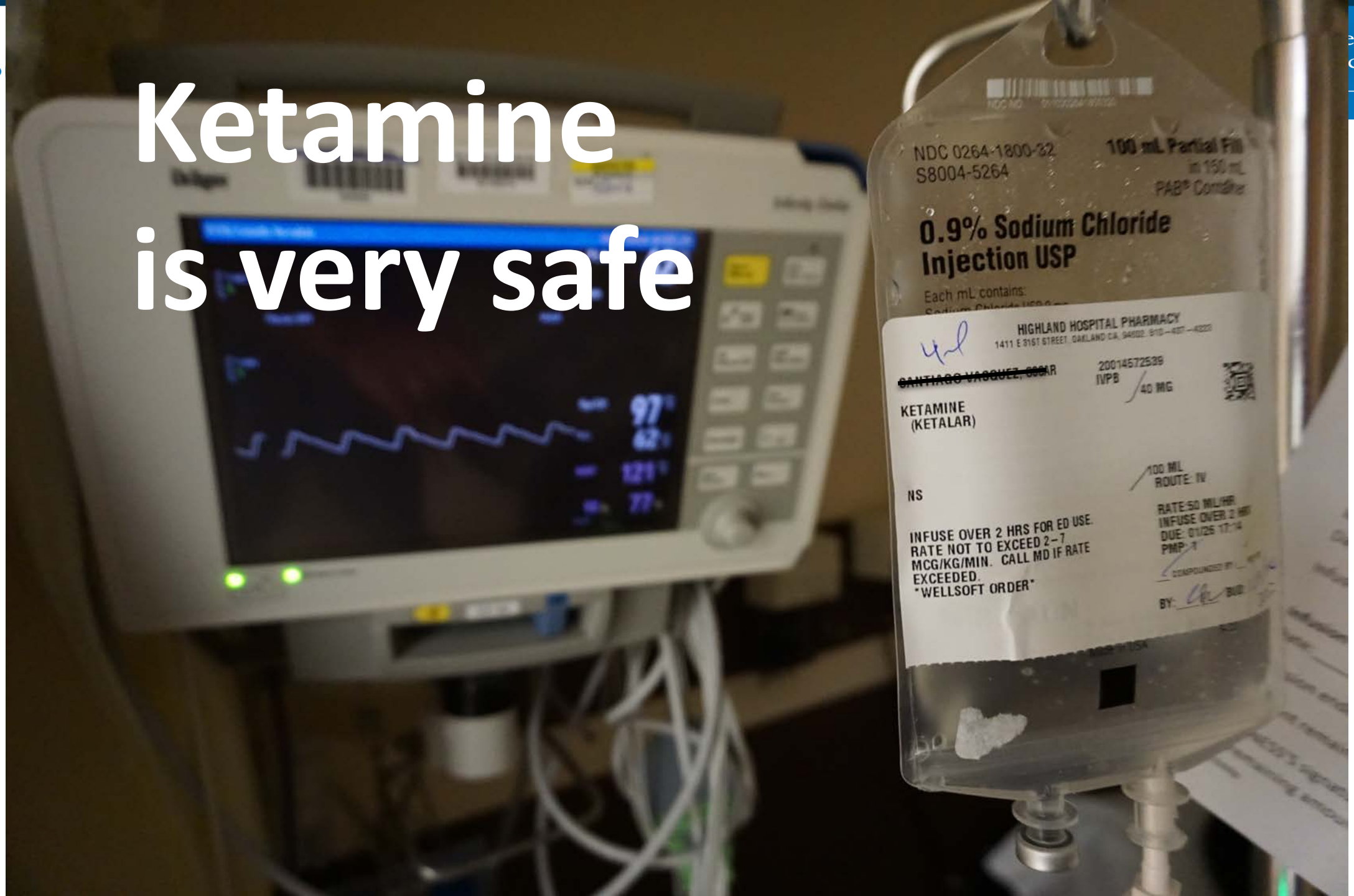
Glutamate

Nerves bringing pain signals from the body may respond to opioid stimulation by releasing more of the excitatory neurotransmitter glutamate in the spinal cord.

Glia

Opioids act on immune cells that release inflammatory molecules to boost pain signaling in nearby neurons.

Ketamine is very safe



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Original Contributions

The first 500: initial experience with widespread use of low-dose ketamine for acute pain management in the ED☆,☆☆,★,★★

Terence L. Ahern, MD [a,*], Andrew A. Herring, MD [a,b], Erik S. Anderson, MD [a], Virat A. Madia, MD [a], Jahan Fahimi, MD [a,b], Bradley W. Frazee, MD [a,b]

[a] Department of Emergency Medicine, Alameda Health System, Highland Hospital, Oakland CA
[b] Department of Emergency Medicine, University of California, San Francisco, San Francisco CA

Terence L. Ahern MD,* Andrew A. Herring MD,*,† Steve Miller MD.* and Bradley W. Frazee MD*,†

Methods. We prospectively administered 15 mg intravenous ketamine followed immediately by con-

Ketamine WORKS

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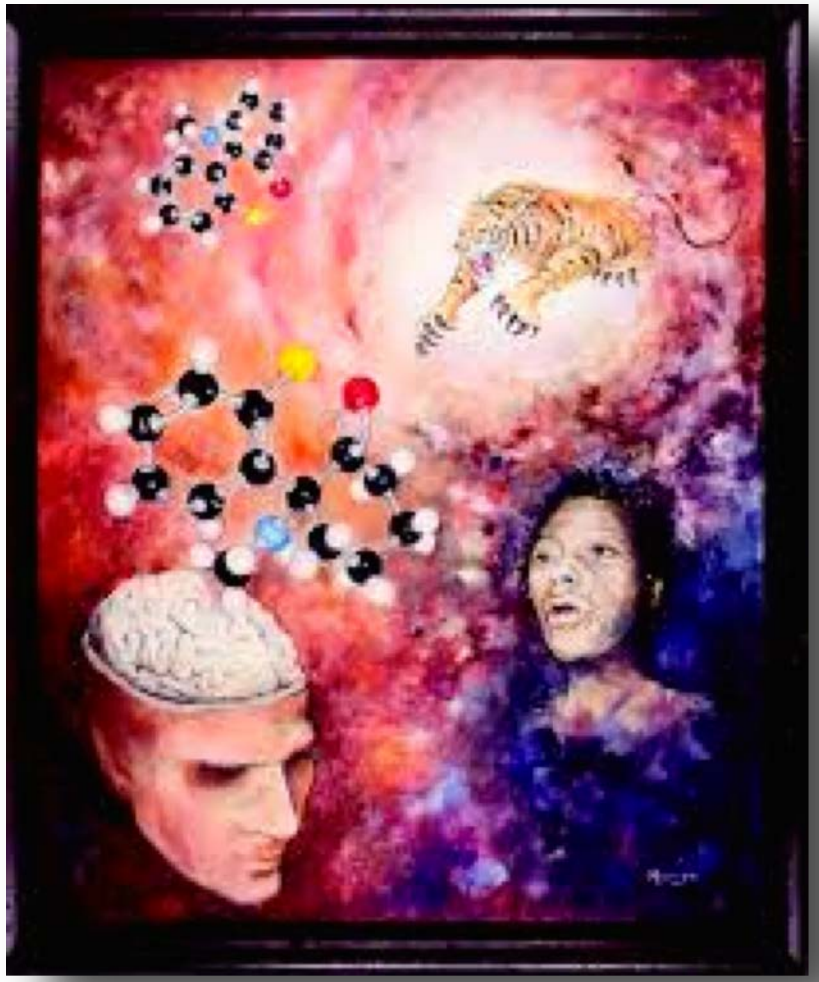
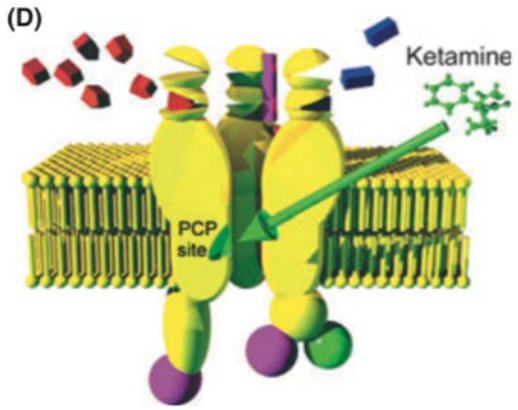
ALAMEDA HEALTH SYSTEM - HIGHLAND HOSPITAL



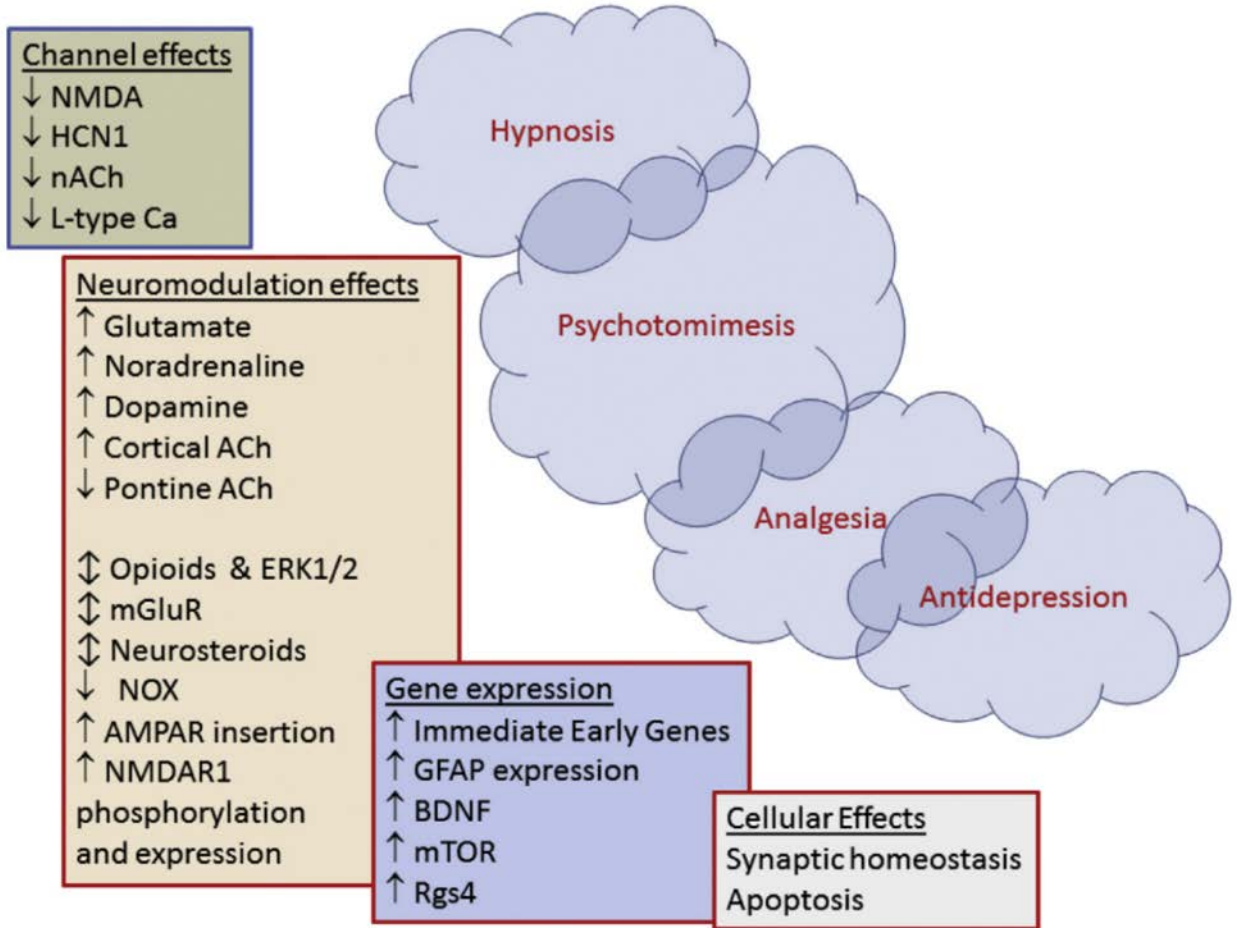
Ketamine can cause perceptual changes And hallucinations

NMDA receptor antagonist



- anti-nociceptive analgesic
- dissociative hypnotic
- cardiovascular stimulant
- neuropsychiatric stimulant

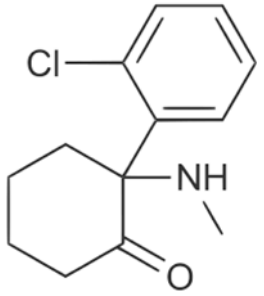
Complex dose dependent pharmacodynamics



Indications for ketamine

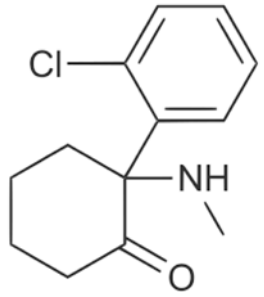
- Intractable pain
- opioid tolerant patients
- critically ill patients
- procedural pain

ketamine



- Safe & requires no special monitoring
- delivered as a bolus or infusion
- Oral, IN, IM IV routes of administration

Low-dose Ketamine analgesia



- *10-20mg IV slow bolus or over 10-20 minutes*

- *Infusion 20-30mg / hour (0.3mg/kg/hr)*

Regional anesthesia

Guidelines for Emergency Regional Anesthesia for Trauma Orthopedic Injuries

Block OK

- **Shoulder dislocation**
- **Clavicle fracture**
- **Proximal humerus fracture**
- **Low energy distal radius fracture**
- **Hand and digit injuries**
- **Hip fracture and dislocation**
- **Low energy foot and ankle fractures**

Contact orthopedic surgery as soon as possible for any patients to be admitted or patients who will require in ED consultation, but do not delay block placement.

Block after Consultation

- **Humeral shaft fracture**
- **Elbow fracture**
- **Both bone forearm fracture**
- **Femoral shaft fracture**

Perform and document detailed neurologic exam and consult with orthopedic service before block is placed.

No Block

High risk for compartment syndrome

- **Tibial fracture**
- **High emergency forearm fracture**
- **High Energy foot fracture**
- **Any injury with evidence of neurovascular injury or clinical concern for a possible compartment syndrome**

Perform block only after requested by Trauma and Orthopedic service attending.

Universal precautions

- Appropriate splinting, protection, icing of any injured extremity.
- Appropriate analgesic administration.
- Block placement should not delay other time sensitive interventions.
- Appropriate consideration of and patient discussion of the risks and benefits of any block.
- Documentation of consent.
- Thorough, detailed, and appropriately documented neurologic exam before block is performed.
- Thorough, detailed, and appropriately documented compartment exam before block is performed.
- Safe and sterile procedural technique appropriately documented including but not limited to: pre-procedure timeout with confirmation correct patient, indication, and side; appropriate patient monitoring; use of real-time ultrasound-guidance with avoidance of needle to nerve contact and vascular puncture; aspiration and small volume (3-5mL) injection of appropriately dosed local anesthetic.
- Presence of necessary resuscitation equipment and intralipid in case of local anesthetic toxicity reaction.
- Clear marking of blocked extremity and documentation of block details in the medical record.
- Verbal communication of block details with participating clinical teams prior to discharge or transfer from ED.
- Appropriate post block care of weakened or insensate extremity to prevent falls and limb injury.

2003 first use of battlefield regional anesthesia

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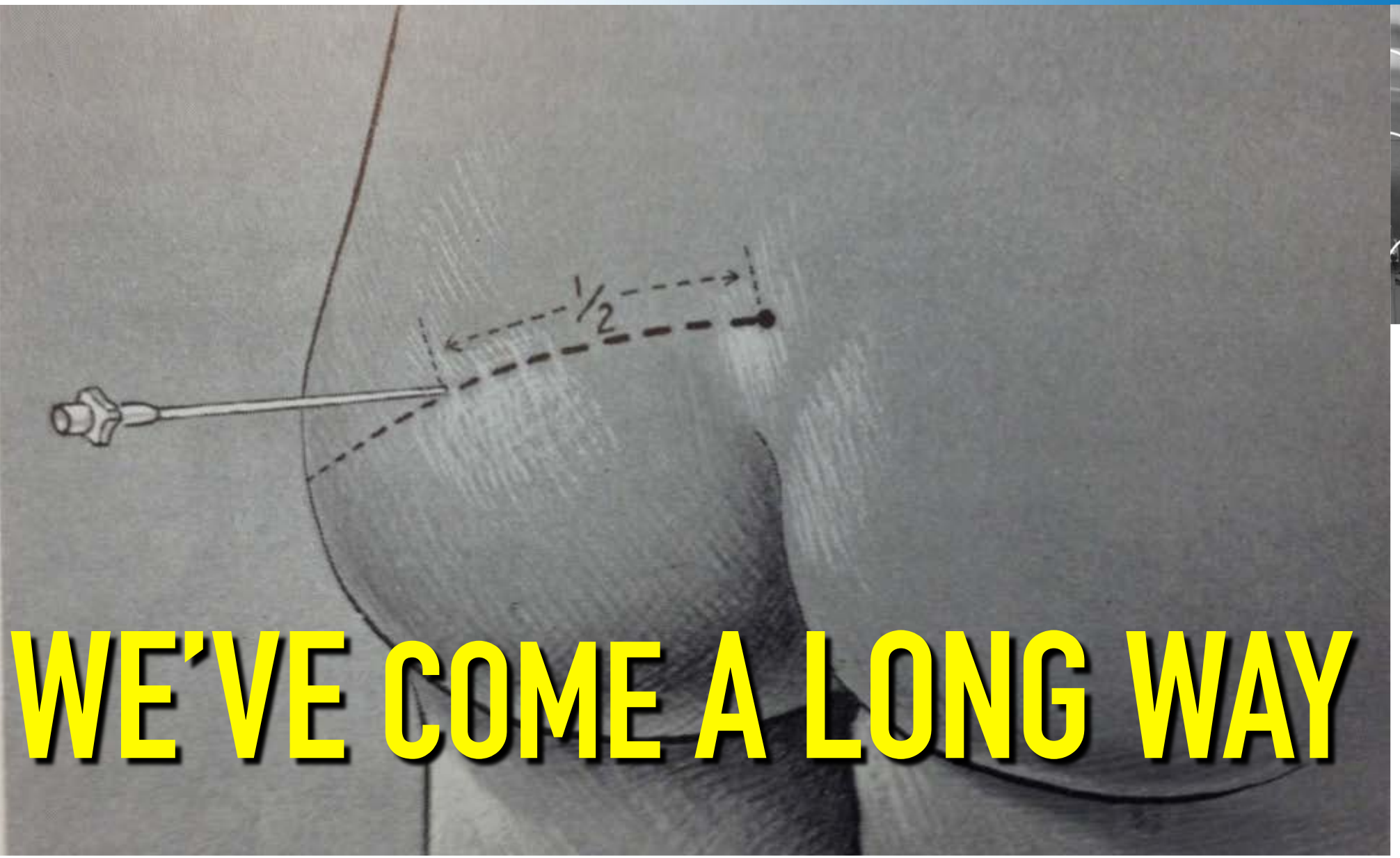

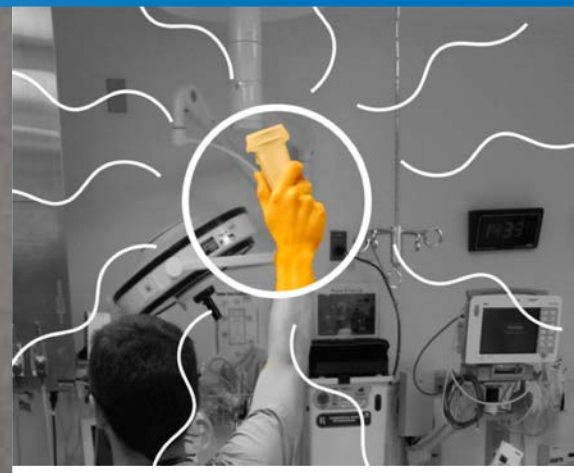

WE'VE COME A LONG WAY

ULTRASOUND GUIDED REGIONAL ANESTHESIA

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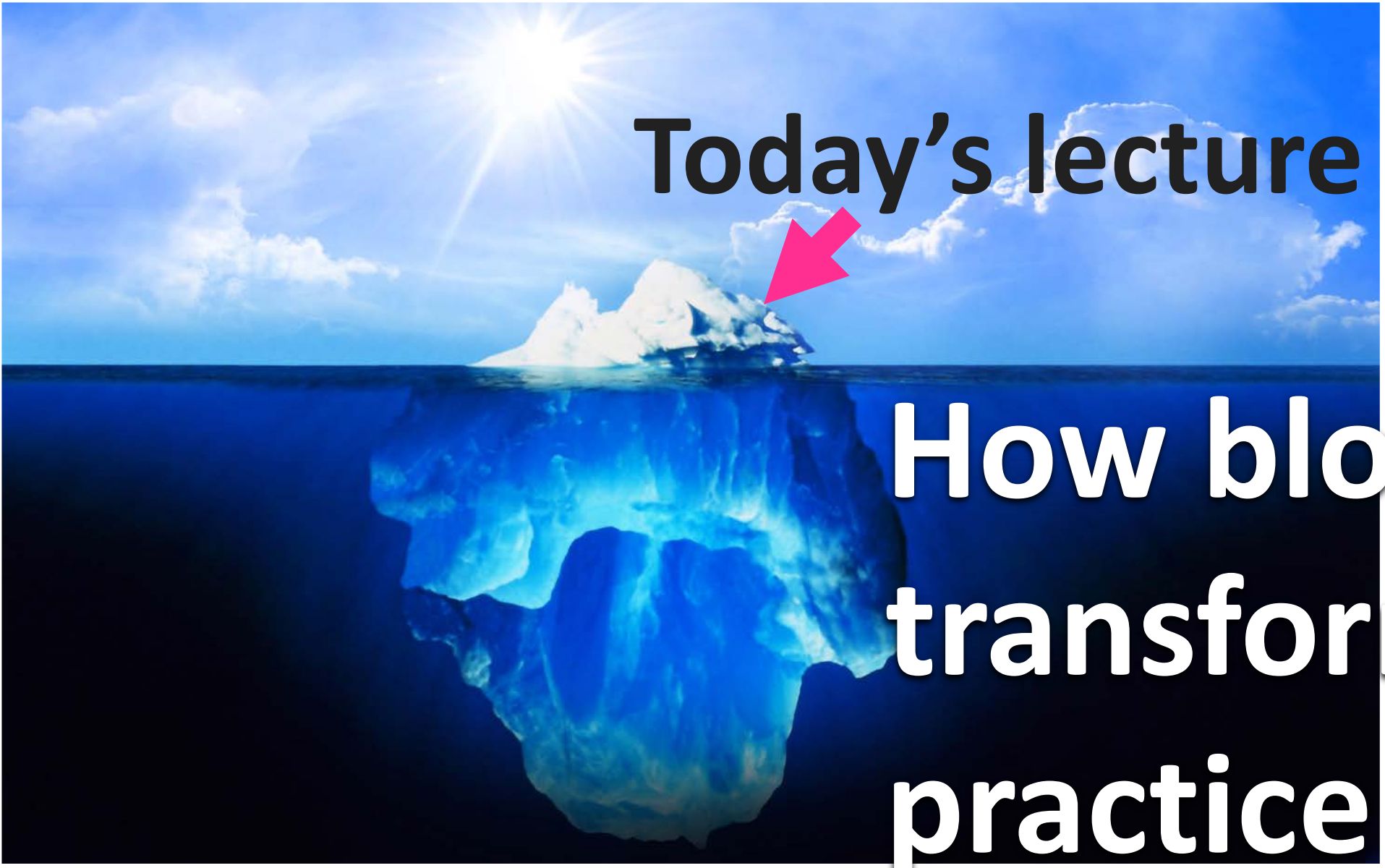
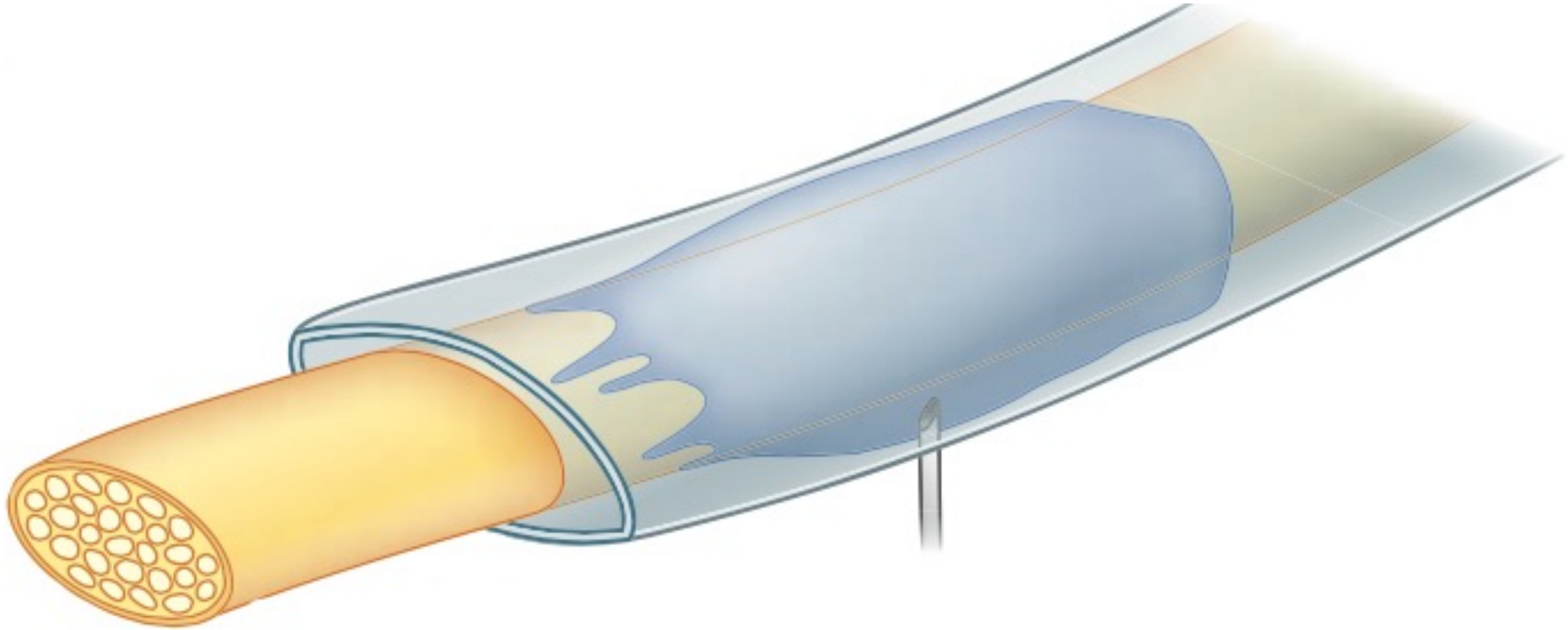


Today's lecture

How blocks can transform your practice



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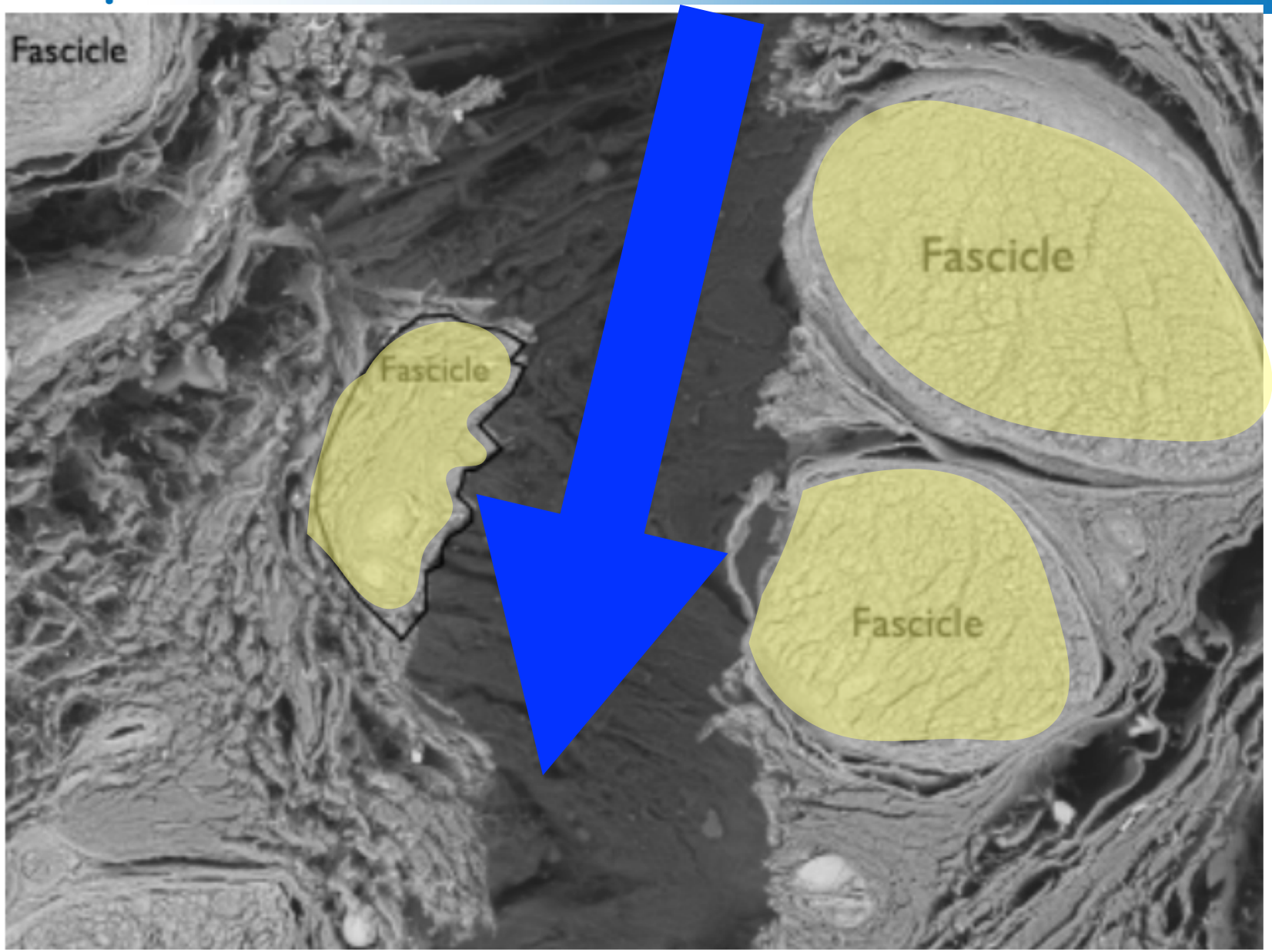
Fascicle
Fascicle
Fascicle
Fascicle


Become a needle jock
DOCTOR

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Work together

Block OK

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- Proximal humerus fracture
- Low energy distal radius fracture
- Hand and digit injuries
- Hip fracture and dislocation
- Low energy foot and ankle fractures

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- Humeral shaft fracture
- Elbow fracture
- Both bone forearm fracture
- Femoral shaft fracture

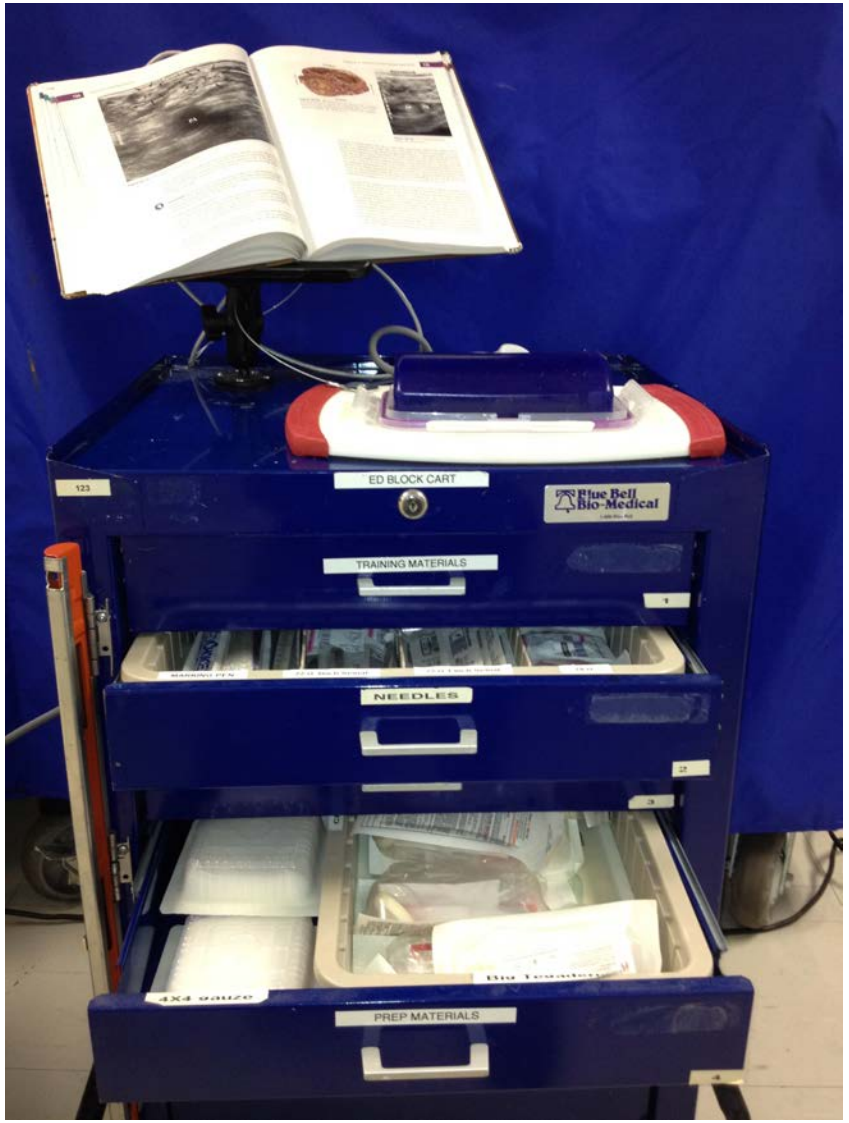
Perform and document detailed neurologic exam and consult with orthopedic service before block is placed.

No Block

High risk for compartment syndrome

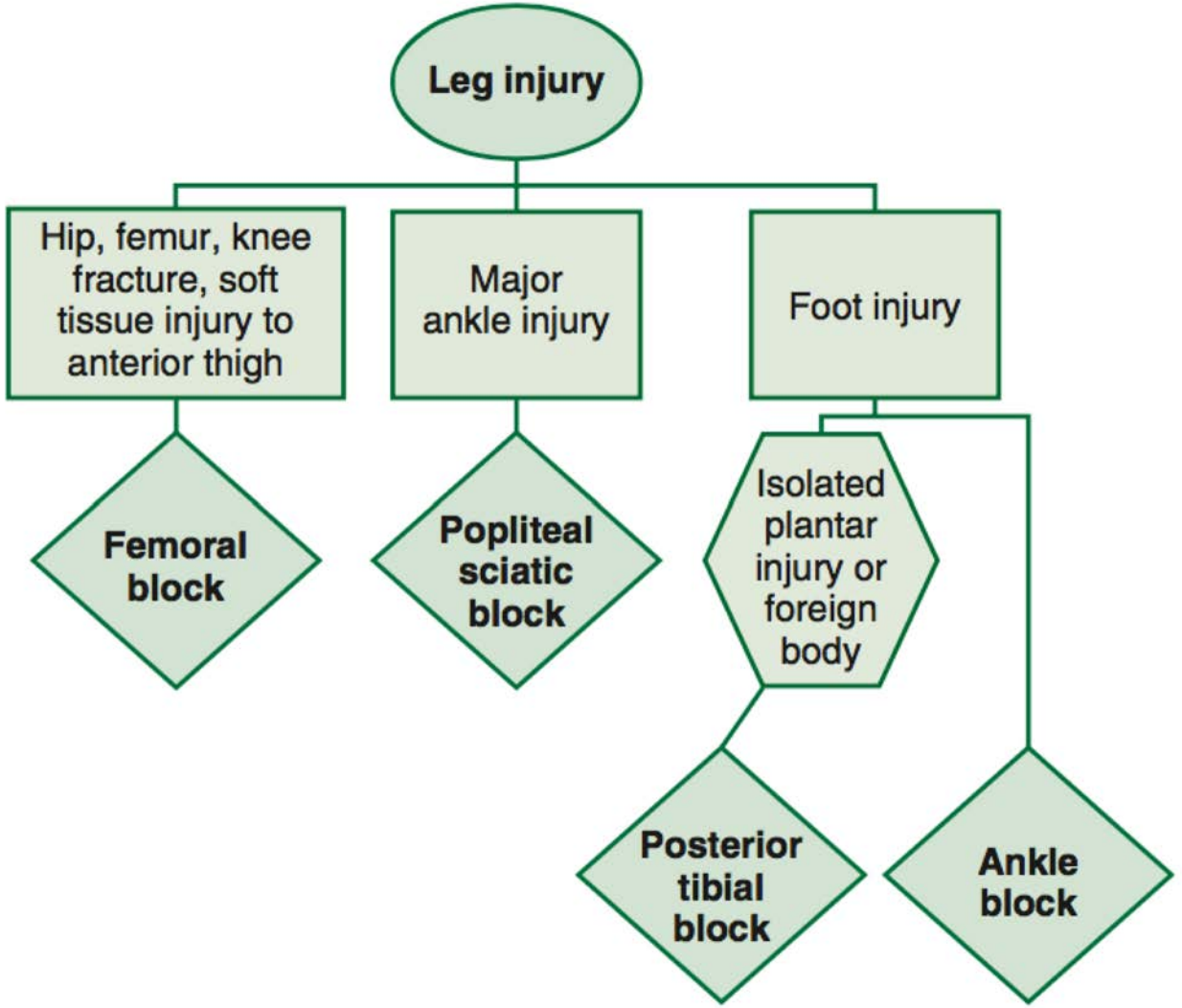
- Tibial fracture
- High emergency forearm fracture
- High Energy foot fracture
- Any injury with evidence of neurovascular injury or clinical concern for a possible compartment syndrome

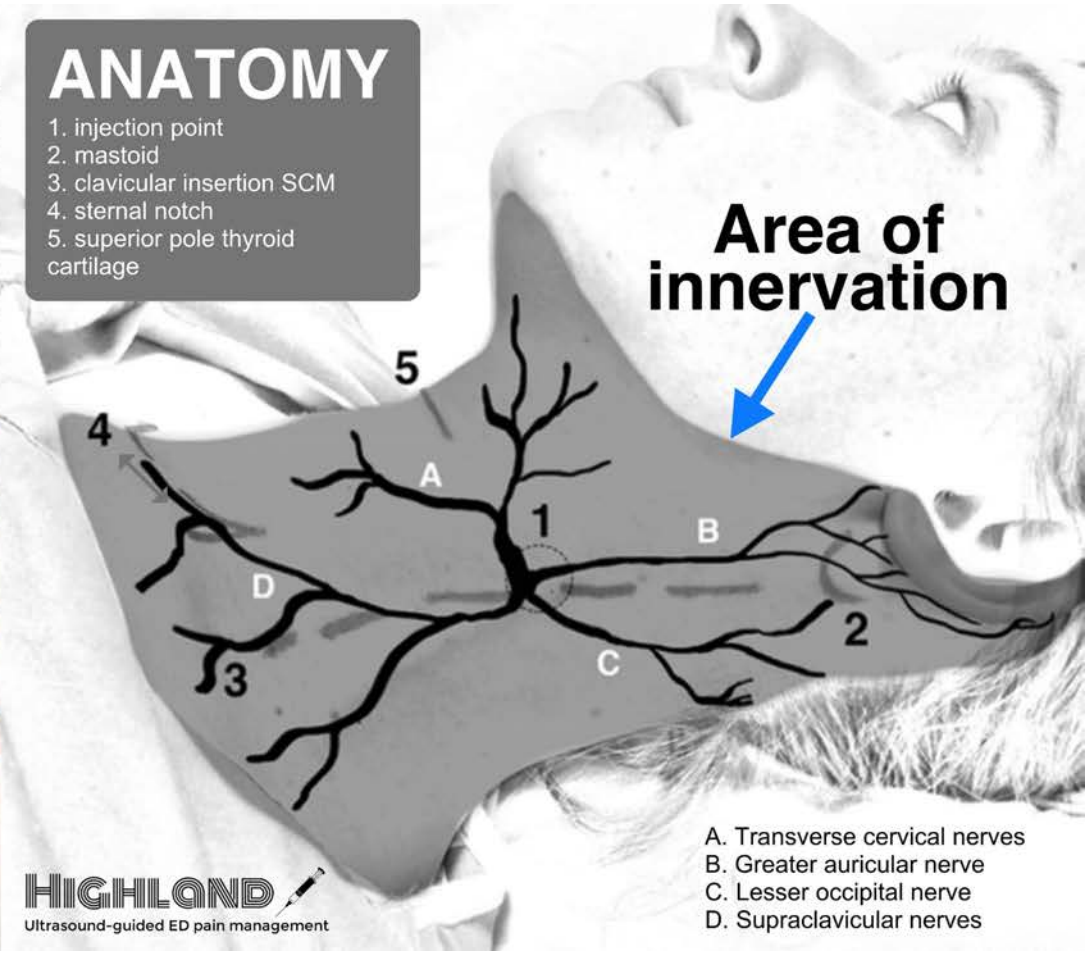
Perform block only after requested by Trauma and Orthopedic service attending.

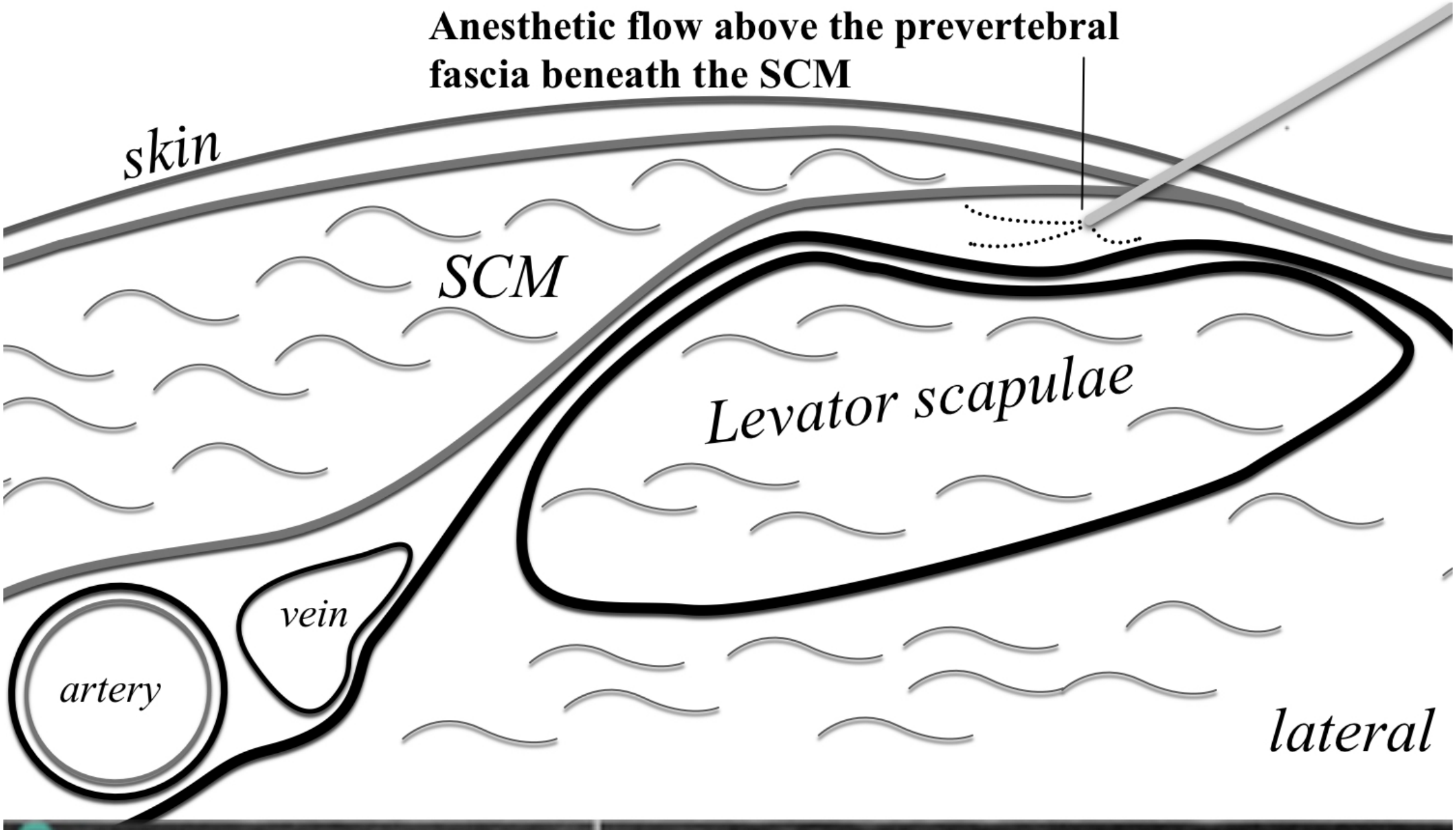

ED BLOCK CART
Blue Bell Bio-Medical
TRAINING MATERIALS
NEEDLES
PREP MATERIALS

GEAR UP

protocols

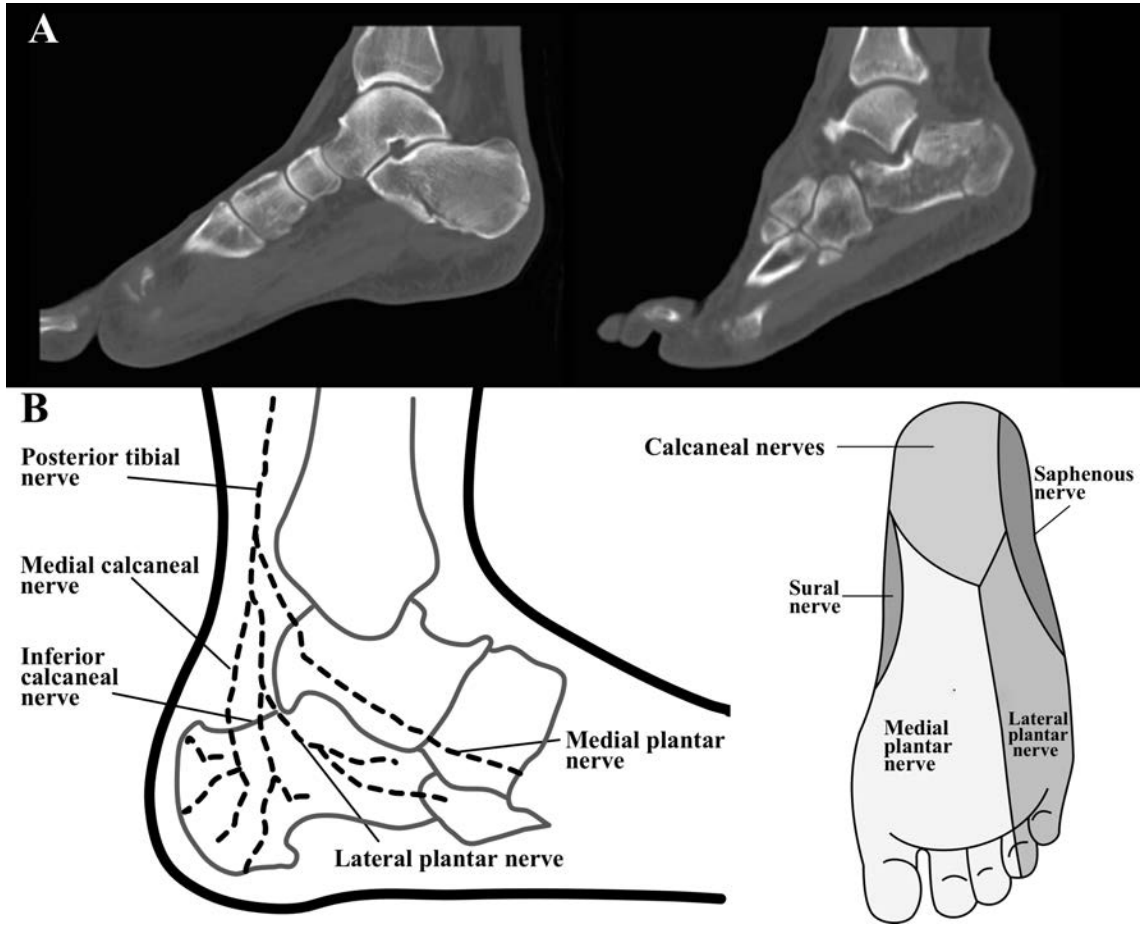

Leg injury
Hip, femur, knee fracture, soft tissue injury to anterior thigh
Major ankle injury
Foot injury
Femoral block
Popliteal sciatic block
Isolated plantar injury or foreign body
Posterior tibial block
Ankle block


ANATOMY
1. injection point
2. mastoid
3. clavicular insertion SCM
4. sternal notch
5. superior pole thyroid cartilage
Area of innervation
5
4
A
1
B
D
2
3
C
A. Transverse cervical nerves
B. Greater auricular nerve
C. Lesser occipital nerve
D. Supraclavicular nerves
HIGHLAND
Ultrasound-guided ED pain management


Anesthetic flow above the prevertebral fascia beneath the SCM
skin
SCM
Levator scapulae
vein
artery
lateral

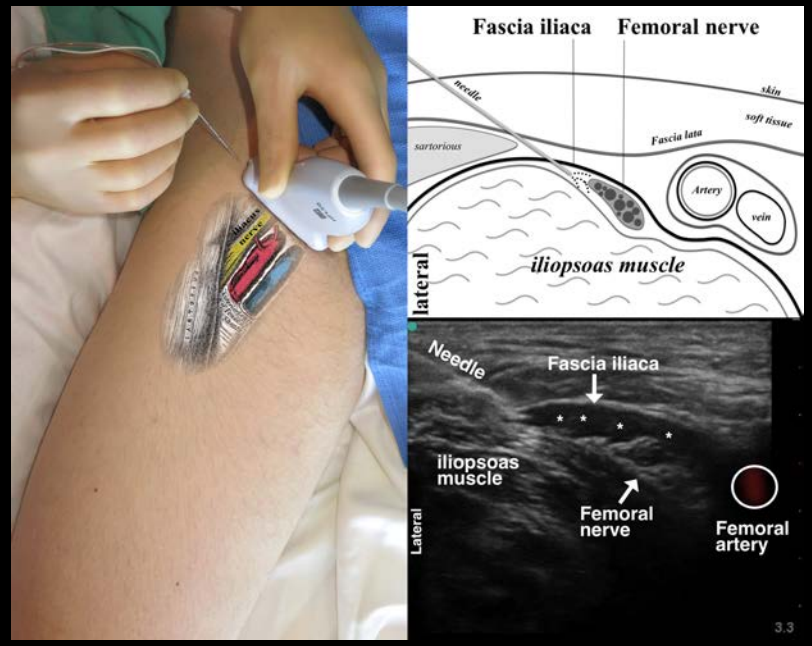
Forearm blocks

posterior tibial block



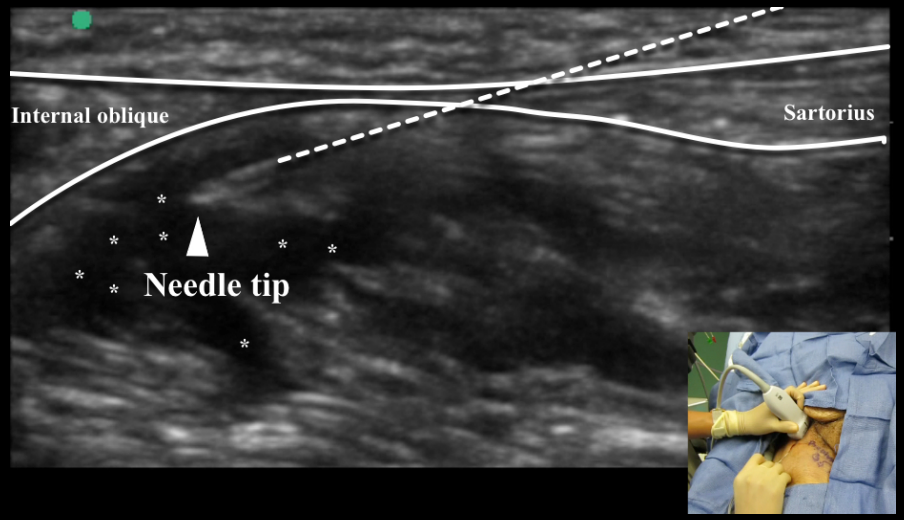
Fem block

Femoral Block
Selective block of the femoral nerve just adjacent to the femoral artery



3 in 1 Fascia Iliaca Block
Large volume block that positions the needle to encourage retrograde flow of local anesthetic towards the lumber plexus with resulting block of these nerves:

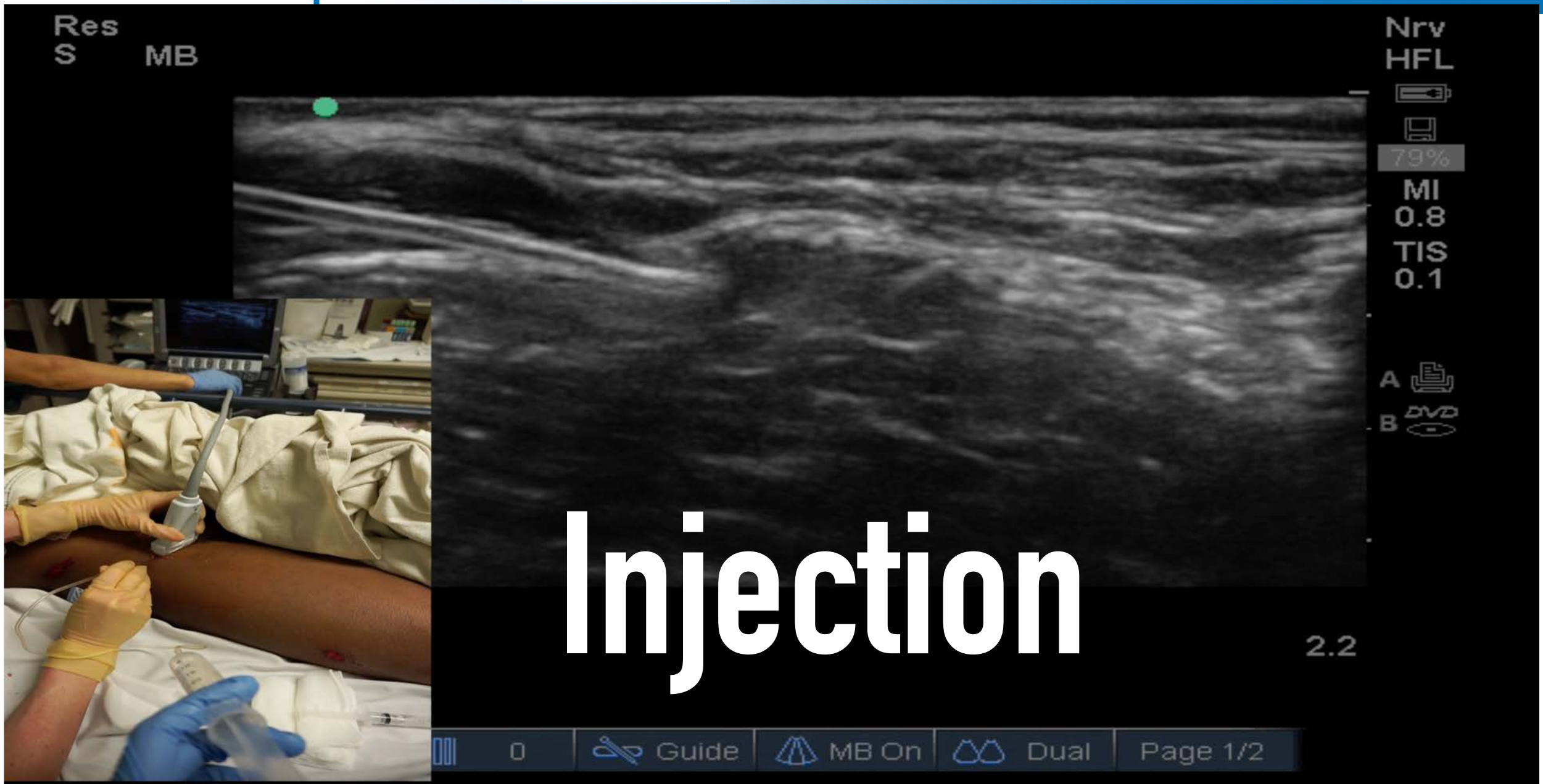
1. Femoral
2. Lateral femoral cutaneous
3. Obturator



E·QUAL EMERGENCY QUALITY NETWORK

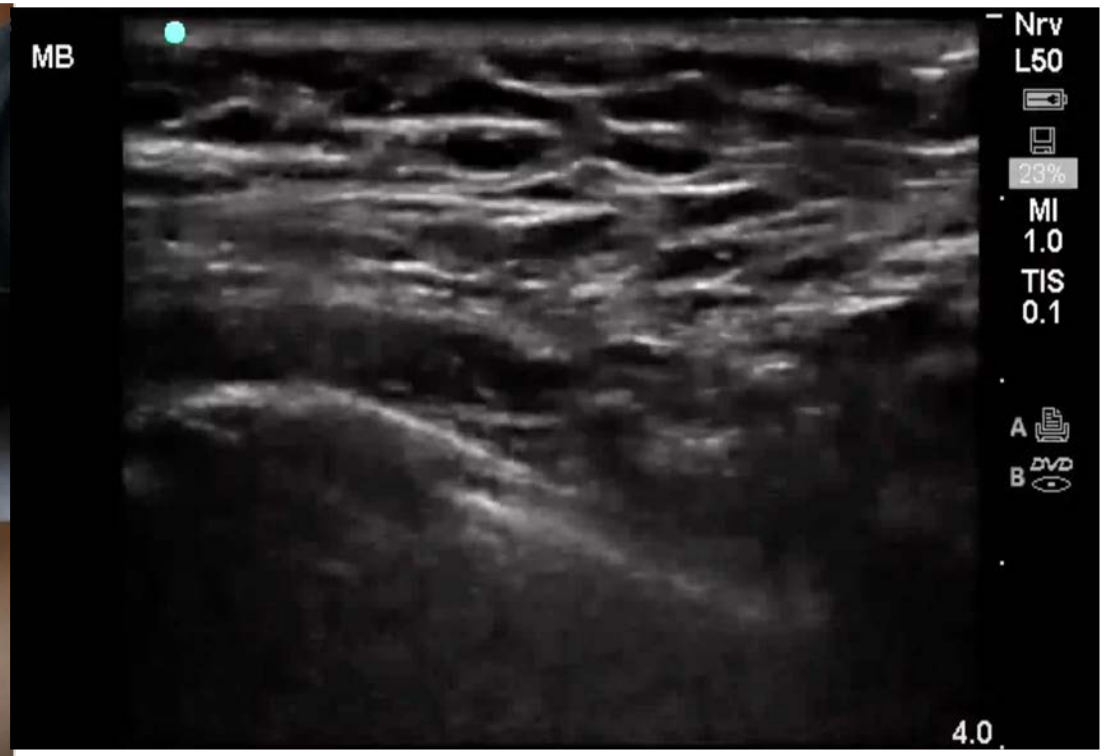
ADDICTION POLICY FORUM

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

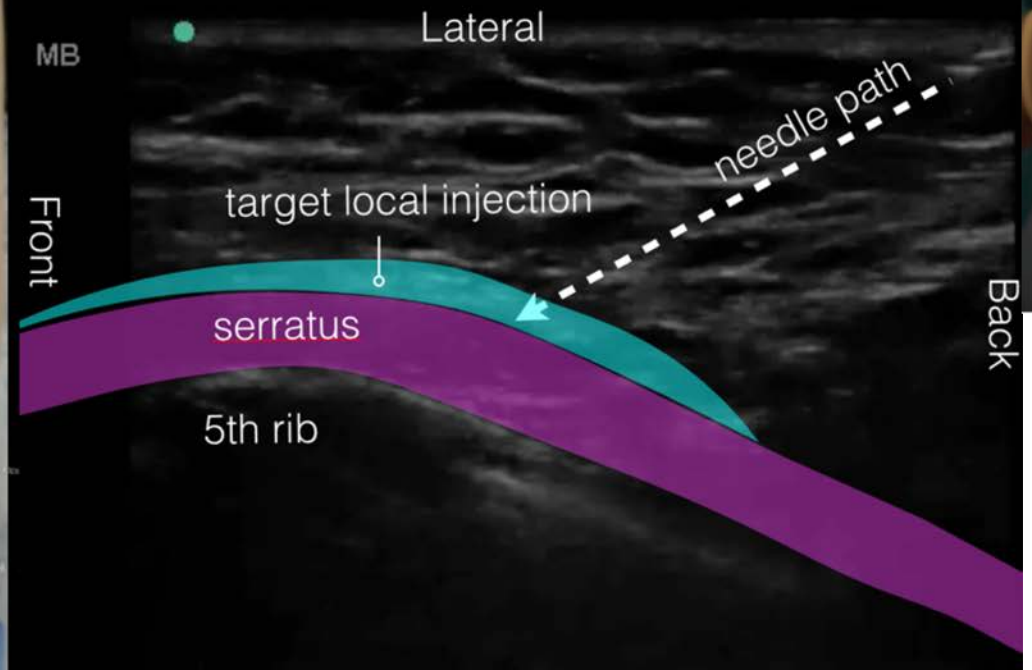


Injection

Serratus block



1. Find T4–5 mid-axillary line
2. Image ribs and pleura
3. Image serratus
4. Inject over serratus



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