

## **Developing an Anesthesia and Analgesia Protocol for Total Knee Arthroplasty**

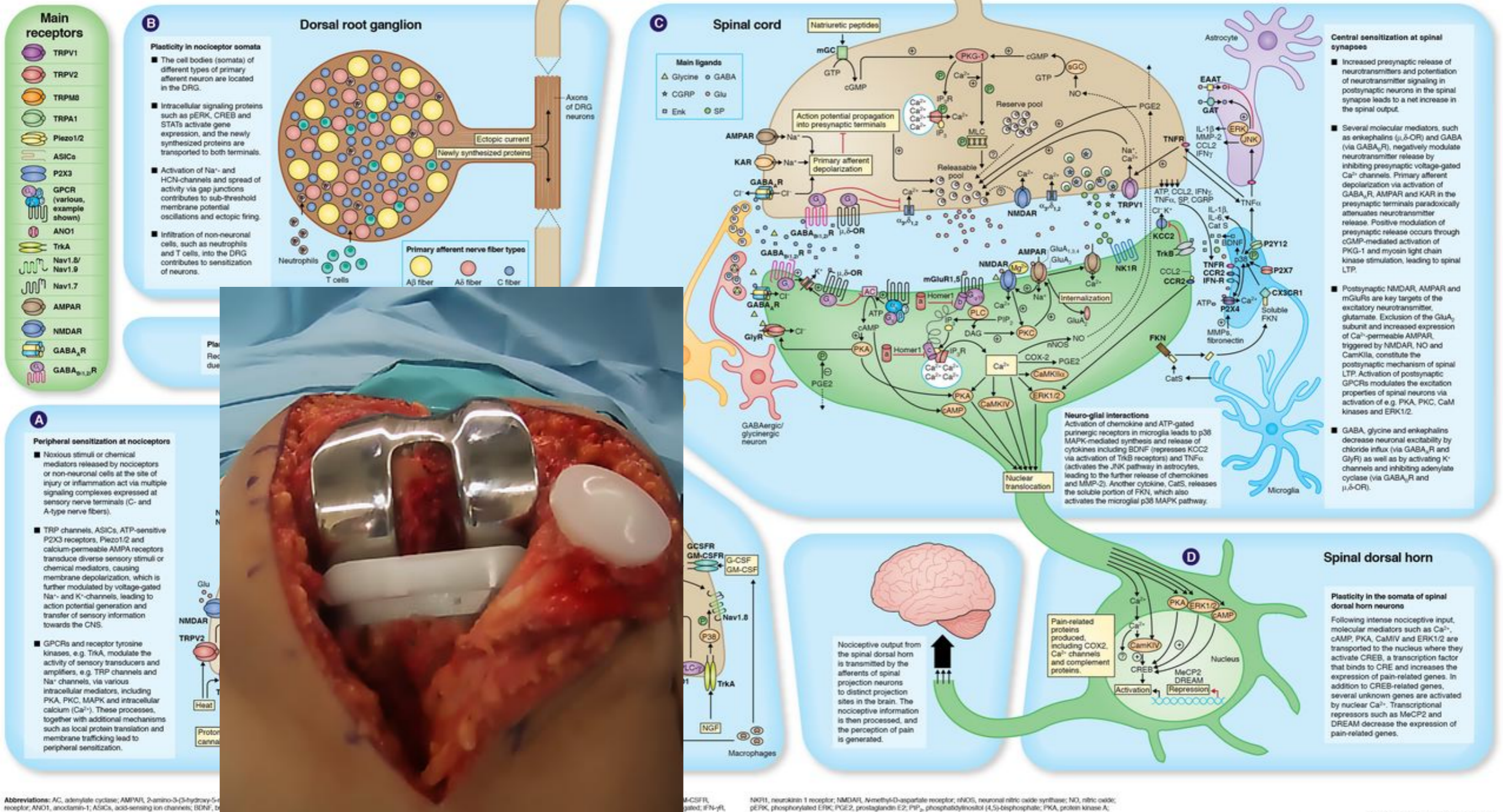
Shane Garner, CRNA

# Disclosures

- None

# Pain hypersensitivity mechanisms at a glance

Vijayan Gangadharan and Rohini Kuner



# Chronic Pain After TKA

700,000 TKA surgeries in the USA annually

- 3.48 million estimated by 2030

***Chronic post-surgical pain (CPSP) is real (15%)***

- Risk factors:
  - Female
  - Severity of preop pain
  - ***Inadequate management of postop pain***
  - ***Catastrophizing pre and postop***

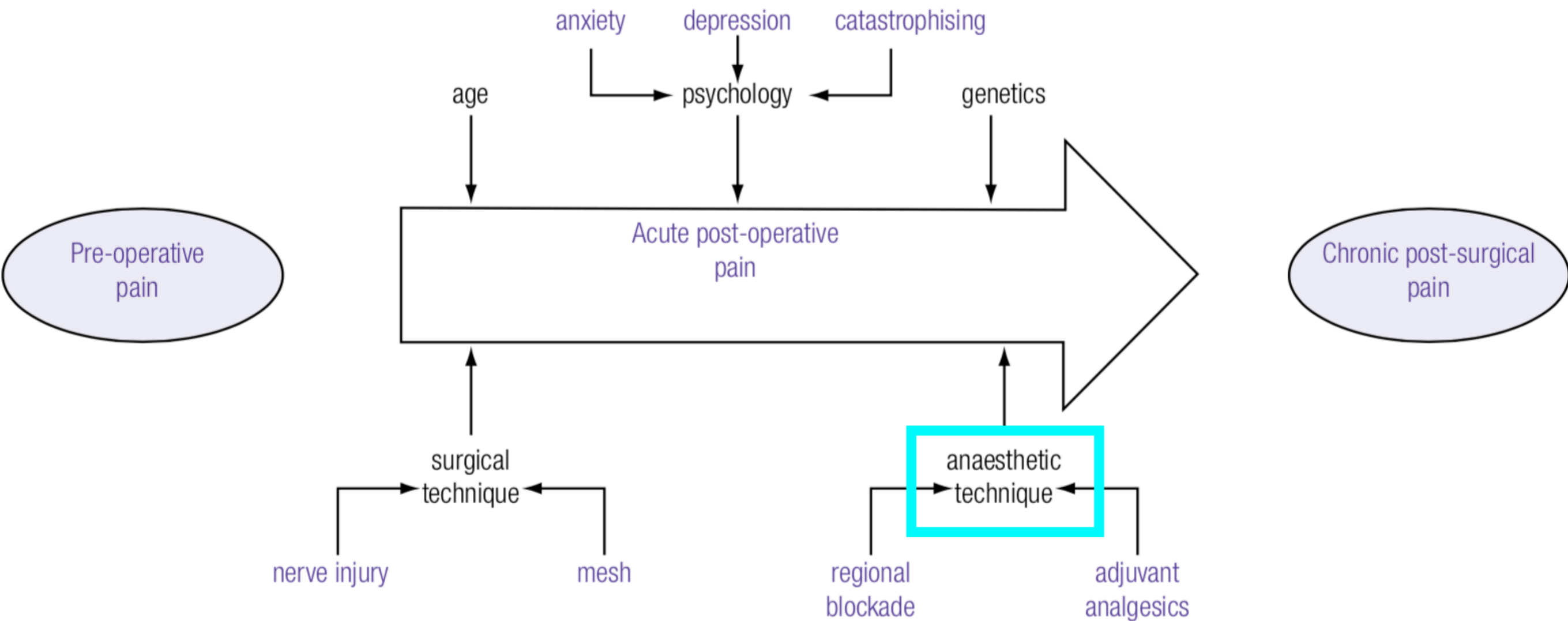
***Acute post-surgical pain is a risk factor for CPSP***

Wylde V, et al. PAIN 2011;252(3):566-572

Gunaratne R, et al. J Arthroplasty 2017;32(12):3854-3860

Buvanendran A, et al. Reg Anesth Pain Med 2019;44:287-296

# Investigated factors thought to be involved in the development of chronic post-surgical pain



# Postoperative pain treatment after total knee arthroplasty: A systematic review

Anders Peder Højer Karlsen<sup>1,2\*</sup>, Mik Wetterslev<sup>3</sup>, Signe Elisa Hansen<sup>4</sup>, Morten Sejer Hansen<sup>5</sup>, Ole Mathiesen<sup>2</sup>, Jørgen B. Dahl<sup>1</sup>

**1** Department of Anaesthesia, Bispebjerg and Frederiksberg Hospital, Copenhagen, Denmark, **2** Department of Anaesthesia, Zealand University Hospital, Koege, Denmark, **3** Department of Anaesthesia, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark, **4** Department of Anaesthesia, Slagelse Hospital, Slagelse, Denmark, **5** Department of Anaesthesia, 4231, Centre of head and Orthopaedics, Rigshospitalet, Copenhagen, Denmark

## 113 trials

## 37 different analgesic interventions

## No gold standard treatment



# Clinical Pathways

- Improve quality of care
- Minimize unnecessary variations in care
- Reduce cost through streamlining



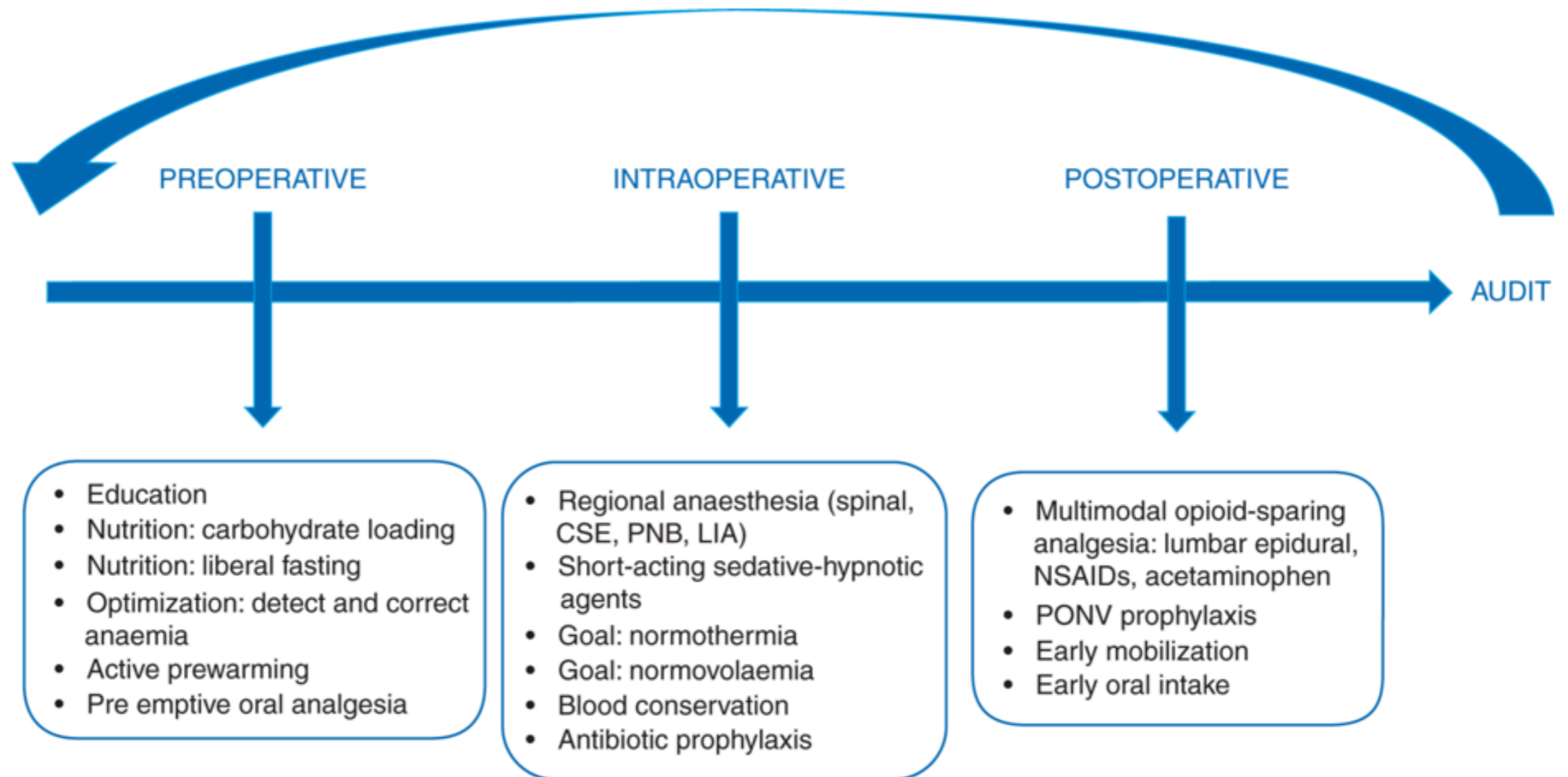
## Standard operation procedures

Developed by airlines for:

- Normal, abnormal, and emergency operations
- ***Designed to ensure aircraft are operated in the most safe, most efficient, most on-time manner***

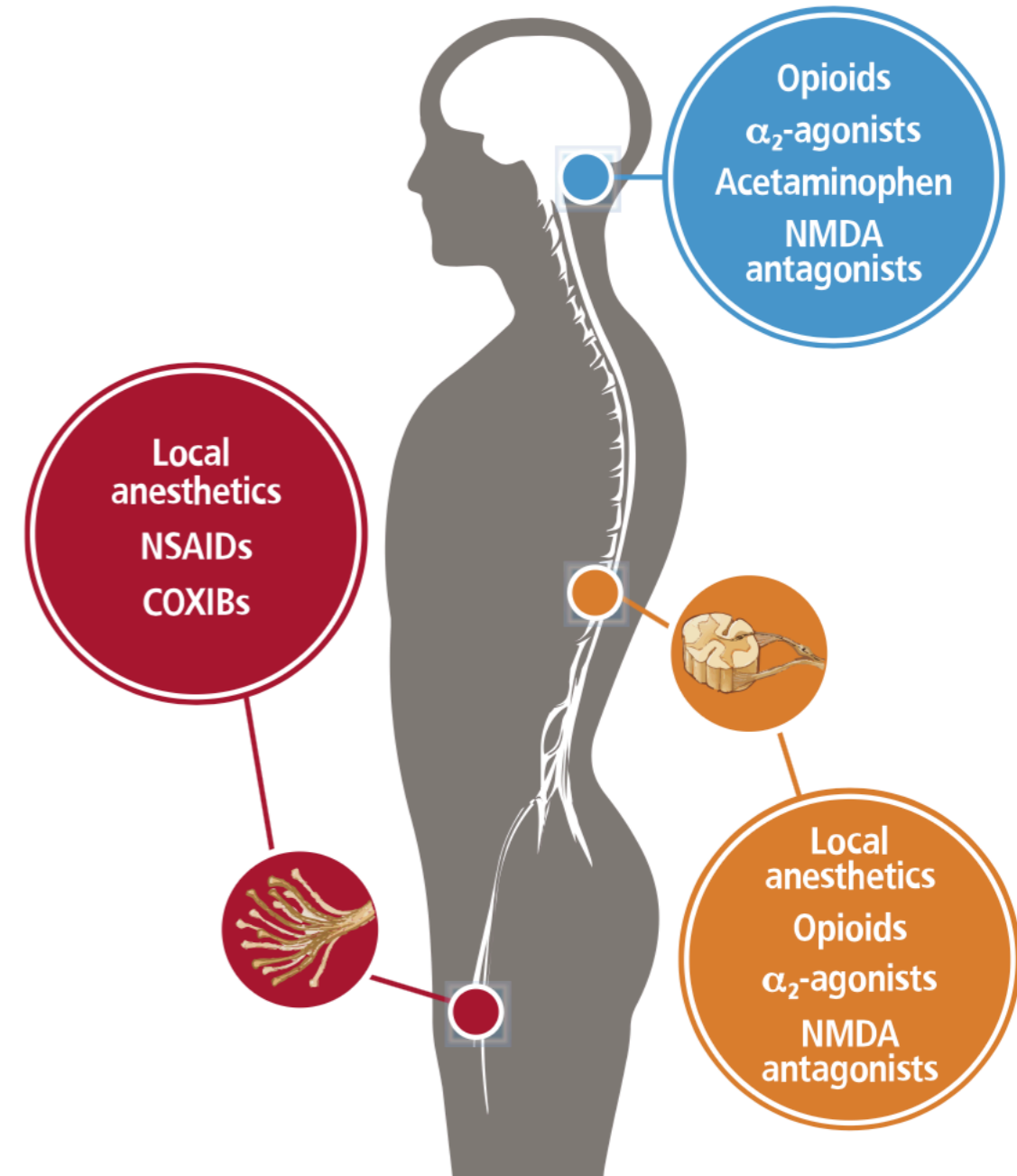


# ERAS



# Multimodal Analgesia

- Superior pain control
- Reduced opioids
- Better patient outcomes
- Shortened hospital stay
- Decreased healthcare costs
- Improved rehabilitation
- Increased patient satisfaction
- ***Potentially decrease chronic post-surgical pain***

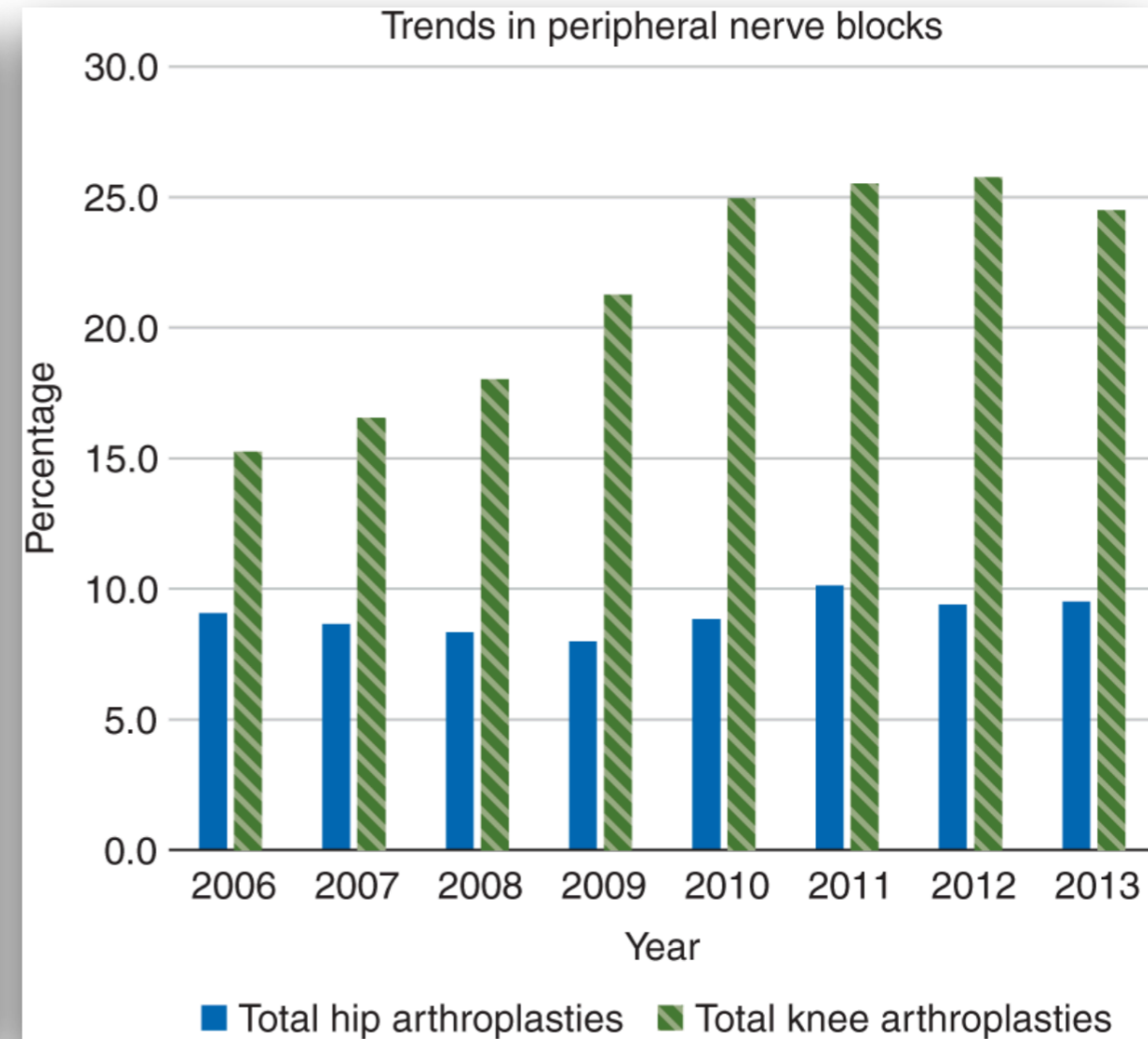
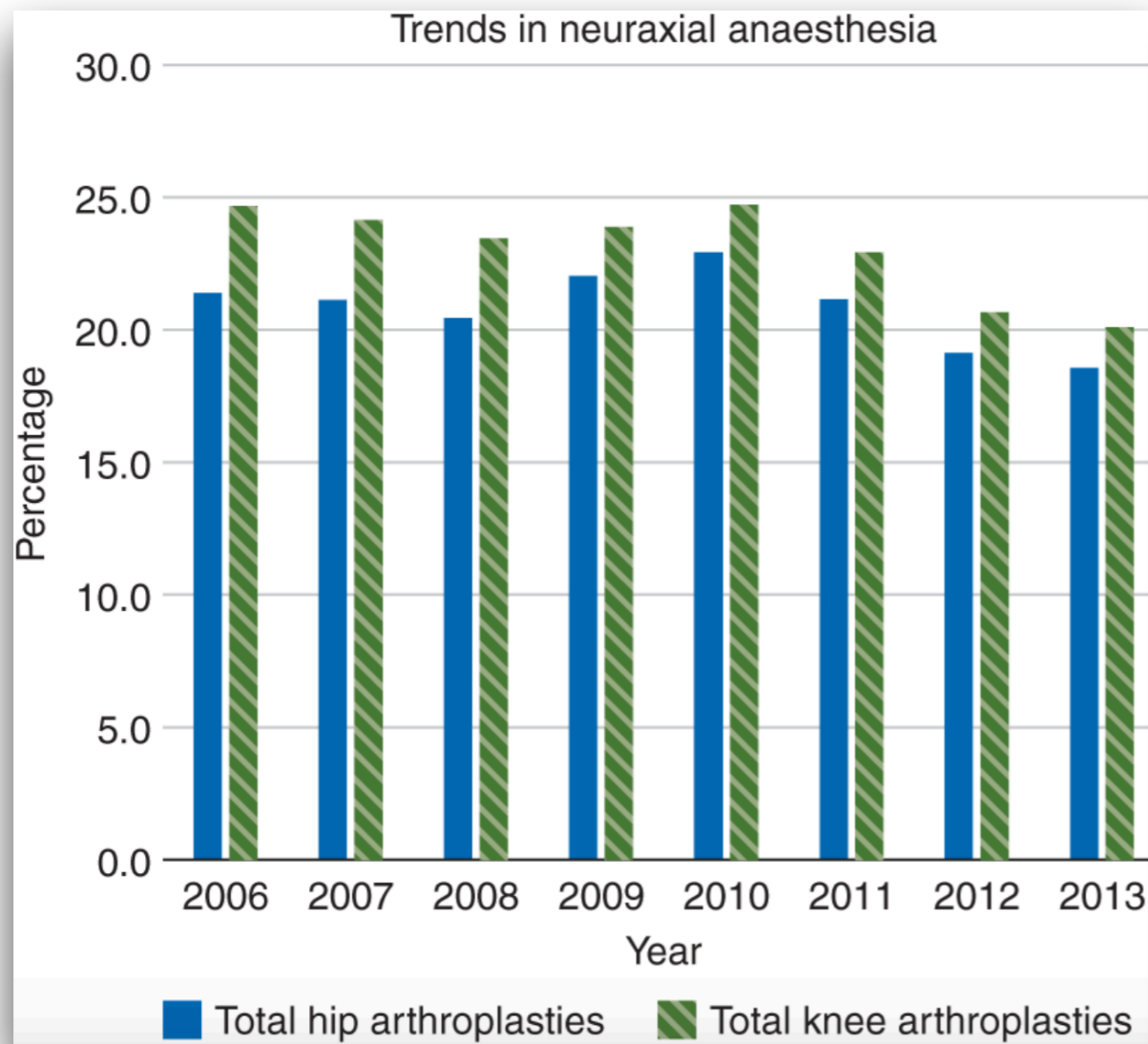


# Resistance to RA

- Time pressure
- Lack of equipment
- Lack of trained personnel
- Complications
- Surgeon LIA



# Trends in RA



## Perioperative Comparative Effectiveness of Anesthetic Technique in Orthopedic Patients

Stavros G. Memtsoudis, M.D., Ph.D., F.C.C.P.,\* Xuming Sun, M.S.,† Ya-Lin Chiu, M.S.,†  
Ottokar Stundner, M.D.,‡ Spencer S. Liu, M.D.,§ Samprit Banerjee, Ph.D., M.Stat.,||  
Madhu Mazumdar, Ph.D., M.A., M.S.,# Nigel E. Sharrock, M.B., Ch.B.§

- 382,236 patients undergoing primary TJA
- 11% NA, 14% NA/GA, 75% GA
- NA/NA-GA: reduced 30 d mortality and in-hospital complications

Anesthesiology 2013;118:1046-1058

## No Difference in 30-Day Major Complications between General Anesthesia and Neuraxial Anesthesia

Found in multicenter retrospective cohort study of outpatient total joint arthroplasty patients



### General anesthesia group:

Discharged from recovery room faster

More likely **NOT** to achieve same-day discharge status

**2.3%** of the 1,520 general anesthesia patients experienced major complications at 30 days



### Neuraxial group:

Less pain and less nausea and vomiting in postoperative period

More likely to achieve same-day discharge status

**1.8%** of the 10,003 neuraxial anesthesia patients experienced major complications at 30 days

aOR 0.85, 95% CI: 0.56-1.27, p=0.39

Primary outcome of 30-day major complications: mortality, myocardial infarction, deep vein thrombosis, pulmonary embolism, stroke, acute renal failure

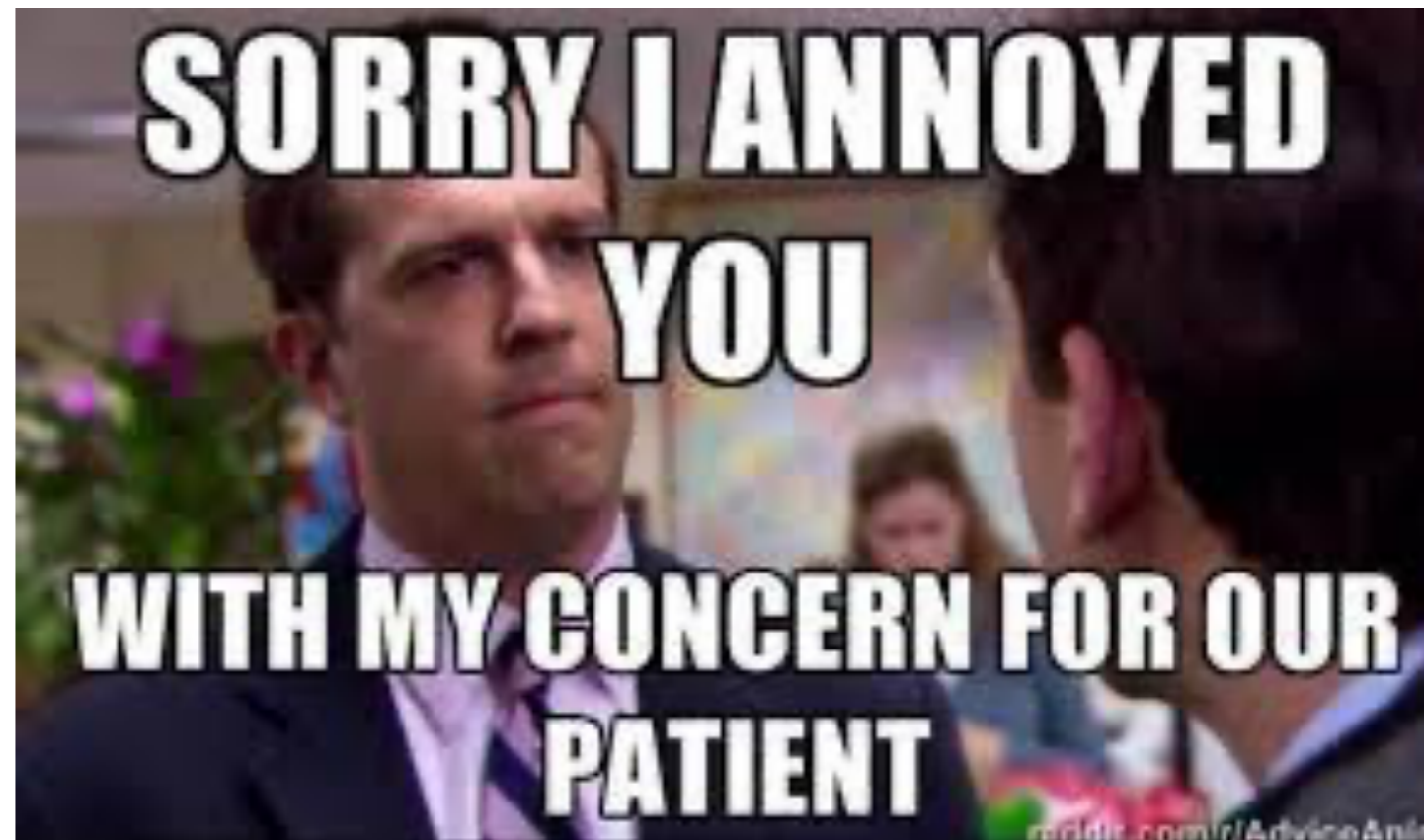
Yap EN, Wei J, Webb C, Ng K, Behrends M. Neuraxial and General Anesthesia for Outpatient Total Joint Arthroplasty Results in Similarly Low Rates of Major Perioperative Complications: A Multicentered Cohort Study. Reg Anesth Pain Med 2022; DOI: 10.1136/rapm-2021-103189 Graphic by Jim Snively.

Regional Anesthesia & Pain Medicine

Yap E, et al. Reg Anesth Pain Med 2022;47:294-300

# Creating a Culture

- **Surgeon “buy-in”**
- Education
- Marketing
- Anesthesia value



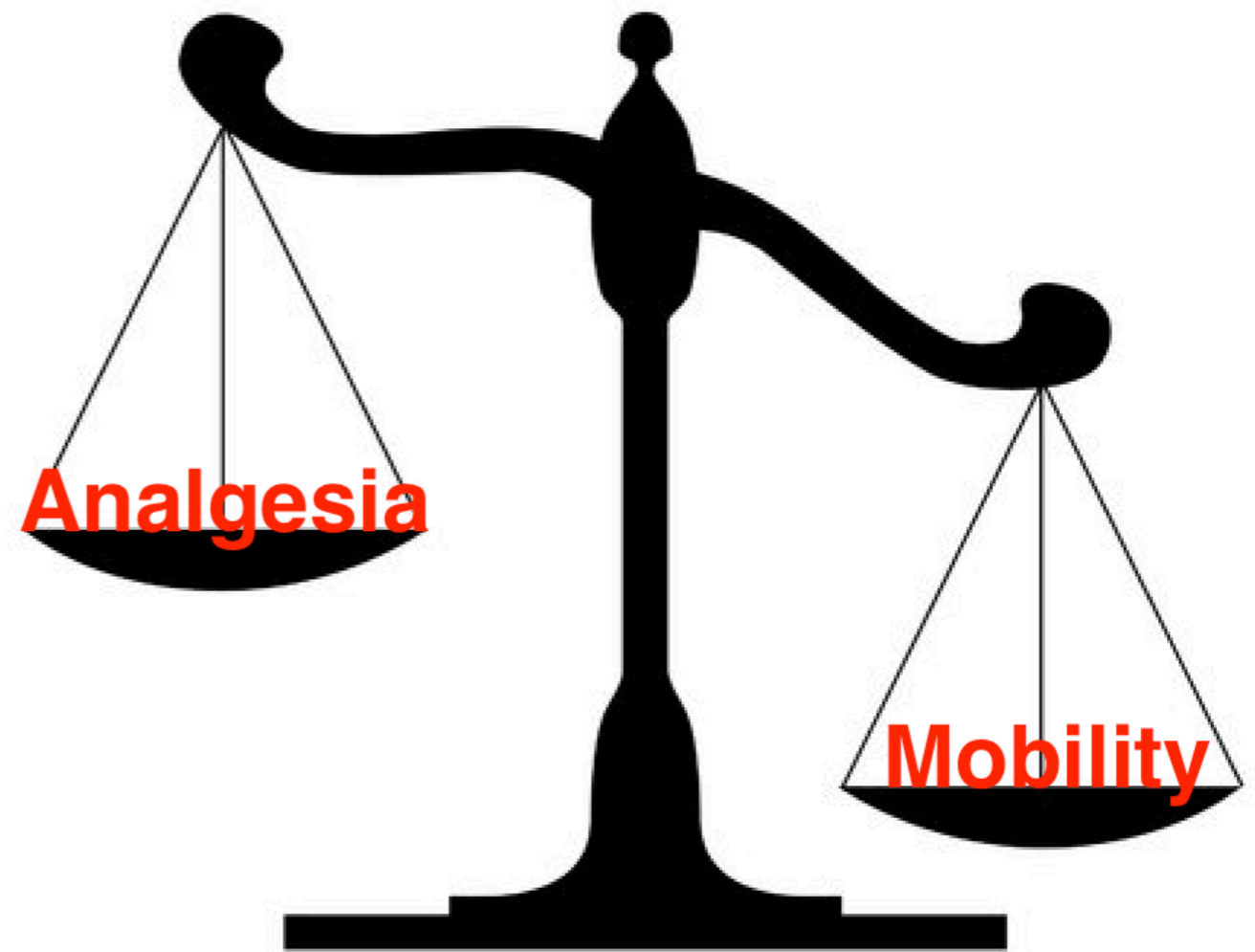
# Preop Visit “Boot Camp”



- Anesthetic evaluation/optimization
- Discuss anesthesia and pain management
- Expectations before, during, and after surgery
- Meet with physical therapy and social worker
- Set realistic expectations/goals

# The Knee is Complicated

- **Femoral**
- **Obturator**
- **Sciatic**





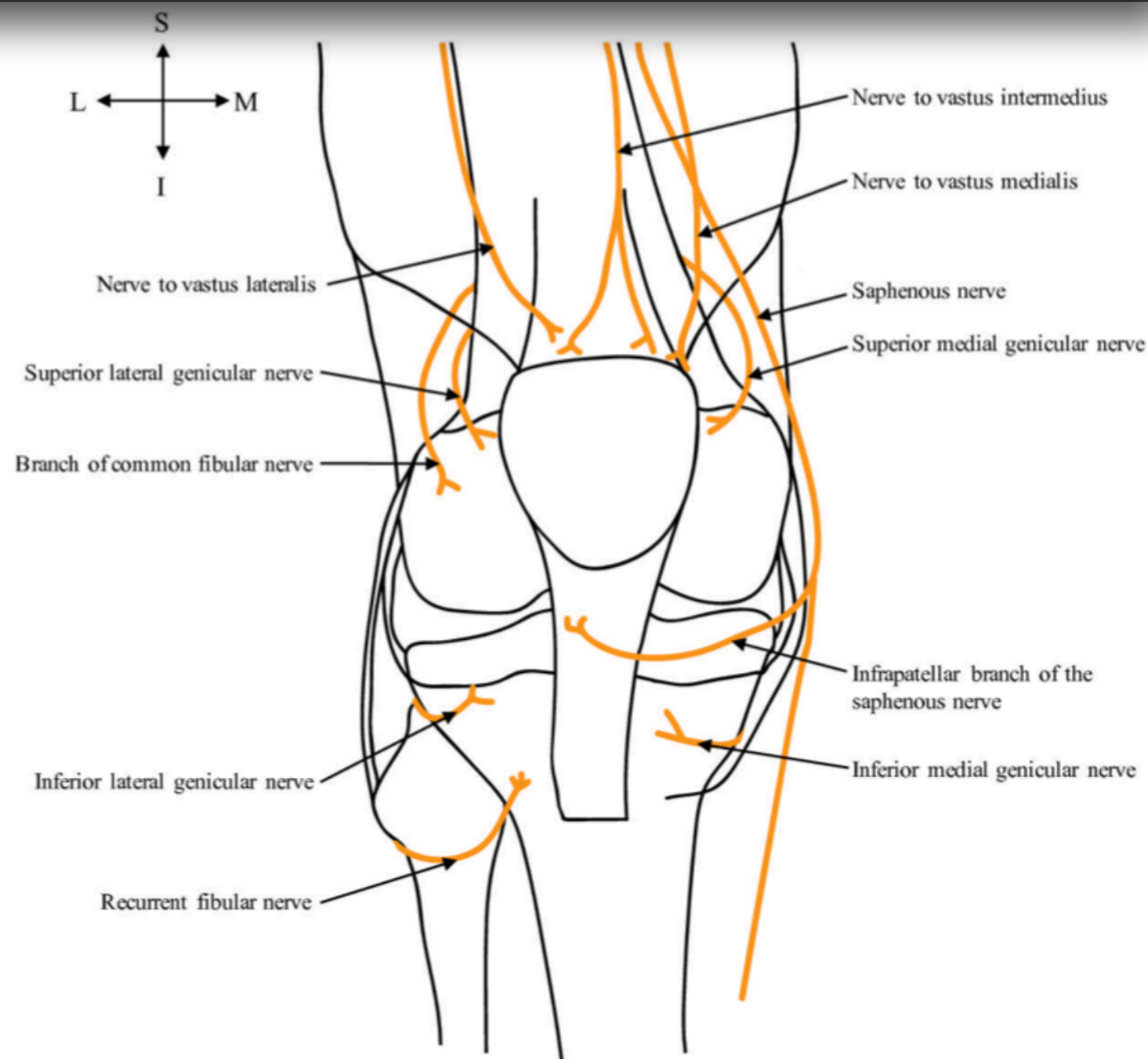
## Knee Compartment

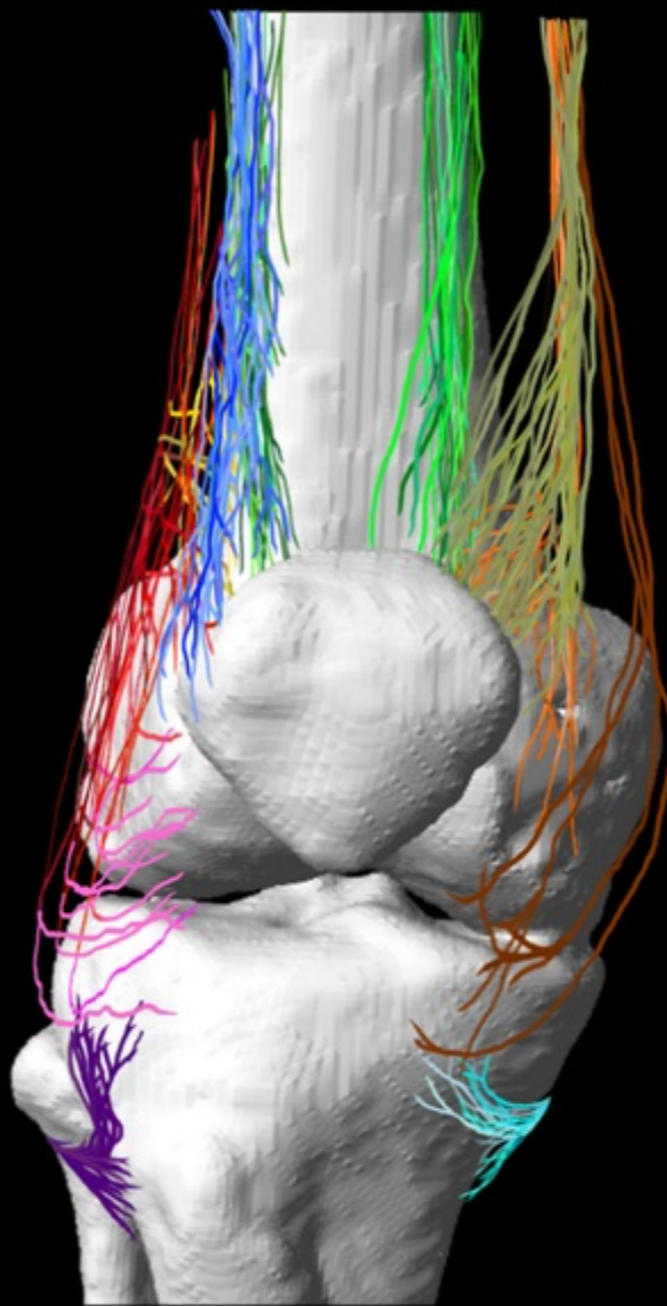
### Medial Aspect

### Lateral Aspect

Nerve origin	Femoral	Obturator	Sciatic
	<ul style="list-style-type: none"> <li>• Infrapatellar branch of the saphenous nerve</li> <li>• Nerve to the vastus medialis muscle</li> </ul>	<ul style="list-style-type: none"> <li>• Anterior branch of the obturator nerve</li> </ul>	
			<ul style="list-style-type: none"> <li>• Nerve to the vastus lateralis muscle</li> <li>• Nerve to the vastus intermedialis muscle</li> </ul>
			<ul style="list-style-type: none"> <li>• Recurrent peroneal nerve</li> <li>• Lateral retinacular nerve</li> </ul>

**Posterior Aspect:** genicular branches of the TN and branches from the posterior branch of the ON.













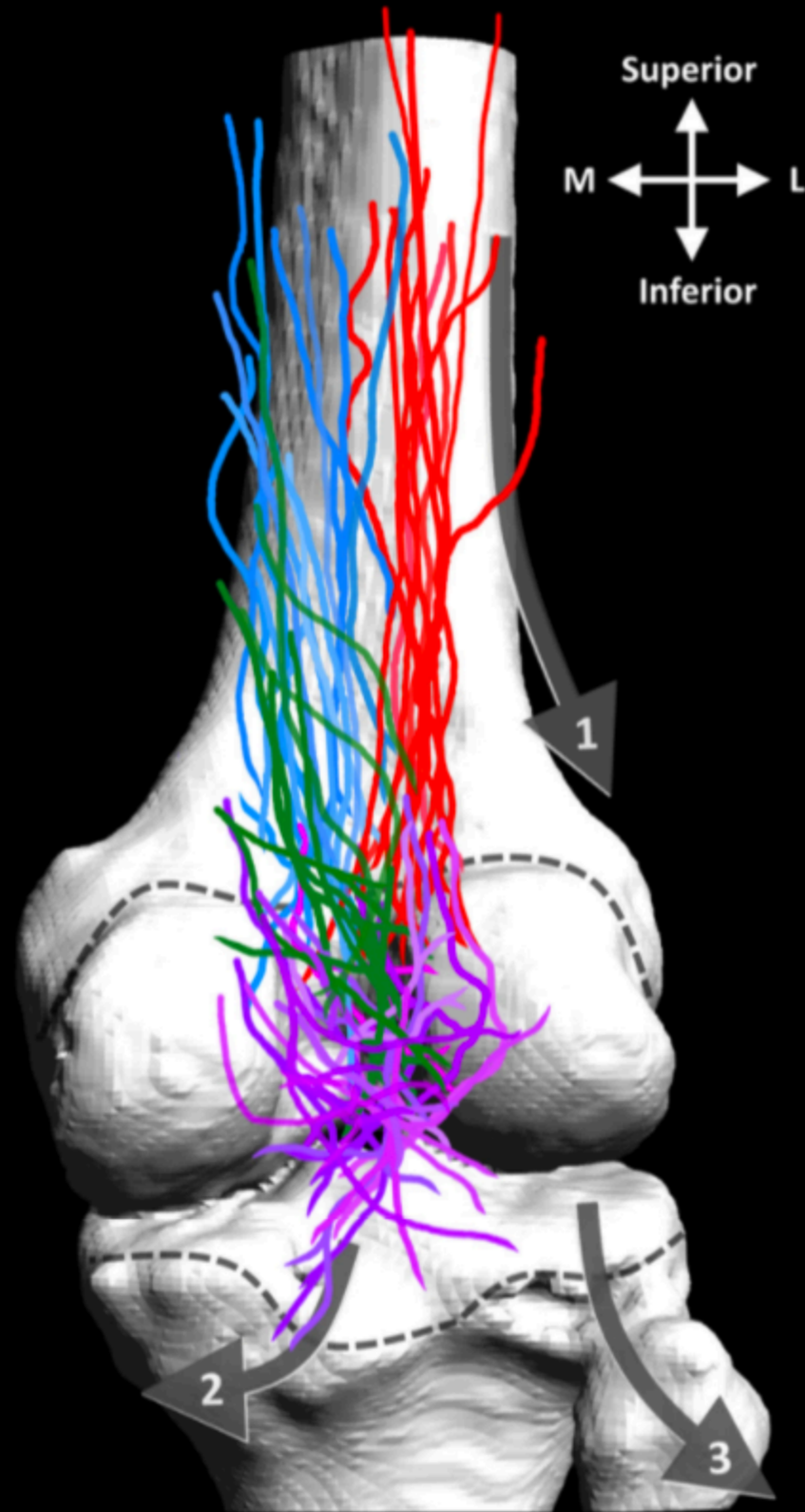


A

B

C

- |   |   |  |  |   |
|---|---|--|--|---|
|  N. to vastus intermedius |  Superior lateral genicular n. |  Superior medial genicular n. |  Common fibular n.    |  N. to vastus medialis             |
|  N. to vastus lateralis   |  Inferior lateral genicular n. |  Inferior medial genicular n. |  Recurrent fibular n. |  Infrapatellar br. of saphenous n. |



- Posterior br. common fibular/sciatic n.
- Posterior div. obturator n.
- Superior br. tibial n.
- Inferior br. tibial n.

# Preoperative Medications

## Initiate multimodal analgesia

- Acetaminophen
- Celecoxib
- Gabapentinoids

Buvanendran A, et al. *Anesth Analg* 2010;110(1):199-207

Huang P, et al. *J Arthroplasty* 2018;33:1052-1056

Huang YM, et al. *BMC Musculoskelet Disord* 2008;9:77

Memtsoudis S, et al. *Anesthesiology* 2018;128:891-902

Schmidt P, et al. *Anesthesiology* 2013;119:1215-1221

# Acetaminophen

**MOA:** Not completely understood. Inhibit COX-2 in CNS

Analgesia and antipyretic, no anti-inflammatory action

**Dosing:** 1000 mg q8h

**Side effects:** caution in liver disease, keep below 4 g/d



# Celecoxib

## **MOA:** COX-2 inhibitor

- Works at site of tissue damage
- Blocks sensitization and hyperalgesia

**Dosing:** 200-400 mg preop,  
200 mg bid

**Side effects:** less GI effects  
and bleeding risk, caution in  
renal insufficiency



Arachidonic acid

Platelets

COX-1

Thromboxane  
( $\text{TxA}_2$ )

- Vasoconstriction
- $\uparrow$  Platelet aggregation

Thrombosis

Gastric mucosa

COX-1

Prostaglandins  
 $\text{E}_2$  and  $\text{I}_2$

- Gastric protection

Joints

COX-2

Prostaglandins  
 $\text{E}_2$  and  $\text{I}_2$

- Pain
- Inflammation

Endothelial cells

COX-1

COX-2

Prostacyclin  
( $\text{PGI}_2$ )

- Vasodilation
- $\downarrow$  Platelet aggregation

# Gabapentinoids

## MOA: Antihyperalgesic

- Inhibit calcium channels
- Activate descending inhibitory noradrenergic pathways

## Dosing:

- Gabapentin 600-1200\* mg preop, 300-600 mg tid
- Pregabalin 150-300 mg preop, 75-150 mg bid

**Side effects:** sedation, dizziness, visual disturbances, dose adjust for renal impairment



***Postoperative use should be decreased or stopped for side effects of sedation, dizziness, or confusion***



# Gabapentin vs Pregabalin

## Gabapentin

- Absorbed slowly with max plasma concentrations within 3-4 h
- Saturable absorption - plasma concentrations do not increase proportionally with increasing dose
- Lower bioavailability

## Pregabalin

- Absorbed more rapidly with max plasma concentrations within 1 h
- Linear absorption - plasma concentrations increase proportionally with increasing dose
- Higher bioavailability

# ANESTHESIOLOGY

## **Perioperative Use of Gabapentinoids for the Management of Postoperative Acute Pain**

A Systematic Review and Meta-analysis

Michael Verret, M.D., M.Sc., François Lauzier, M.D., M.Sc., Ryan Zarychanski, M.D., M.Sc., Caroline Perron, M.Sc., Xavier Savard, M.D. candidate, Anne-Marie Pinard, M.D., M.Sc., Guillaume Leblanc, M.D., M.Sc., Marie-Joëlle Cossi, Ph.D., Xavier Neveu, M.Sc., Alexis F. Turgeon, M.D., M.Sc., and the Canadian Perioperative Anesthesia Clinical Trials (PACT) Group\*

*ANESTHESIOLOGY* 2020; 133:265–79

**281 trials ~ 25k pts**

- ***No clinically significant analgesic effect or prevention of postop chronic pain***
- ***Greater risk of AE: dizziness and visual disturbances***

# Peripheral Nerve Blocks

- **Adductor canal vs femoral triangle block**
  - Single shot vs catheter
- **Anterior femoral cutaneous nerves**
- **IPACK**
- **Geniculars**

# Intraoperative Anesthesia

## Considerations

- Surgeon expectations
- Length of surgery
- Tourniquet time
- Patient expectations
- Patient health status

# Adductor Canal

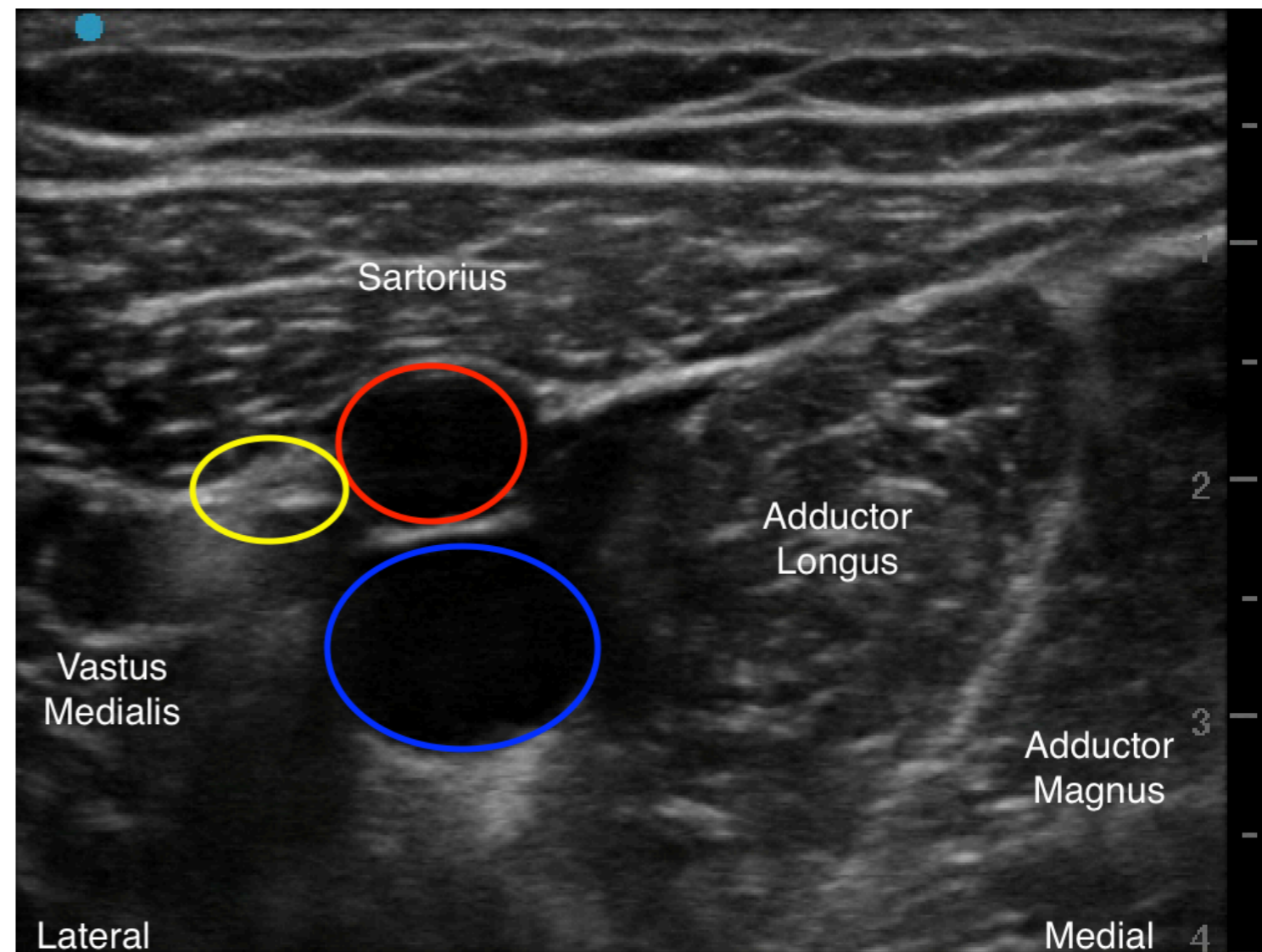
Block saphenous nerve and NVM\*

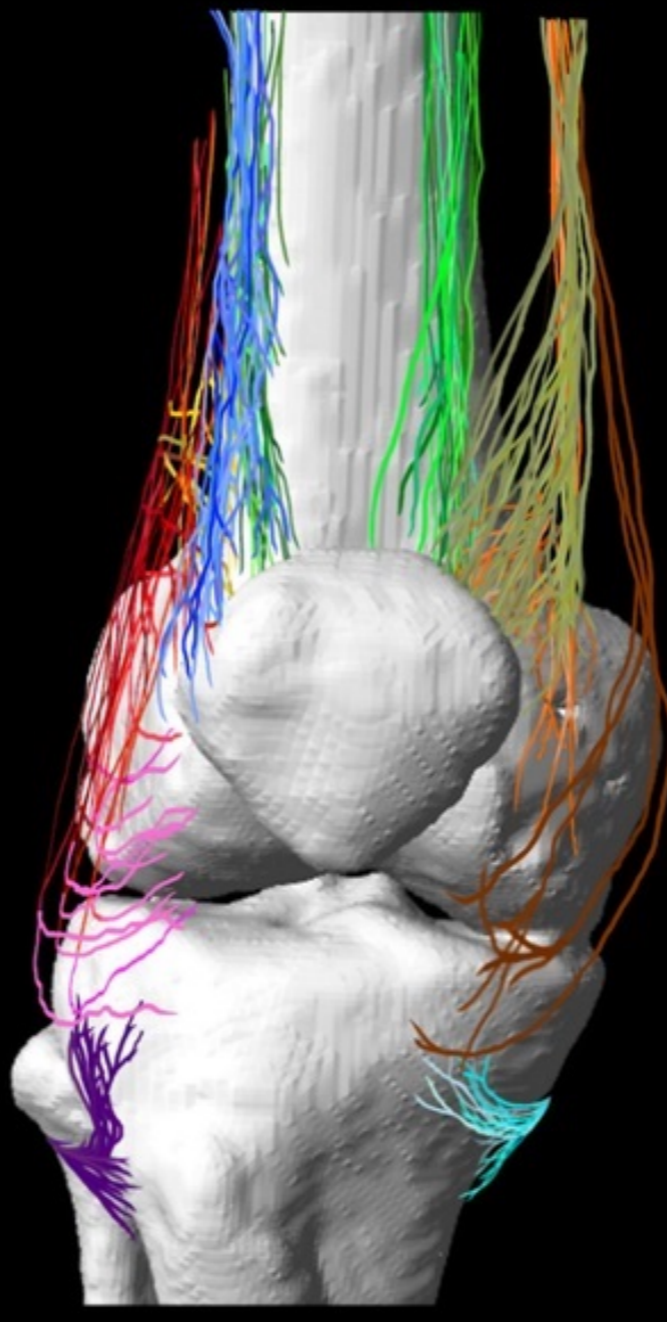
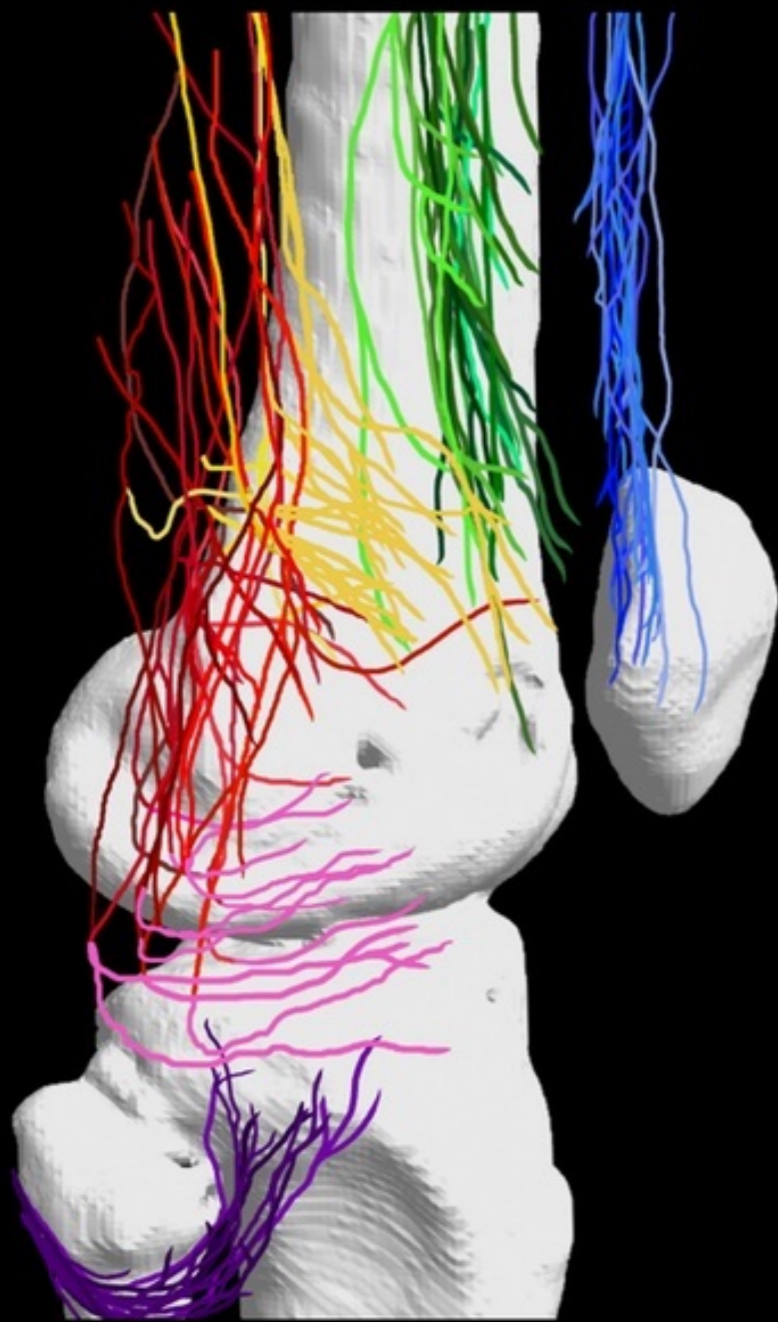
- Femoral triangle block

Cover anterior knee pain

Considered “motor sparing”

- May result in quad weakness















A

B

C

- |   |   |  |  |   |
|---|---|--|--|---|
|  N. to vastus intermedius |  Superior lateral genicular n. |  Superior medial genicular n. |  Common fibular n.    |  N. to vastus medialis             |
|  N. to vastus lateralis   |  Inferior lateral genicular n. |  Inferior medial genicular n. |  Recurrent fibular n. |  Infrapatellar br. of saphenous n. |

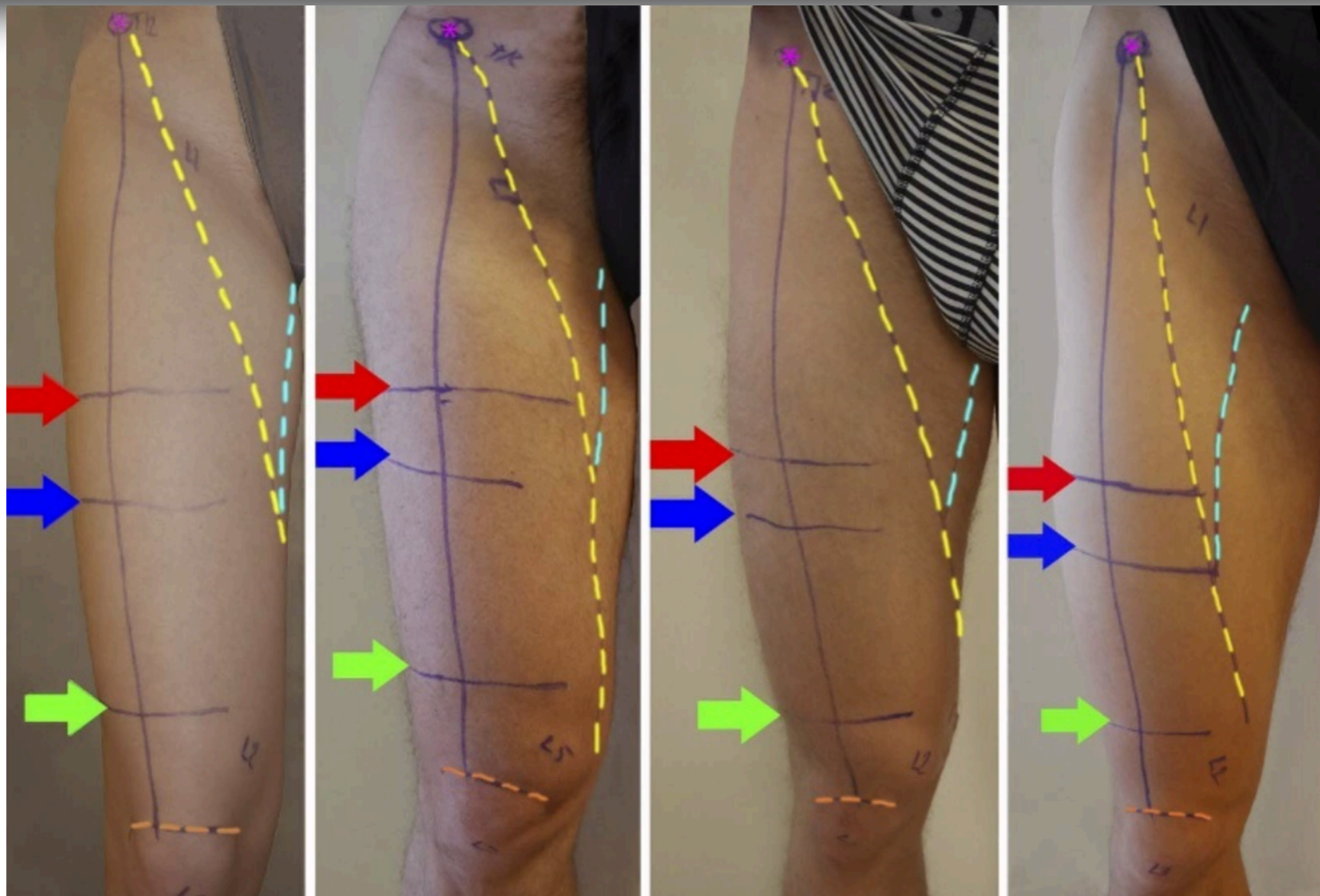
# Adductor Canal



OPEN

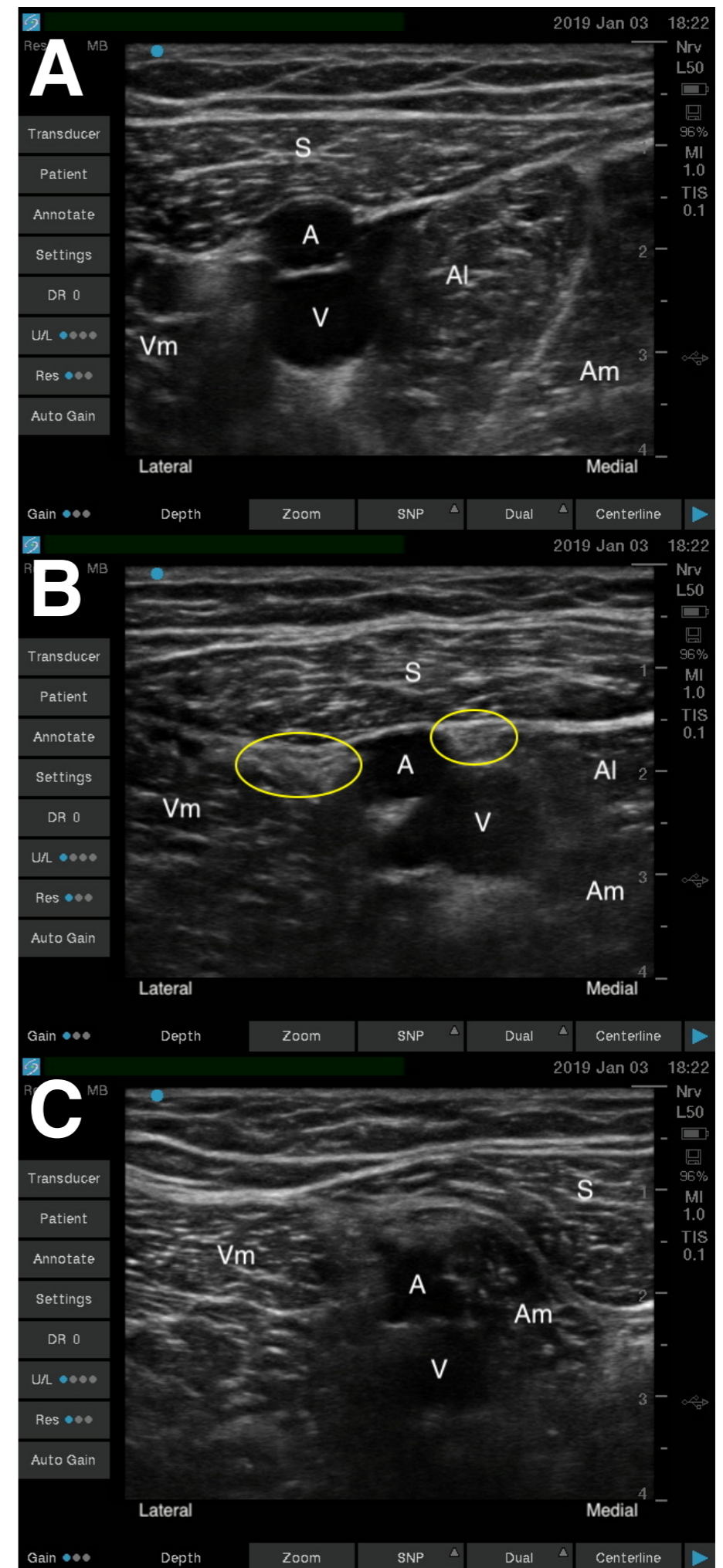
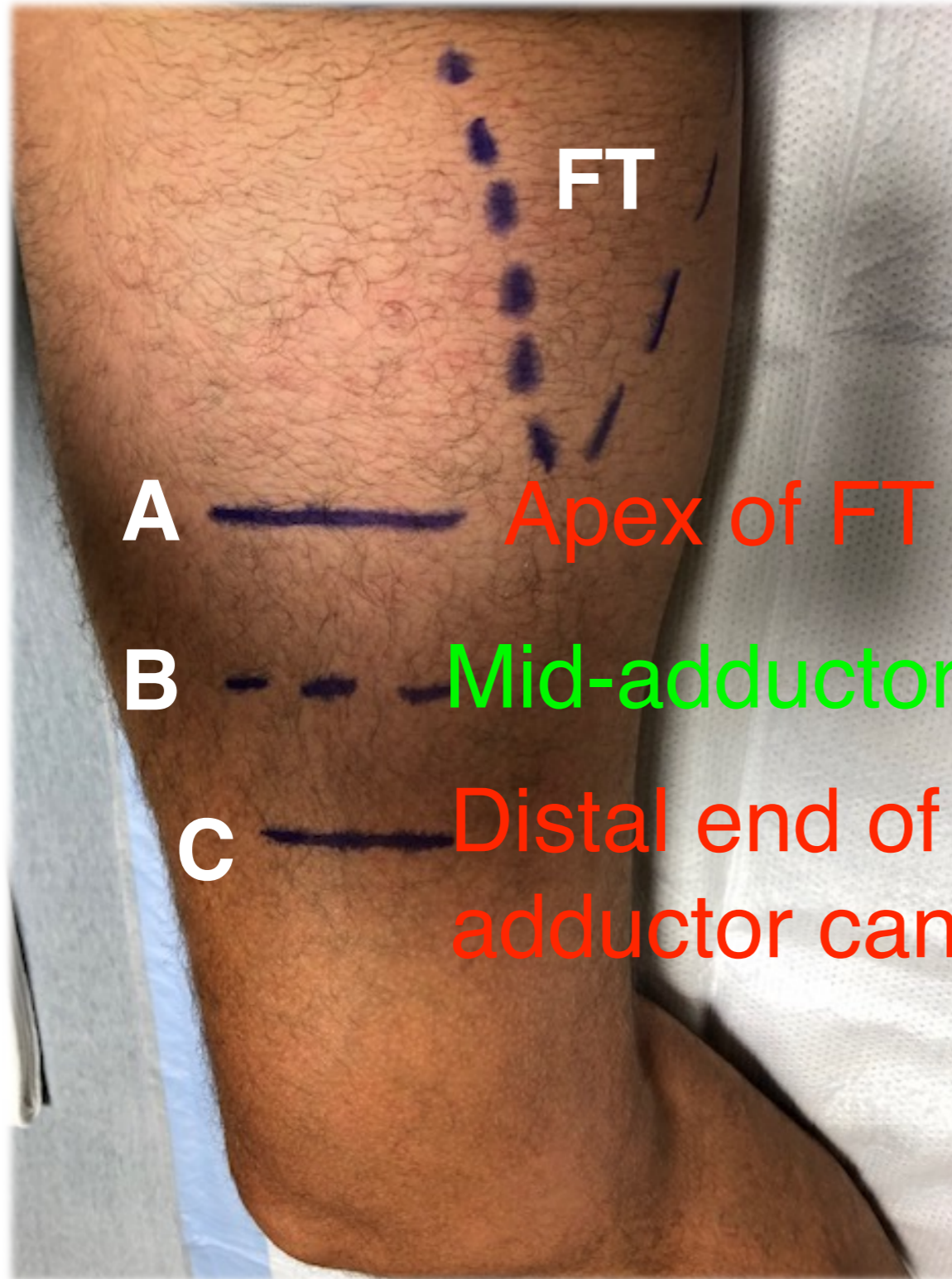
# Defining the Location of the Adductor Canal Using Ultrasound

*Wan Yi Wong, MMed, MBBS,\* Siska Bjørn, MS,† Jennie Maria Christin Strid, MD,†  
Jens Børglum, MD, PhD,‡ and Thomas Fichtner Bendtsen, MD, PhD†*





# Adductor Canal



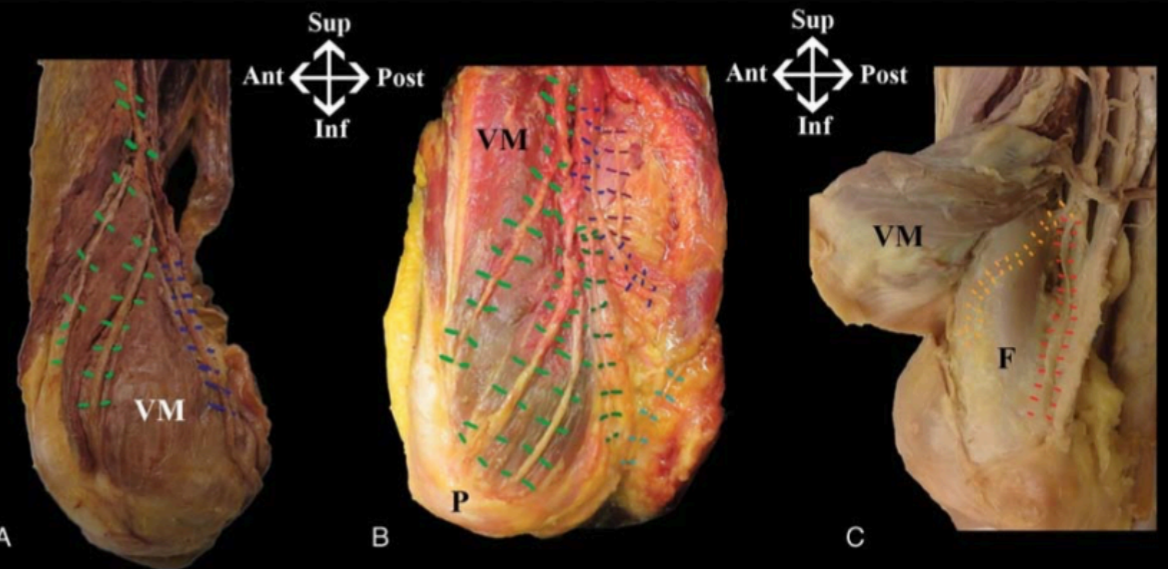
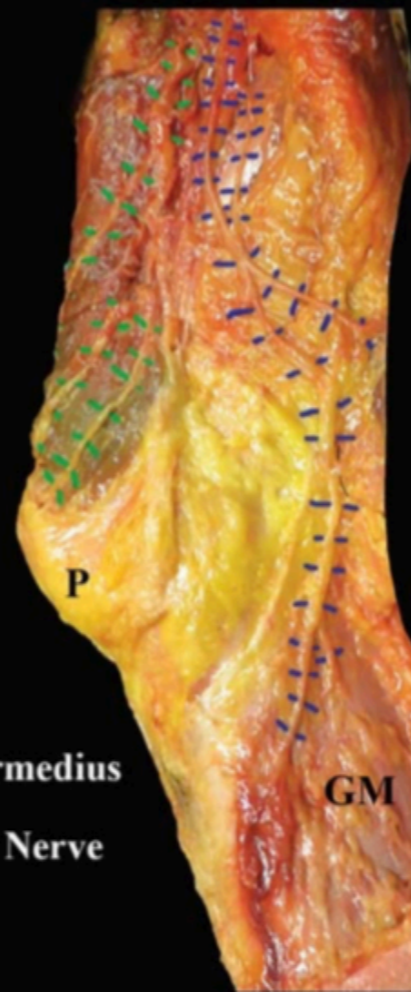
# The Nerves of the Adductor Canal and the Innervation of the Knee

## An Anatomic Study

David Burckett-St. Laurant, MBBS, FRCA,\* Philip Peng, MBBS, FRCPC,†† Laura Girón Arango, MD,§  
 Ahtsham U. Niazi, MBBS, FCARCSI, FRCPC,†† Vincent W.S. Chan, MD, FRCPC, FRCA,††  
 Anne Agur, BScOT, MSc, PhD,|| and Anahi Perlas, MD, FRCPC††

**TABLE 1.** The Nerves of the Adductor Canal and Their Relative Contribution to the Innervation of the Anteromedial Knee Joint

Nerve	Origin Within the Adductor Canal, n (%)	Contribution to Knee Innervation
NVM (via intramuscular branches)	20 (100)	+++
NVM (via extramuscular branch)	7 (35)	++
SN (via infrapatellar branch)	11 (55)	++
Deep plexus of mixed NVM and SN origin (via deep genicular nerves)	18 (90)	+++
Anterior ON (via small anastomotic branches)	2 (10)	+/-

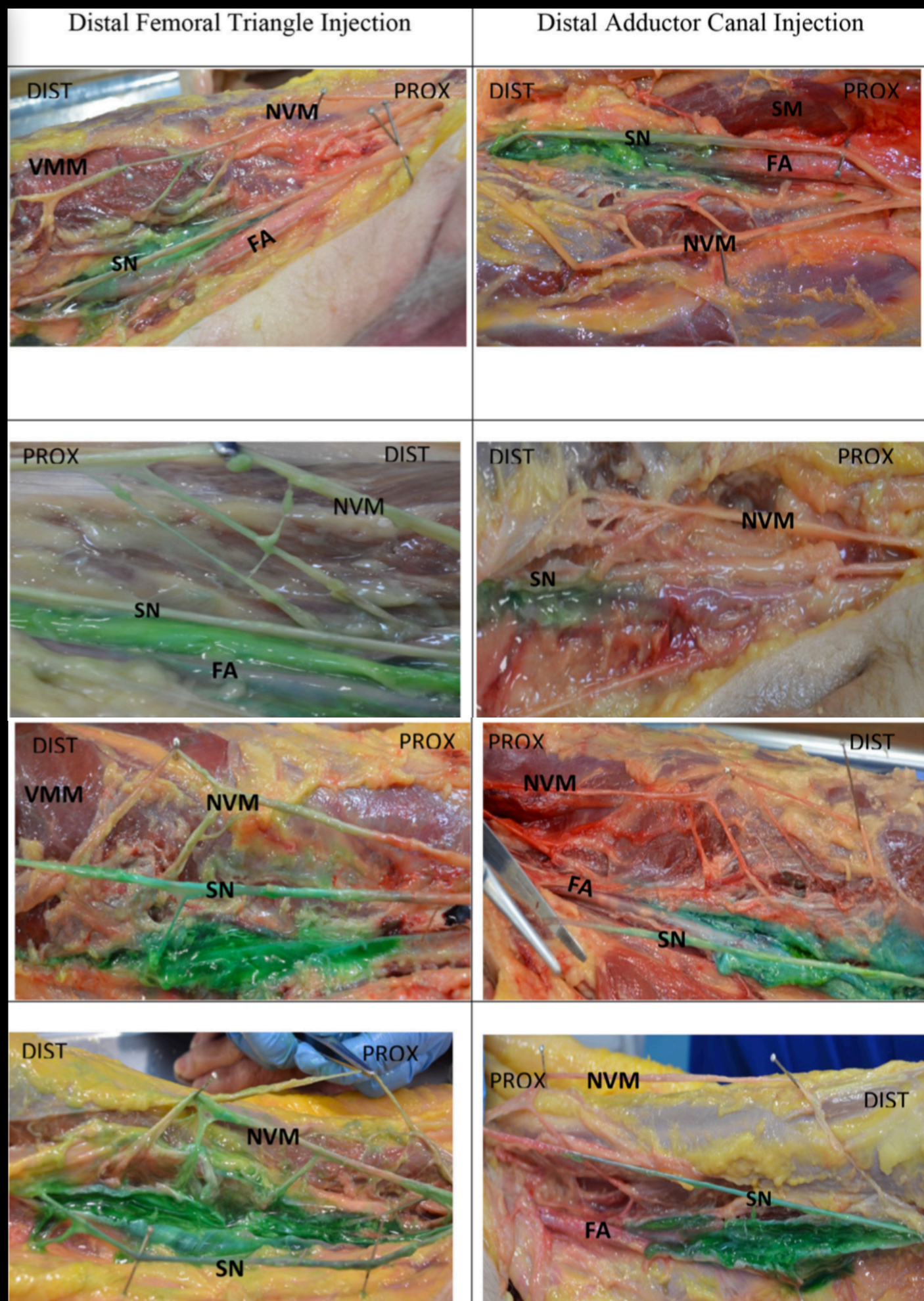
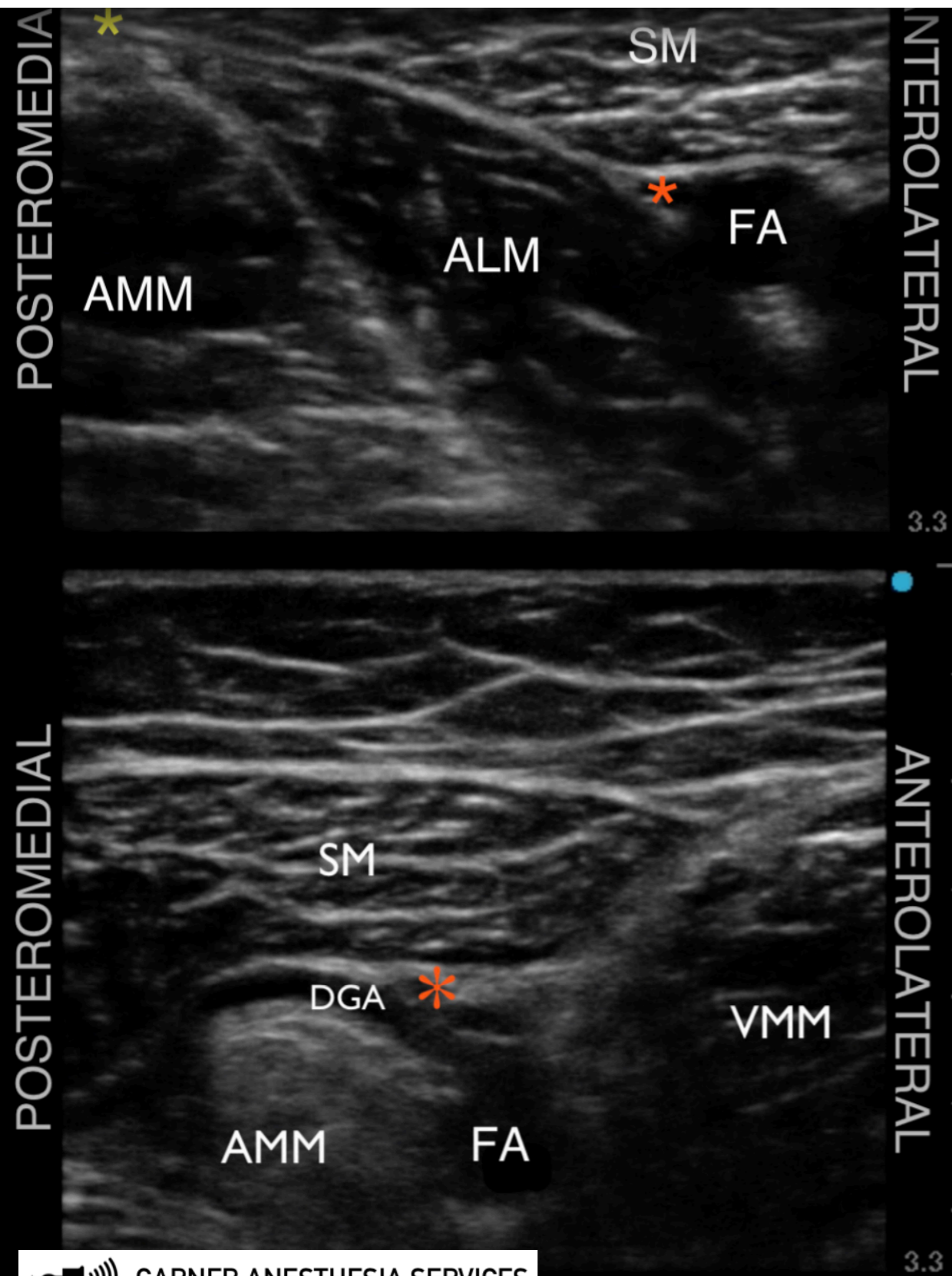


■ Nerve to Vastus Medialis    ■ Medial Femoral Cutaneous Nerve    ■ Medial Genicular Nerve  
■ Saphenous Nerve    ■ Anterior Obturator Nerve    ■ Anterior Genicular Nerve

■ Nerve to Vastus Medialis    ■ Nerve to Vastus Intermedius  
■ Medial Femoral Cutaneous Nerve    ■ Saphenous Nerve  
■ Anterior Femoral Cutaneous Nerve

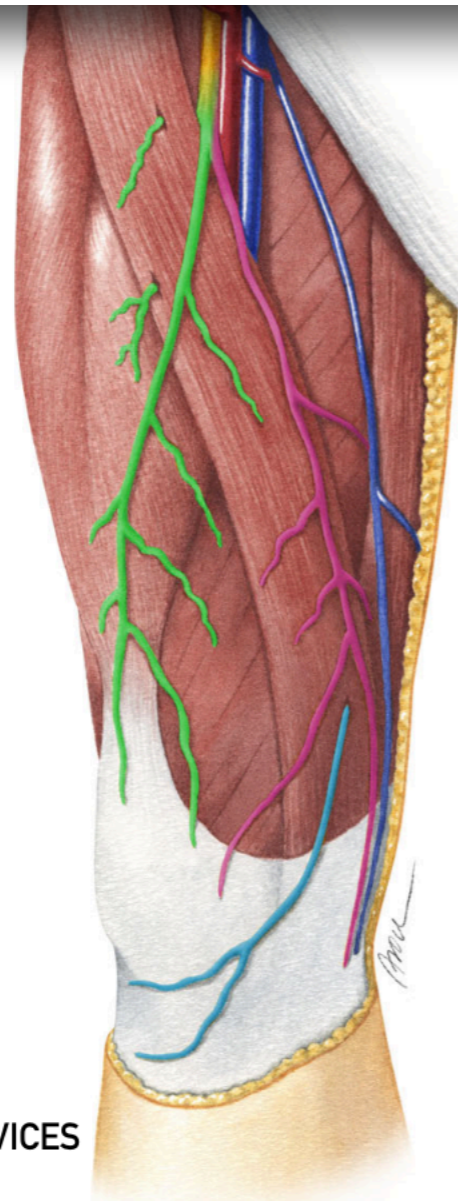
# Spread of dye injectate in the distal femoral triangle versus the distal adductor canal: a cadaveric study

David F Johnston,<sup>1</sup> Nicholas D Black,<sup>2</sup> Rebecca Cowden,<sup>3</sup> Lloyd Turbitt,<sup>1</sup> Samantha Taylor<sup>4</sup>



# Anesthesia of the anterior femoral cutaneous nerves for total knee arthroplasty incision: randomized volunteer trial

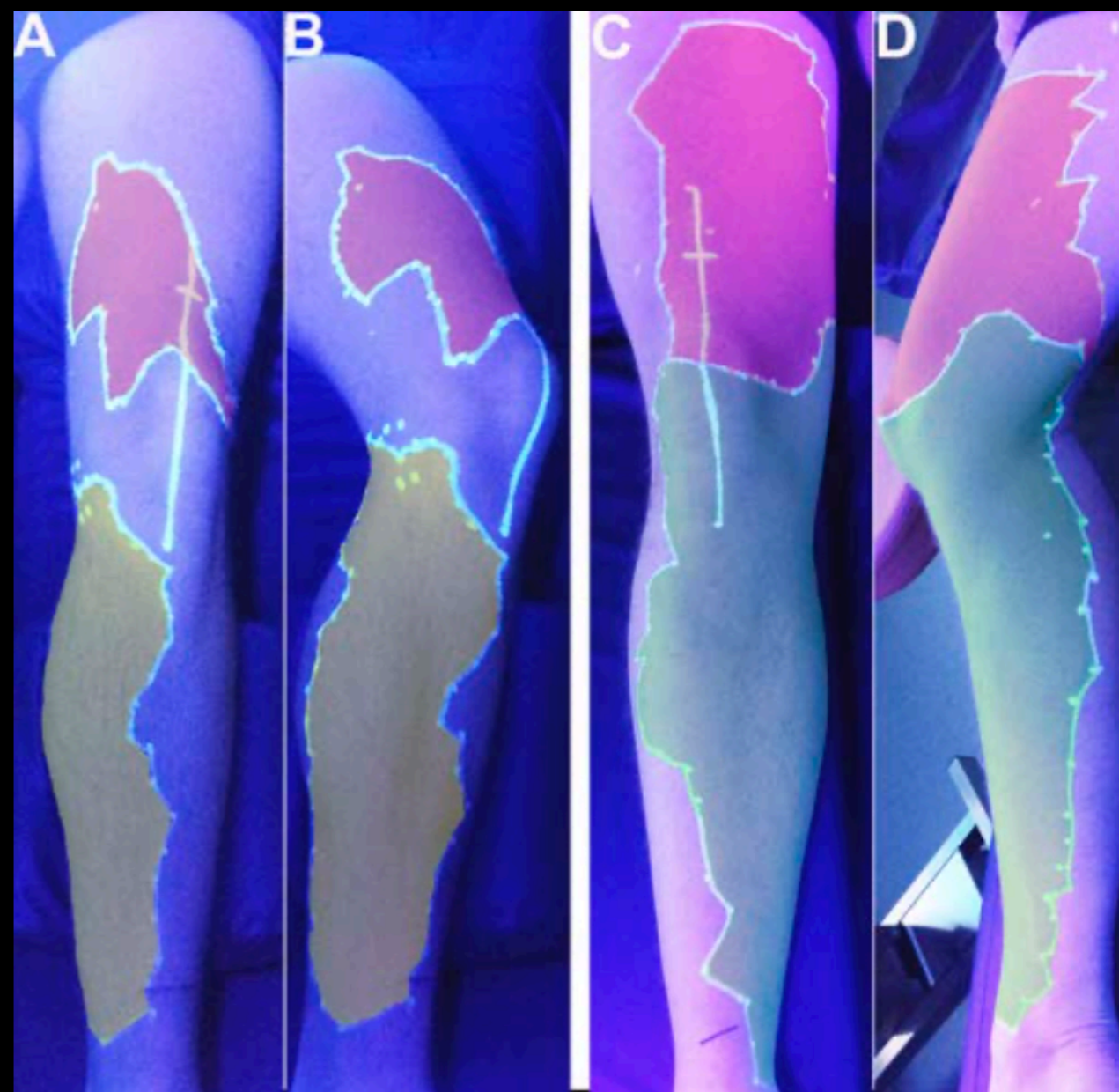
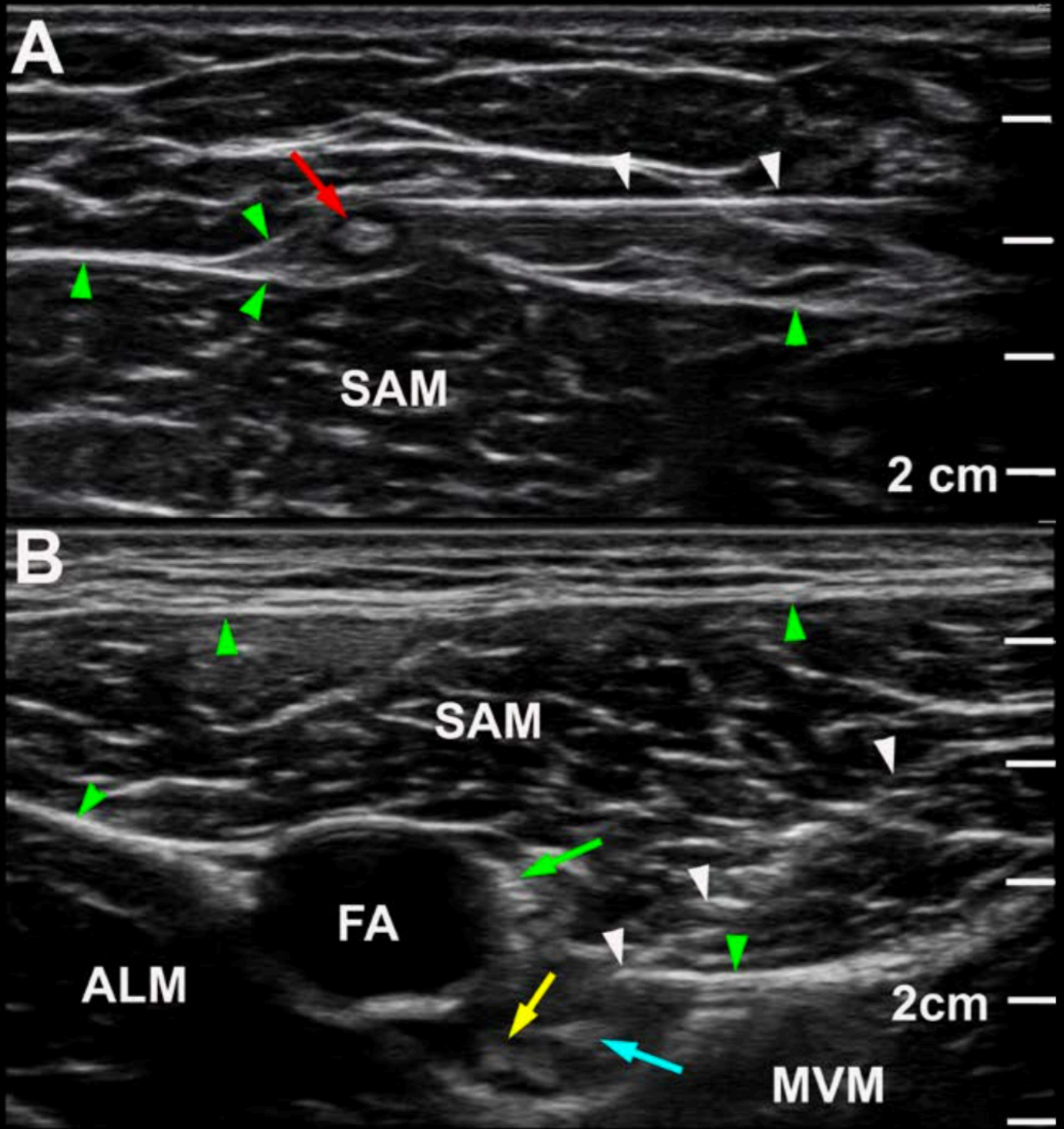
Siska Bjørn,<sup>1</sup> Thomas Dahl Nielsen,<sup>2</sup> Bernhard Moriggl,<sup>3</sup> Romed Hoermann,<sup>3</sup>  
Thomas Fichtner Bendtsen<sup>2</sup>



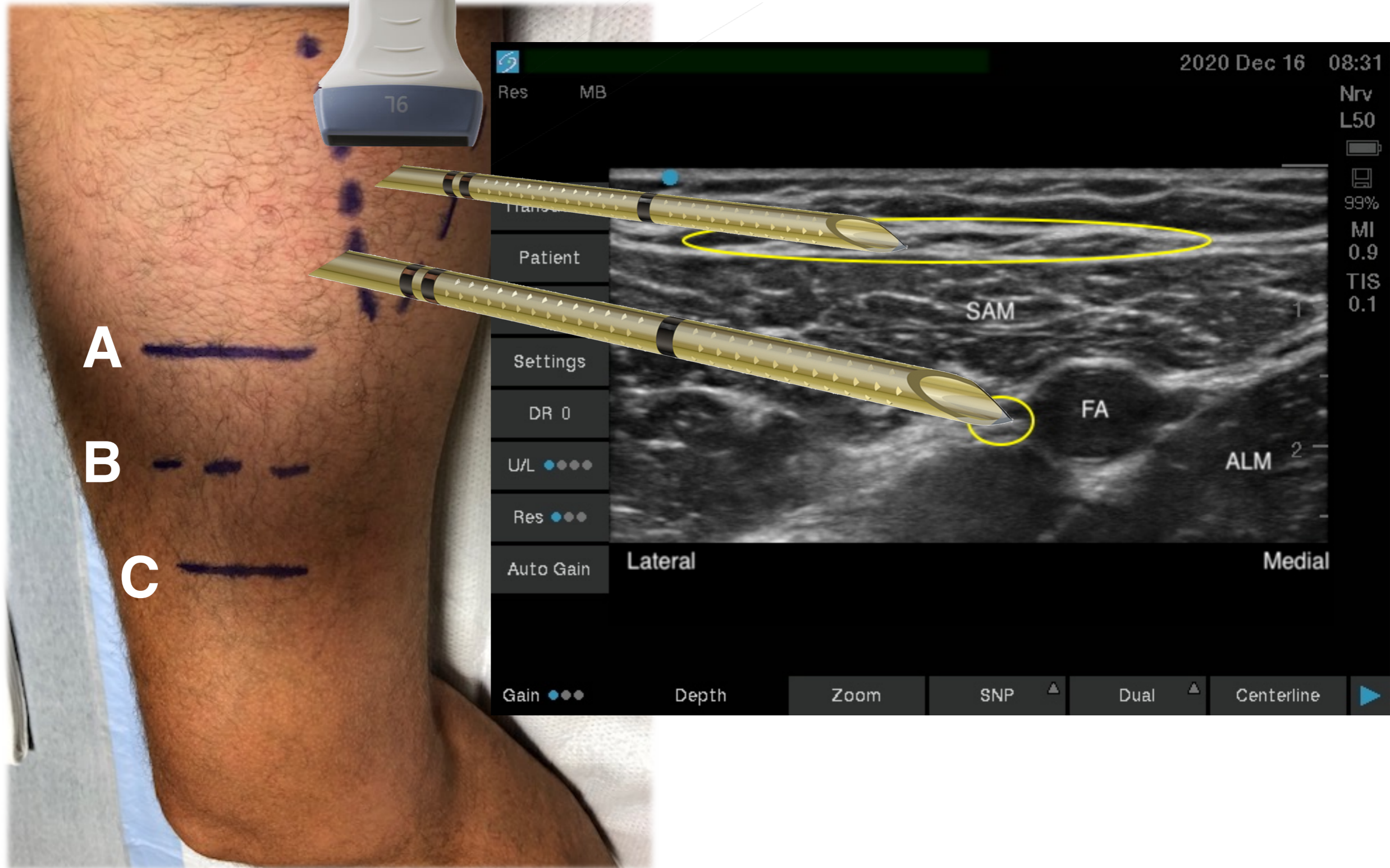
- 9 cadavers and 40 volunteers
- IFCN selectively anesthetized and MFCN anesthetized by a proximal FT block

medial

anterior



# Proximal FTR





Res MB

Nrv  
L50

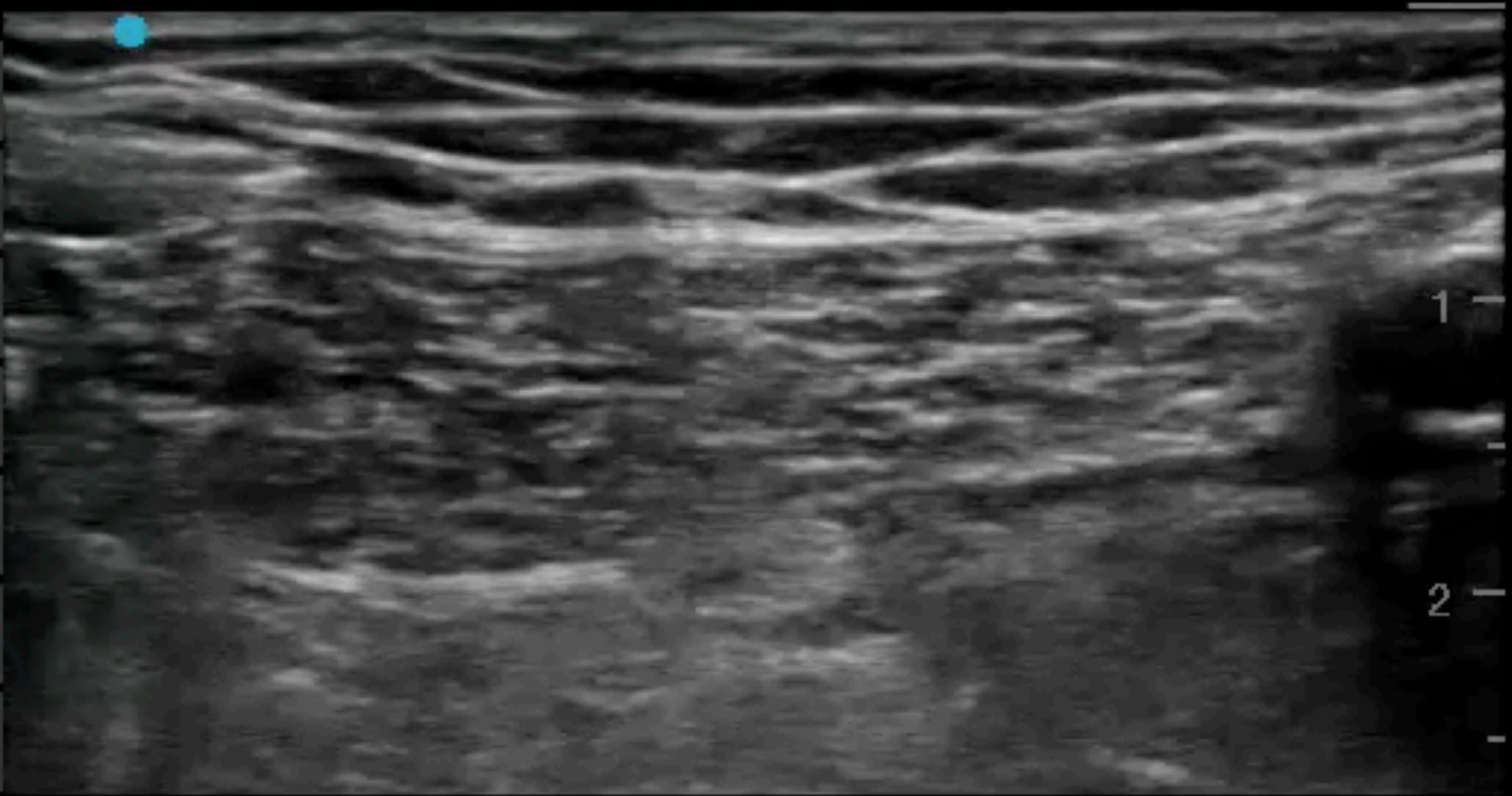


97%

MI  
0.9

TIS  
0.1

- Transducer
- Patient
- Annotate
- Settings
- DR 0
- U/L ●●●●
- Res ●●●
- Auto Gain



Zoom

SNP ▲

Dual ▲

Centerline





Res MB

Nrv

L50



94%

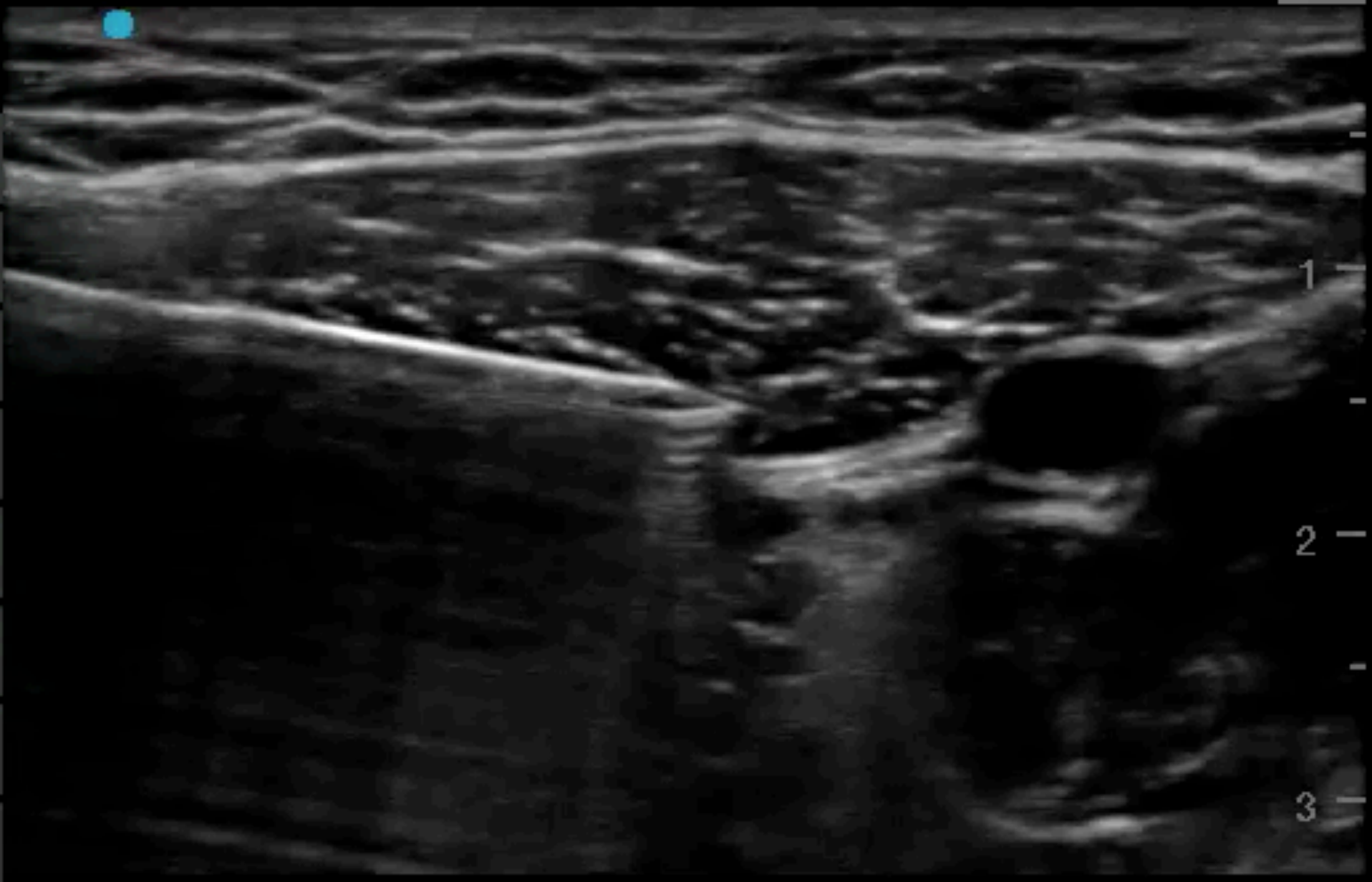
MI

1.0

TIS

0.1

- Transducer
- Patient
- Annotate
- Settings
- DR 0
- U/L ●●●●
- Res ●●●
- Auto Gain



—

1 —

2 —

3 —







Res MB

Nrv

L50



94%

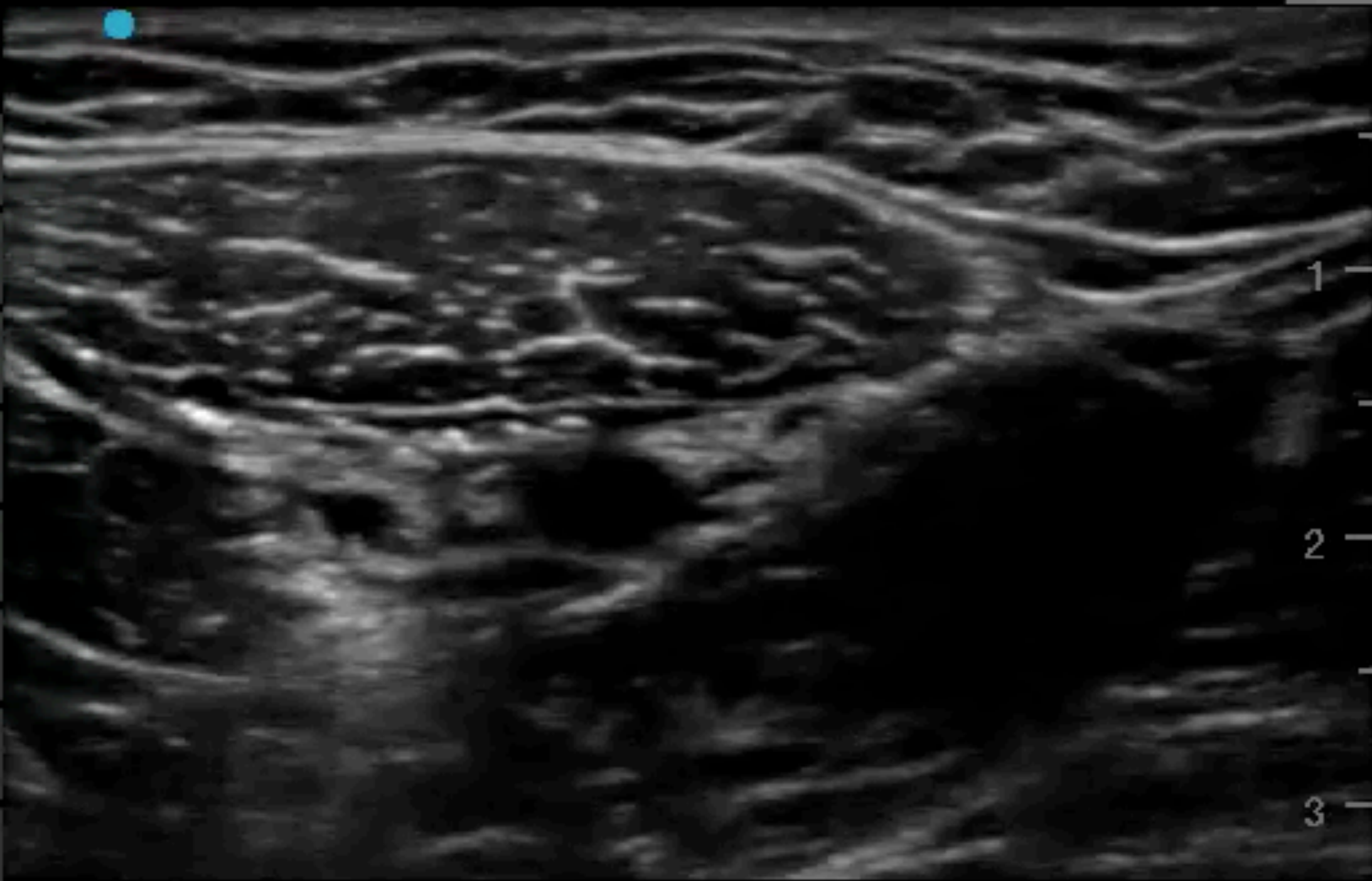
MI

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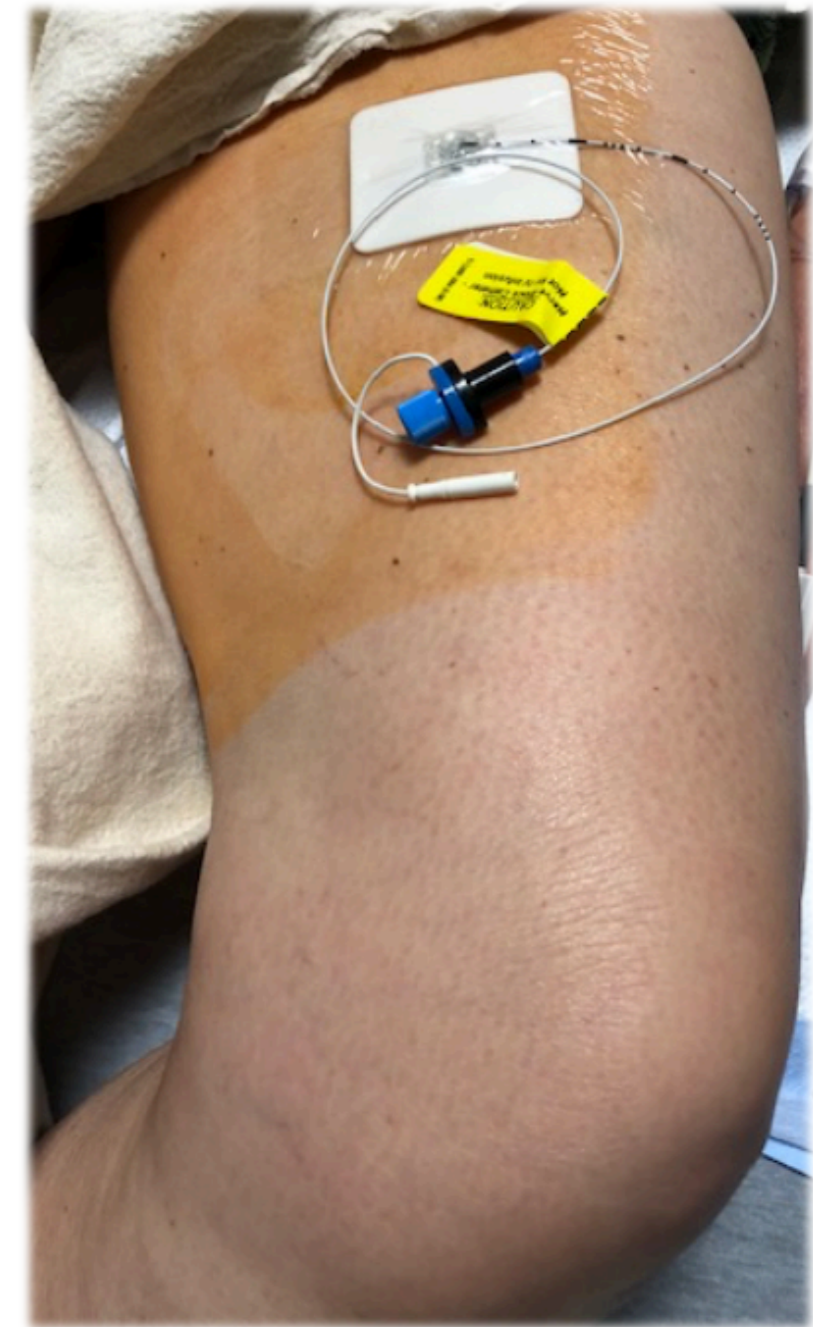
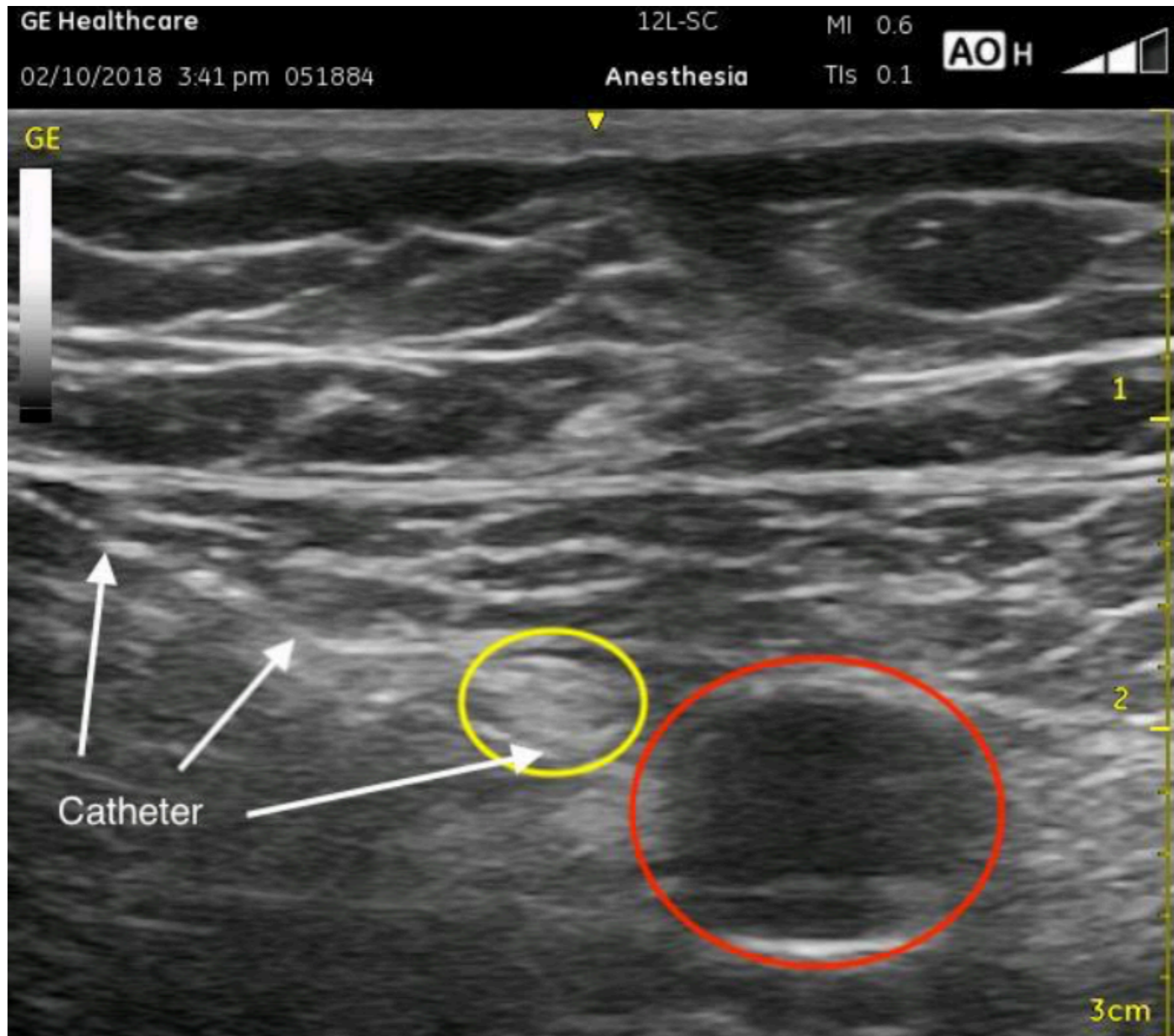
- Transducer
- Patient
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- DR 0
- U/L ●●●●
- Res ●●●
- Auto Gain



1  
2  
3

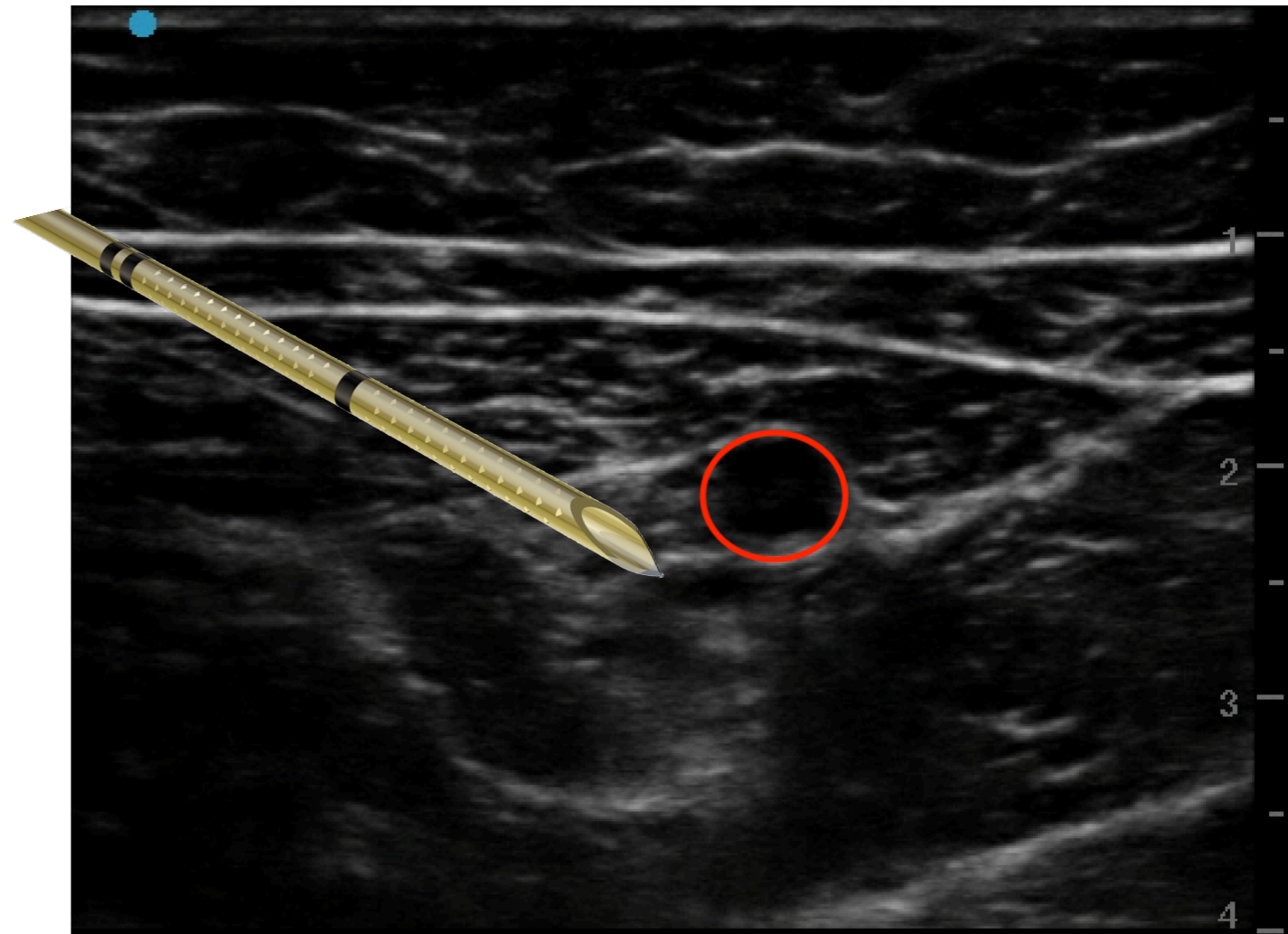


# Adductor Canal



# Block Tips

- Abduct and externally rotate leg
- Lateral to medial approach
- 1st: block IFCN
- 2nd: Inject deep to sartorius muscle, next to artery
- Volume: 20-25 mL



Effect of Adductor Canal Block Versus Femoral Nerve Block on Quadriceps Strength, Mobilization, and Pain After Total Knee Arthroplasty  
A Randomized, Blinded Study

Ulrik Grevstad, MD,\* Ole Mathiesen, MD, PhD,† Laura Staun Valentiner, PT,‡ Pia Jaeger, MD,§ Karen Lisa Hilsted, RN,§ and Jørgen B. Dahl, MD, DMSci, MBA§

Reg Anesth Pain Med 2015;40:3–10

**ACB increased quad strength to 193% vs decline to 16% with FNB**

**Pain scores were similar**

**ACB > FNB?**

**KJA**

Korean Journal of Anesthesiology

Clinical Research Article

Korean J Anesthesiol 2020;73(5):417–424

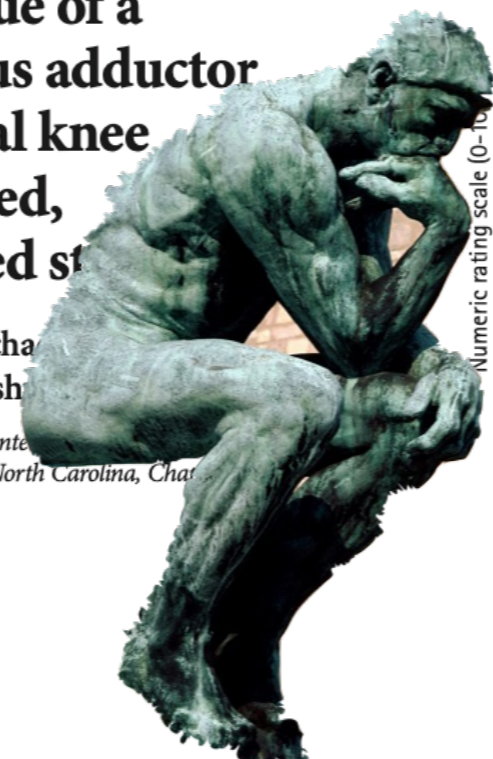
<https://doi.org/10.4097/kja.20269>

pISSN 2005–6419 • eISSN 2005–7563

The relative analgesic value of a femoral nerve block versus adductor canal block following total knee arthroplasty: a randomized, controlled, double-blinded study

Jeff C. Gadsden<sup>1</sup>, Siddharth Sata<sup>1</sup>, W. Michael  
Amanda H. Kumar<sup>1</sup>, Stuart A. Grant<sup>1</sup>, Joshua

Department of Anesthesiology, <sup>1</sup>Duke University Medical Center  
<sup>2</sup>University of North Carolina Medical Center, University of North Carolina, Chapel Hill, NC, USA



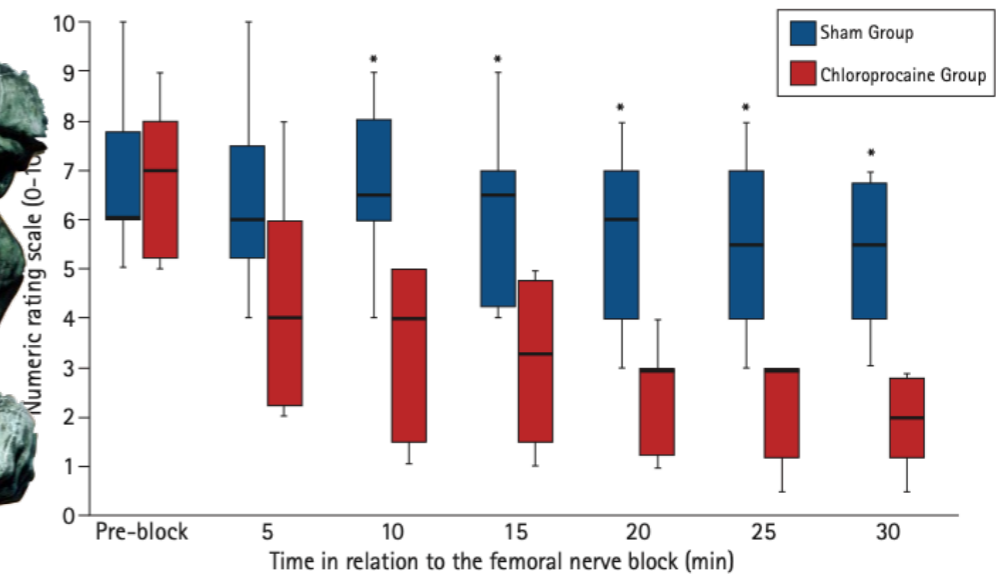
Adductor Canal Block Versus Femoral Nerve Block for Analgesia After Total Knee Arthroplasty  
A Randomized, Double-blind Study

Pia Jæger, MD,\* Dusanka Zaric, MD, DMSci,† Jonna S. Fomsgaard, MD,‡ Karen Lisa Hilsted, RN,\* Jens Bjerregaard, MD,‡ Jens Gyron, MD,† Ole Mathiesen, MD, PhD,§ Tommy K. Larsen, MD,|| and Jørgen B. Dahl, MD, DMSci, MBAex\*

Reg Anesth Pain Med 2013;38:526–532

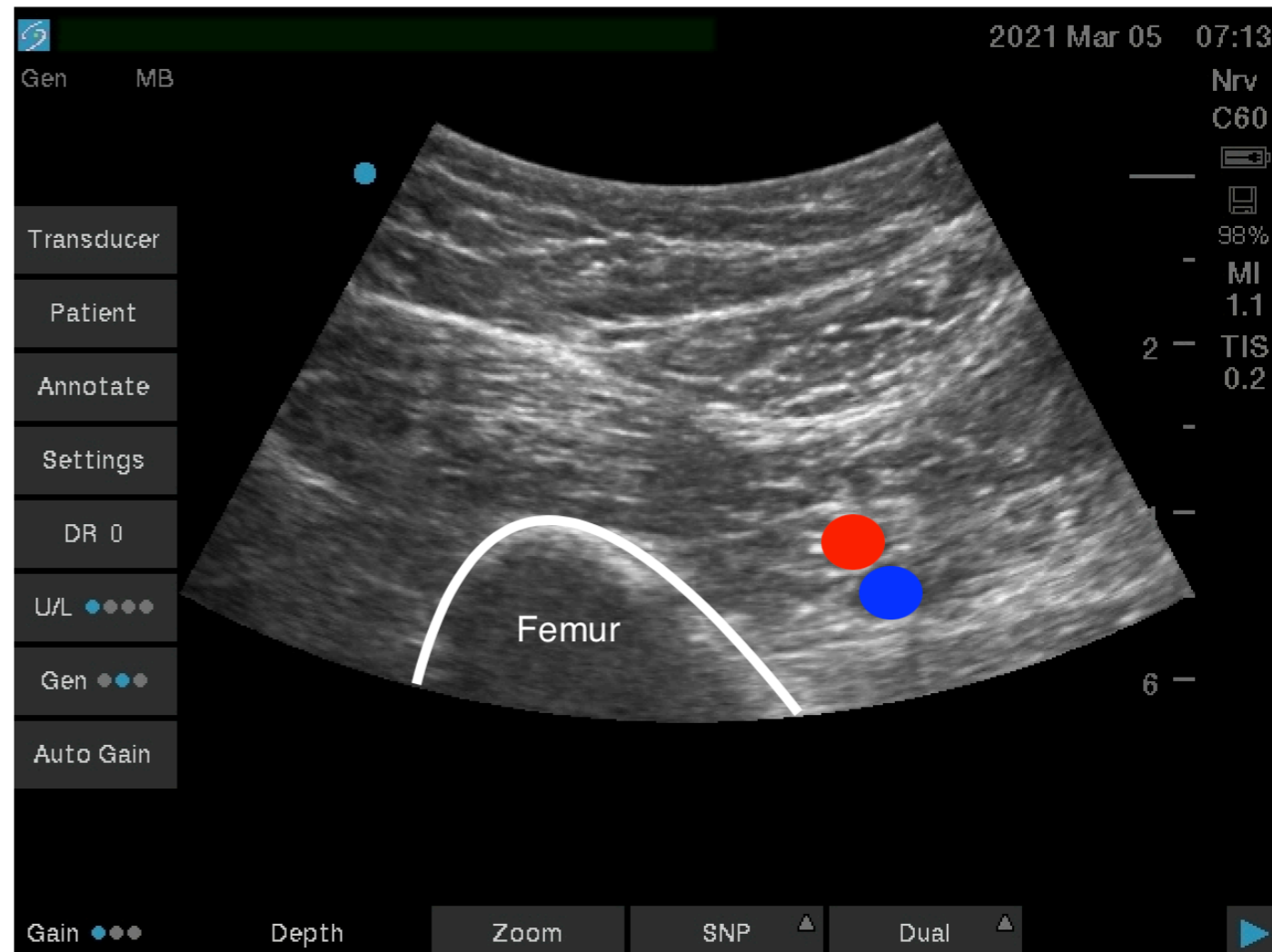
**cACB group significantly higher quad strength 52% vs 18%**

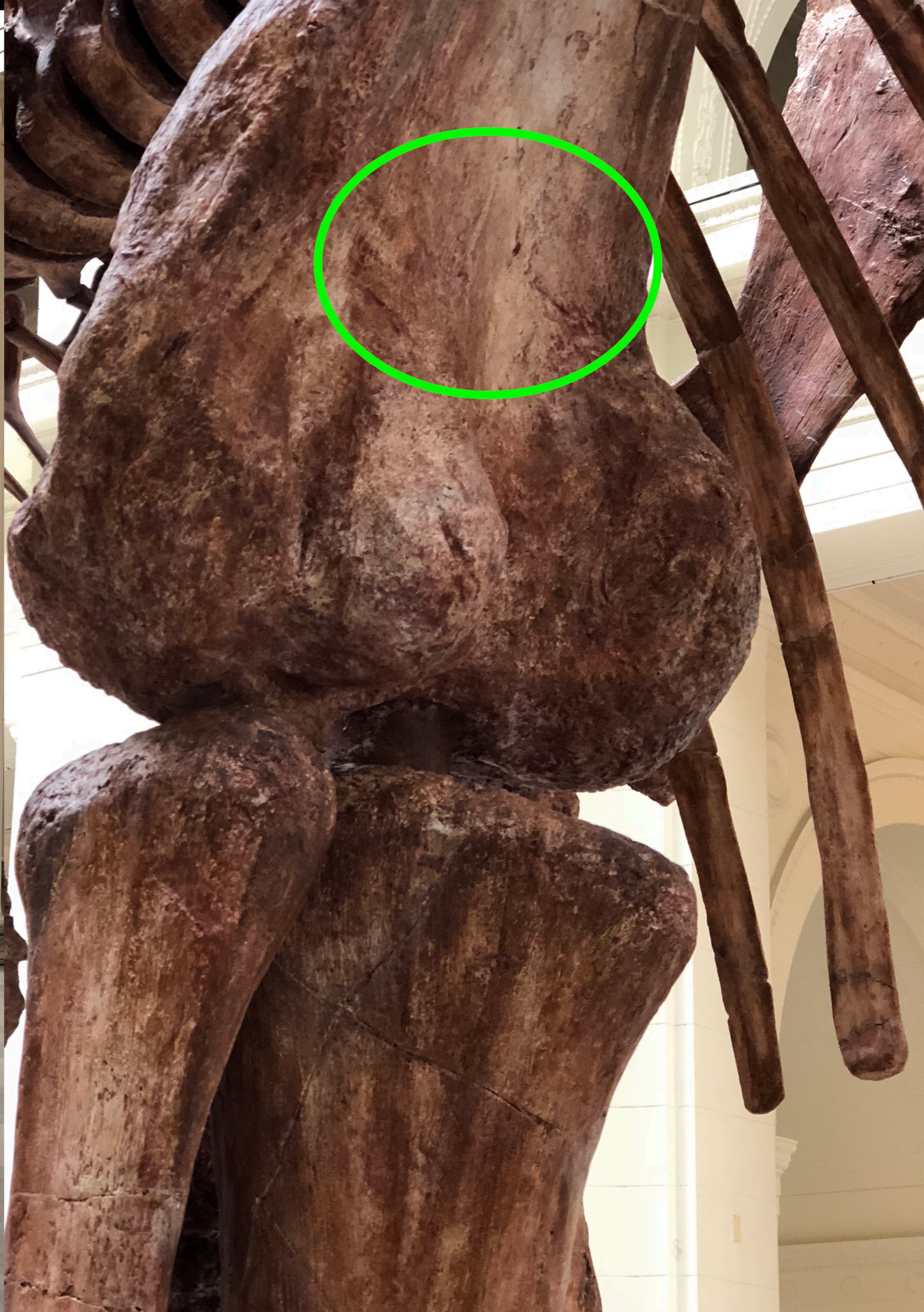
**No difference in morphine consumption, pain at rest and during flexion**

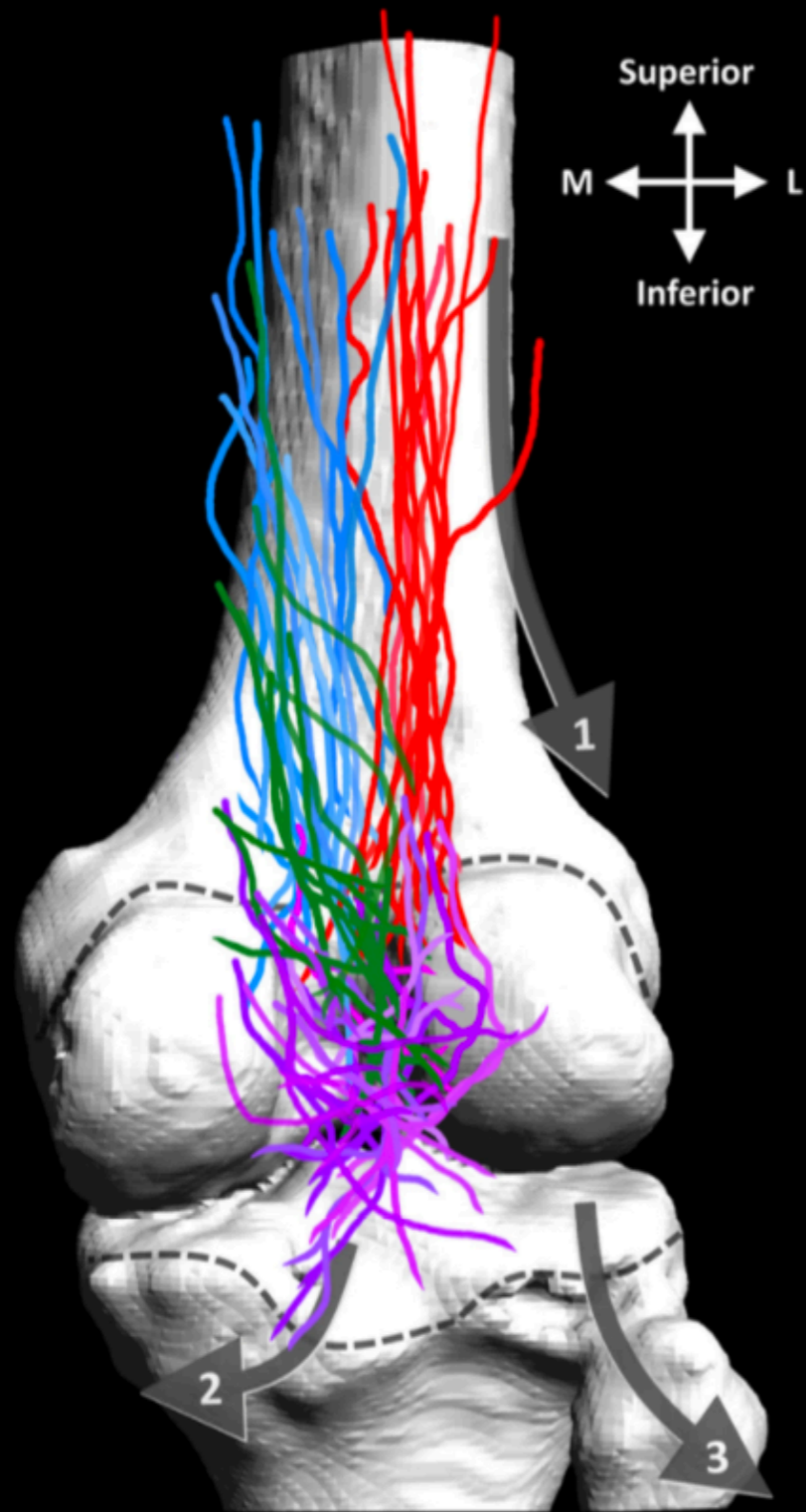


# IPACK

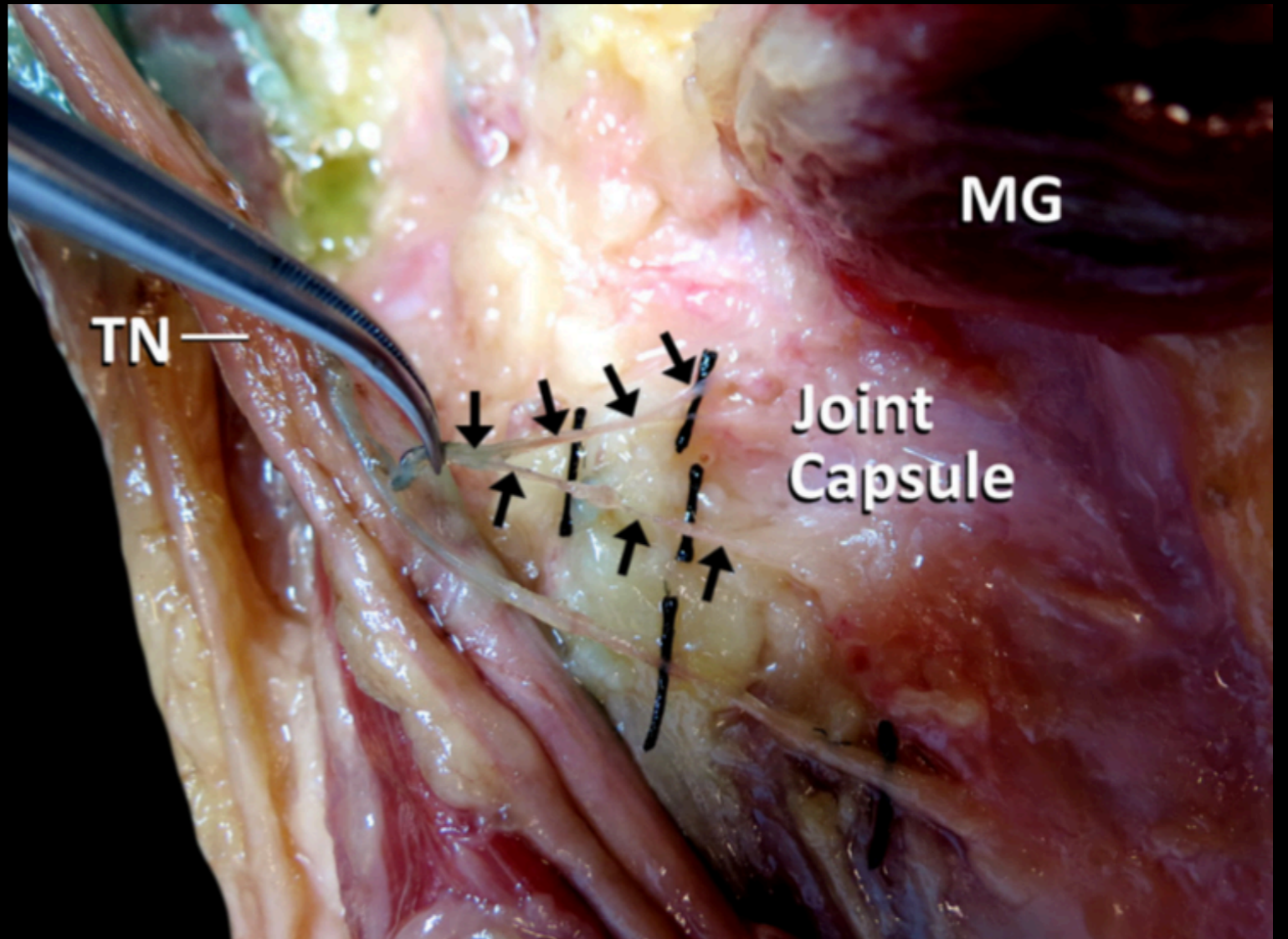
- Target articular branches of the TN, CPN and ON
- Avoids main trunks of TN and CPN
- Innervates posterior knee joint

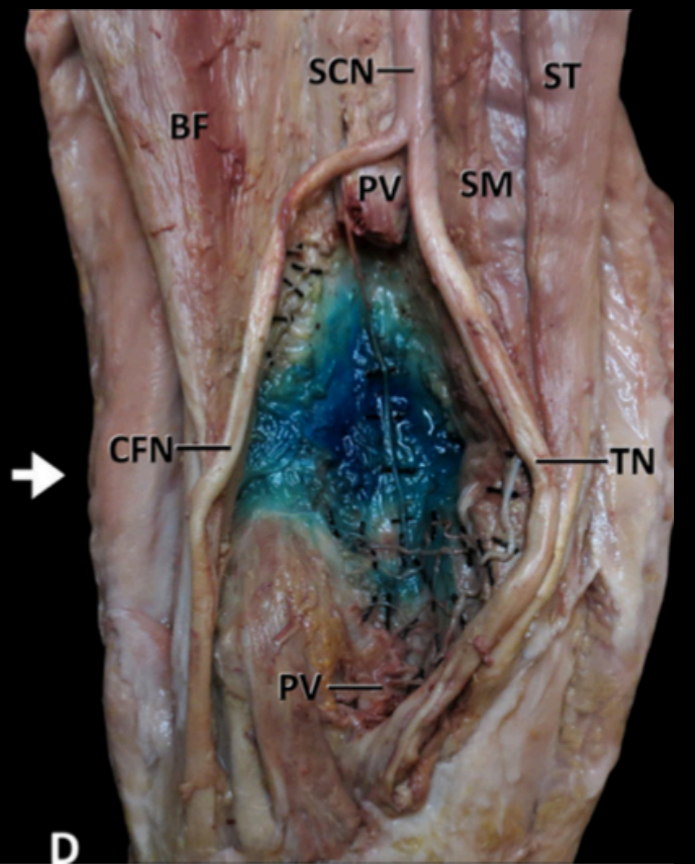
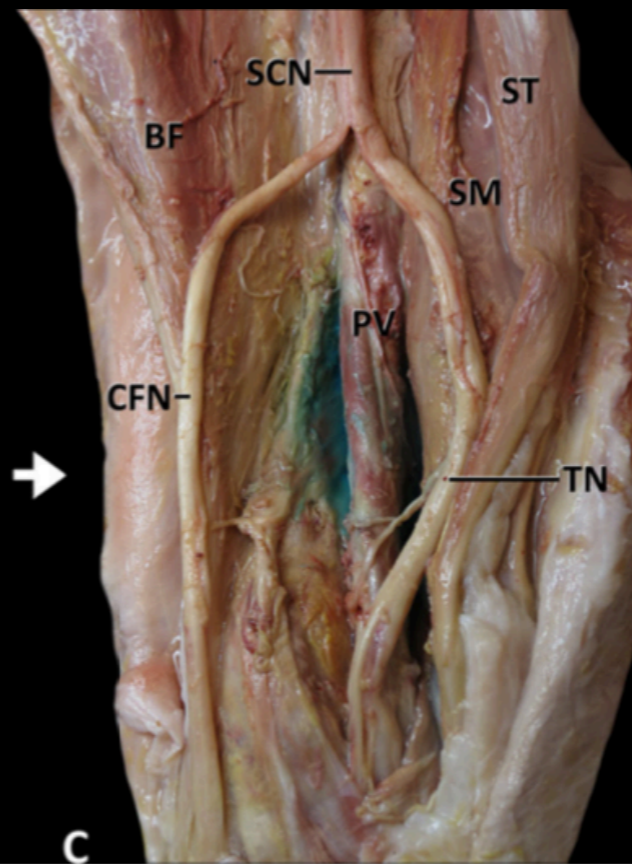
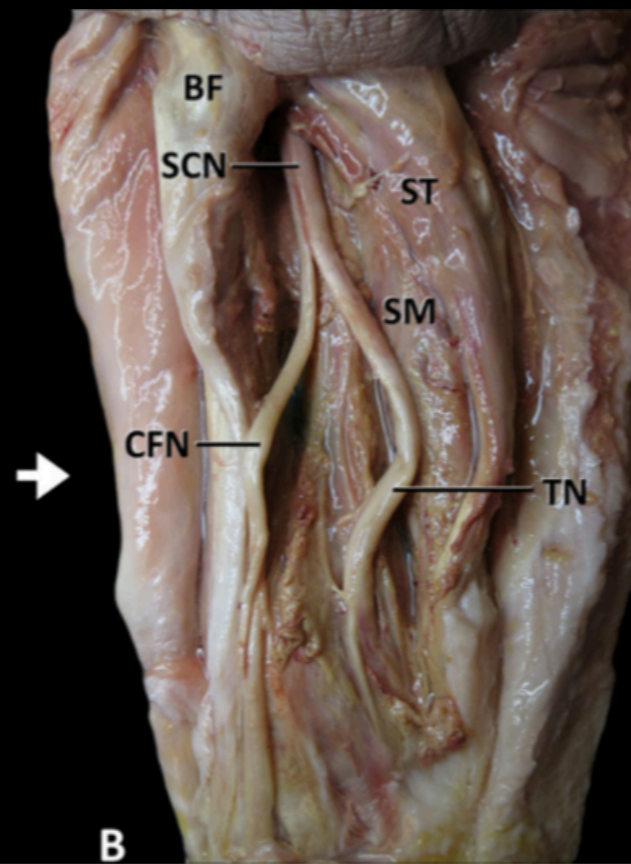
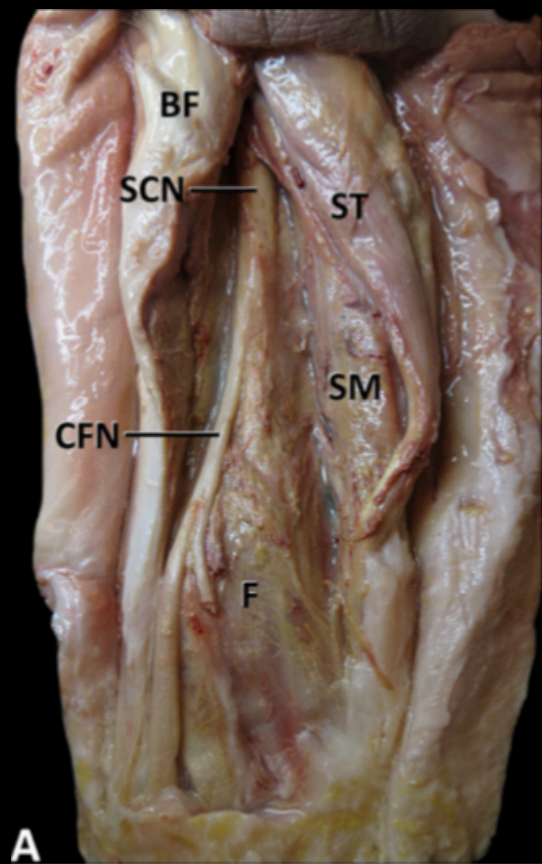
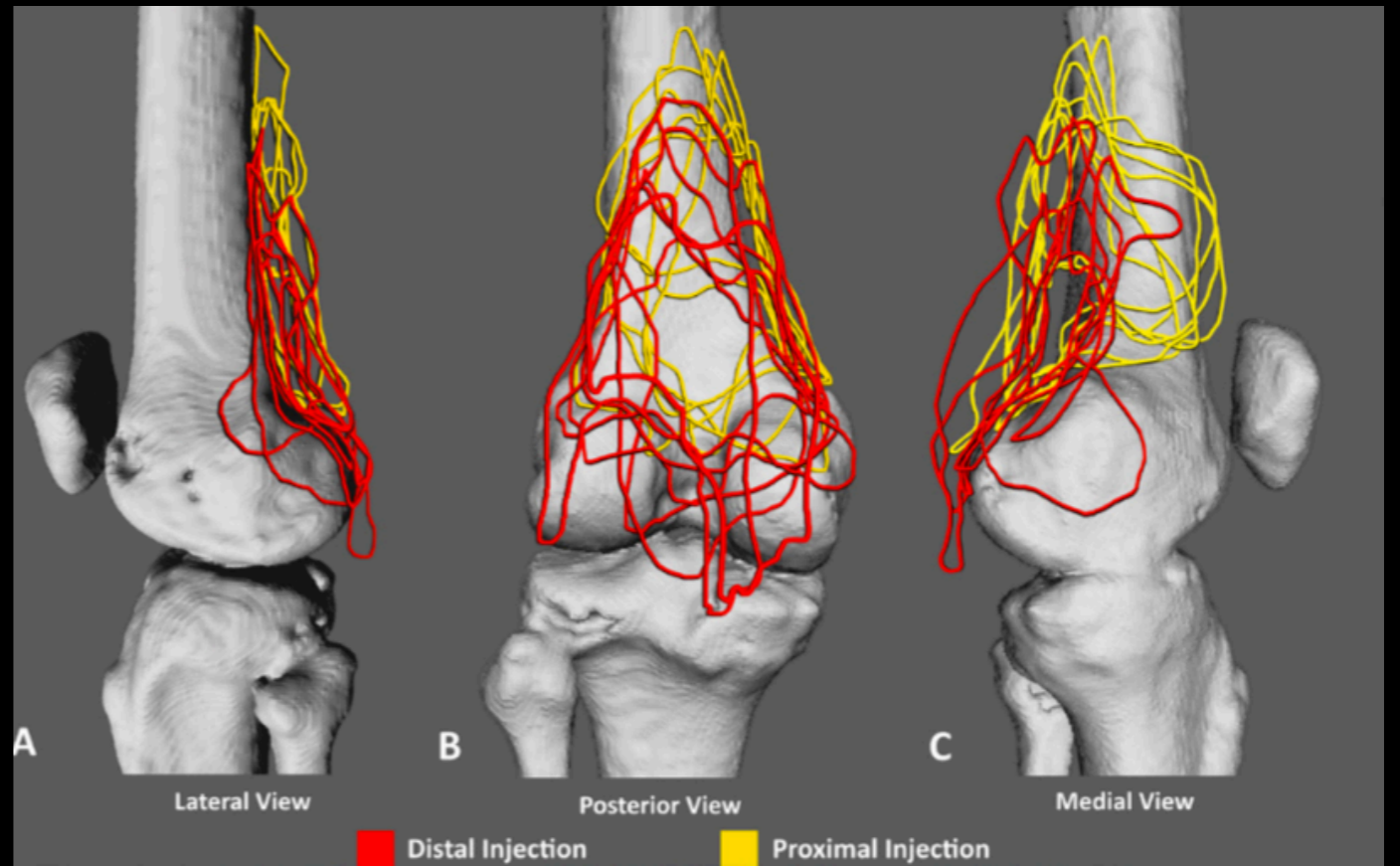
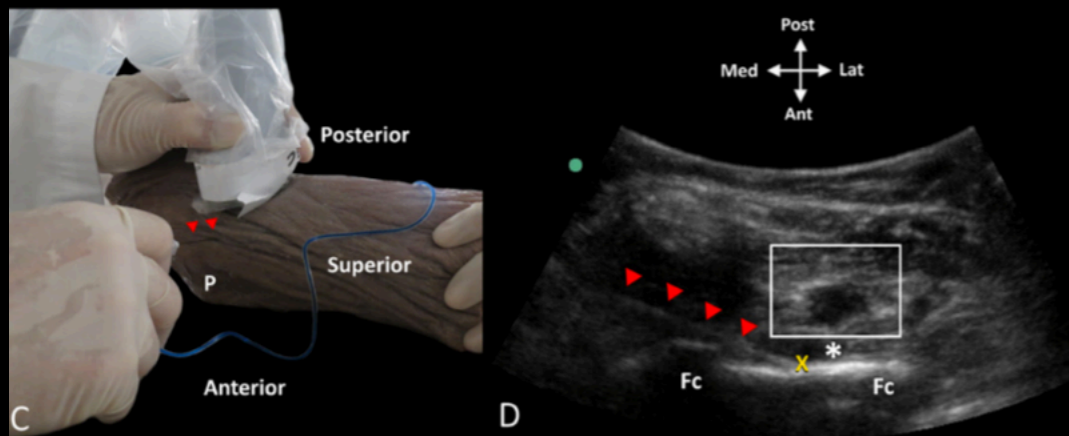
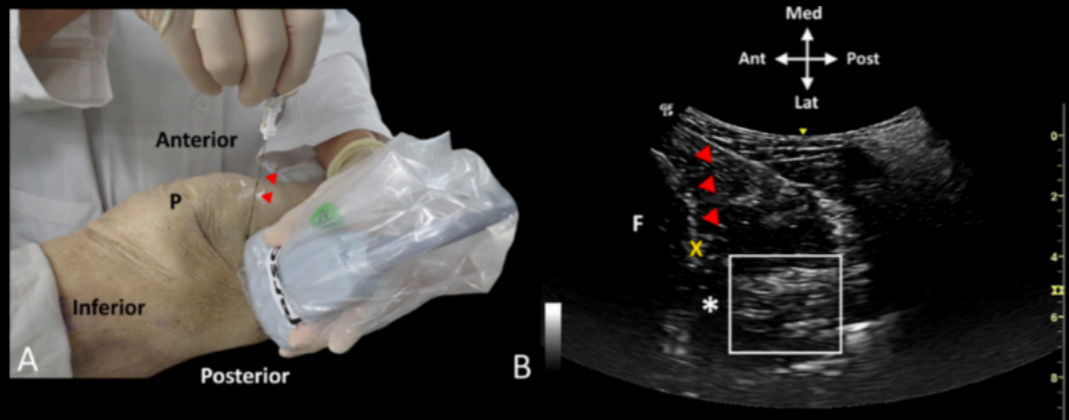






- Posterior br. common fibular/sciatic n.
- Posterior div. obturator n.
- Superior br. tibial n.
- Inferior br. tibial n.









Gen MB

Nrv  
C60



94%

MI  
0.6

TIS  
0.1

- 
- 1 —
- 2 —
- 3 —
- 4 —
- 5 —
- 



- Transducer
- Patient
- Annotate
- Settings
- DR 0
- U/L ●●●●●
- Gen ●●●●●
- Auto Gain

Zoom

SNP ▲

Dual ▲





Gen MB

Nrv

C60



98%

MI

1.1

TIS

0.2

Transducer

Patient

Annotate

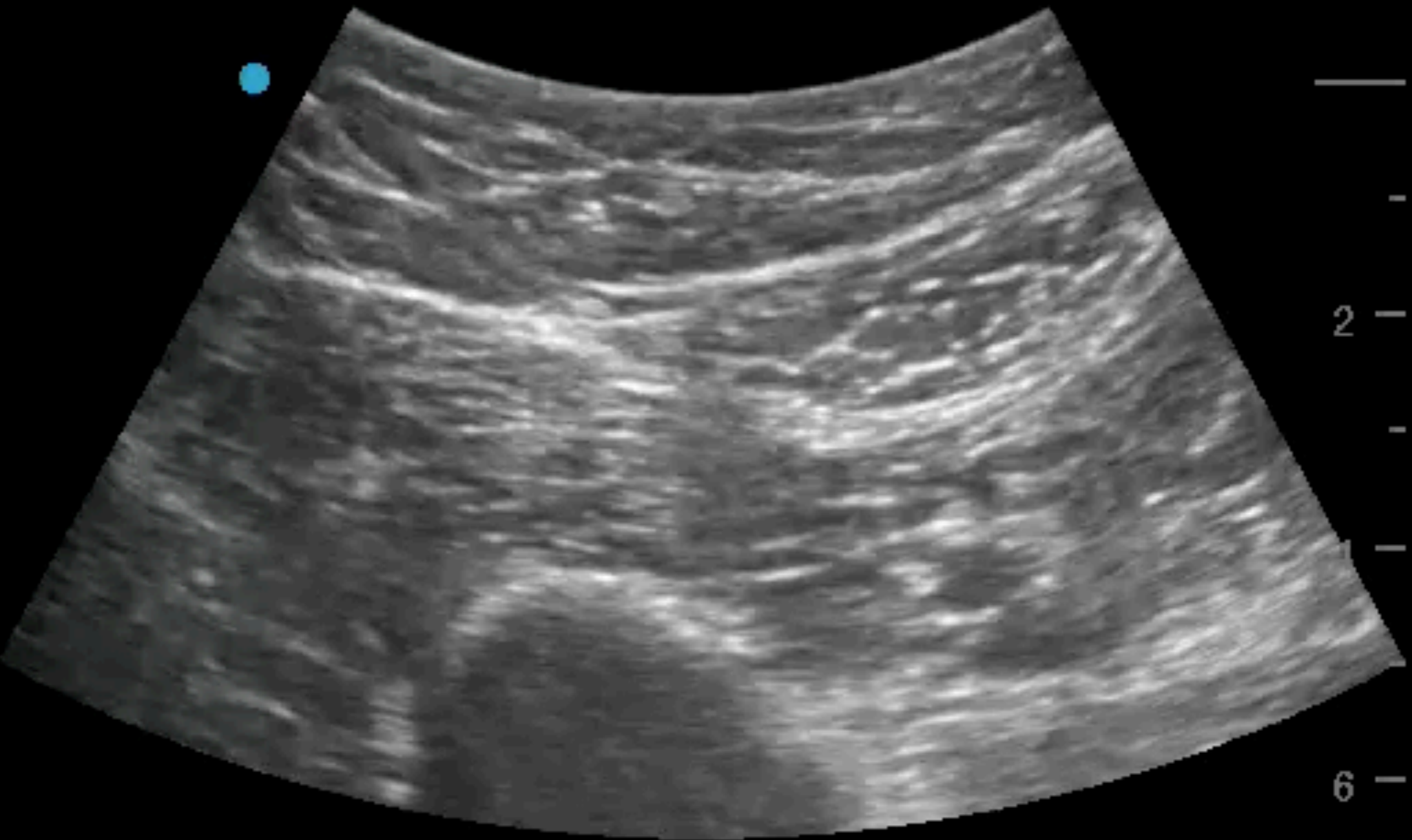
Settings

DR 0

U/L

Gen

Auto Gain



6

Zoom

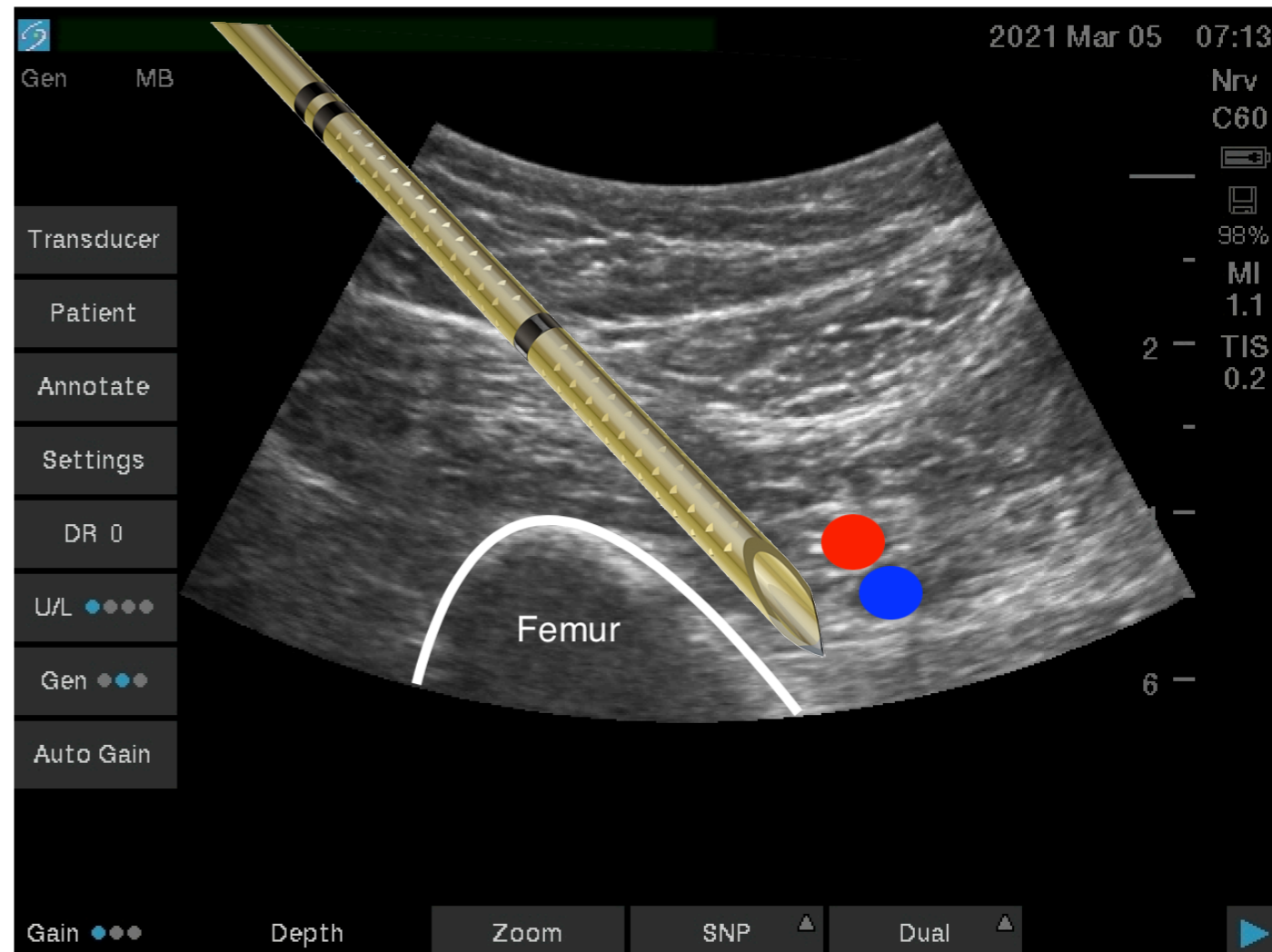
SNP

Dual



# Block Tips

- Abduct and externally rotate leg
- 1st - scan popliteal fossa to find femoral condyles
- 2nd- scan cephalad to shaft of femur
- Inject between femur and popliteal vessels
- Volume: 15-20 mL



# Analgesic efficacy of adding the IPACK block to a multimodal analgesia protocol for primary total knee arthroplasty

Jason Ochroch,<sup>1</sup> Victor Qi,<sup>1</sup> Ignacio Badiola,<sup>1</sup> Taras Grosh,<sup>1</sup> Lu Cai,<sup>1</sup> Veena Graff,<sup>1</sup> Charles Nelson,<sup>2</sup> Craig Israelite,<sup>2</sup> Nabil M Elkassabany<sup>1</sup>

- 119 patients
- ACB + IPACK (20 mL ropiv 0.5%) vs ACB + Sham
- **IPACK block reduced incidence of posterior knee pain 6 hr postop**

# Novel Regional Techniques for Total Knee Arthroplasty Promote Reduced Hospital Length of Stay: An Analysis of 106 Patients

Salman Thobhani, MD,<sup>1</sup> Lauren Scalerio, MD,<sup>1</sup> Clint E. Elliott, MD,<sup>1,2</sup> Bobby D. Nossaman, MD,<sup>1,2</sup> Leslie C. Thomas, MD,<sup>1</sup> Dane Yuratich, MD,<sup>1</sup> Kim Bland, MD,<sup>1</sup> Kristie Osteen, MD,<sup>1,2</sup> Matthew E. Patterson, MD<sup>1,2</sup>

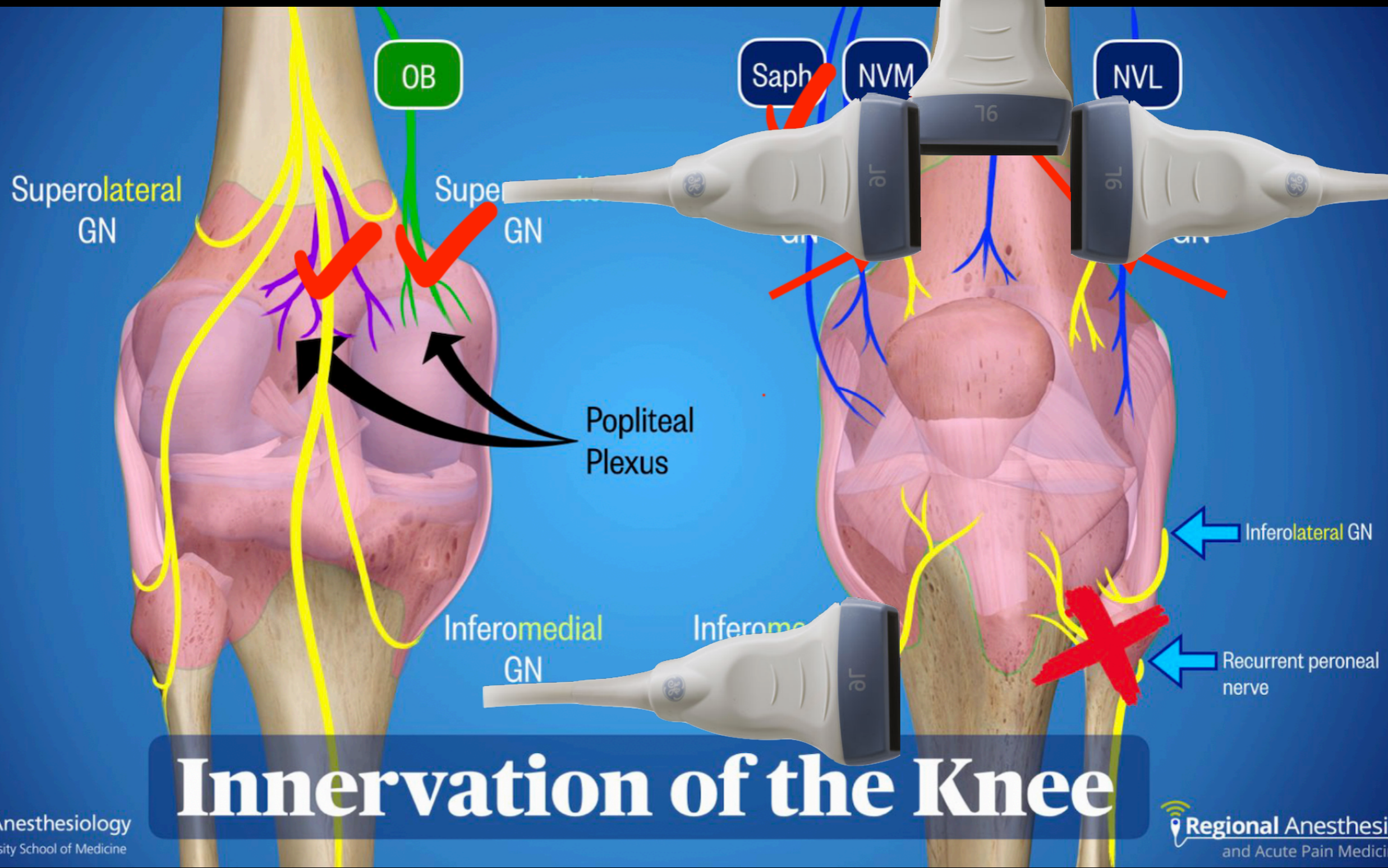
- 106 patients undergoing TKA
- cFNB, cFNB + IPACK, ACB + IPACK: 30 mL ropivacaine 0.25%
- **ACB + IPACK provides adequate analgesia, promotes improved PT, allows earlier hospital discharge than cFNB and cFNB + IPACK**

# Addition of Infiltration Between the Popliteal Artery and the Capsule of the Posterior Knee and Adductor Canal Block to Periarticular Injection Enhances Postoperative Pain Control in Total Knee Arthroplasty: A Randomized Controlled Trial

David H. Kim, MD,\* Jonathan C. Beathe, MD,\* Yi Lin, MD, PhD,\* Jacques T. YaDeau, MD, PhD,\* Daniel B. Maalouf, MD, MPH,\* Enrique Goytizolo, MD,\* Christopher Garnett, BS,\* Amar S. Ranawat, MD,† Edwin P. Su, MD,† David J. Mayman, MD,† and Stavros G. Memtsoudis, MD, PhD\*

- 86 patients undergoing TKA
- PAI only: cocktail of bupivacaine/steroid/cefazolin/NS
- mPAI + IPACK/ACB: ACB 15 mL bupivacaine 0.25% + dex 2 mg, IPACK 25 mL bupivacaine 0.25%
- **Block group had lower pain scores, less opioid consumption, higher satisfaction**

# Geniculars



## Innervation of the Knee

**Easily blocked at femur and tibia with 4 mL of bupivacaine 0.25%**

# Ultrasound-guided genicular nerve blocks following total knee arthroplasty: a randomized, double-blind, placebo-controlled trial

Milly Rambhia,<sup>1</sup> An Chen,<sup>1</sup> Amanda H Kumar,<sup>2</sup> W Michael Bullock ,<sup>2</sup>  
Michael Bolognesi,<sup>3</sup> Jeffrey Gadsden <sup>2</sup>

- 40 patients, all received multimodal analgesia, SAB, AC catheter, IPACK block
- Genicular nerve blocks (SL, SM, IM) with 15 mL bupivacaine 0.25% + dexamethasone 2 mg vs saline
- **Opioid consumption at 24 hr was reduced by 60% in genicular block group**





Res MB

Transducer

Patient

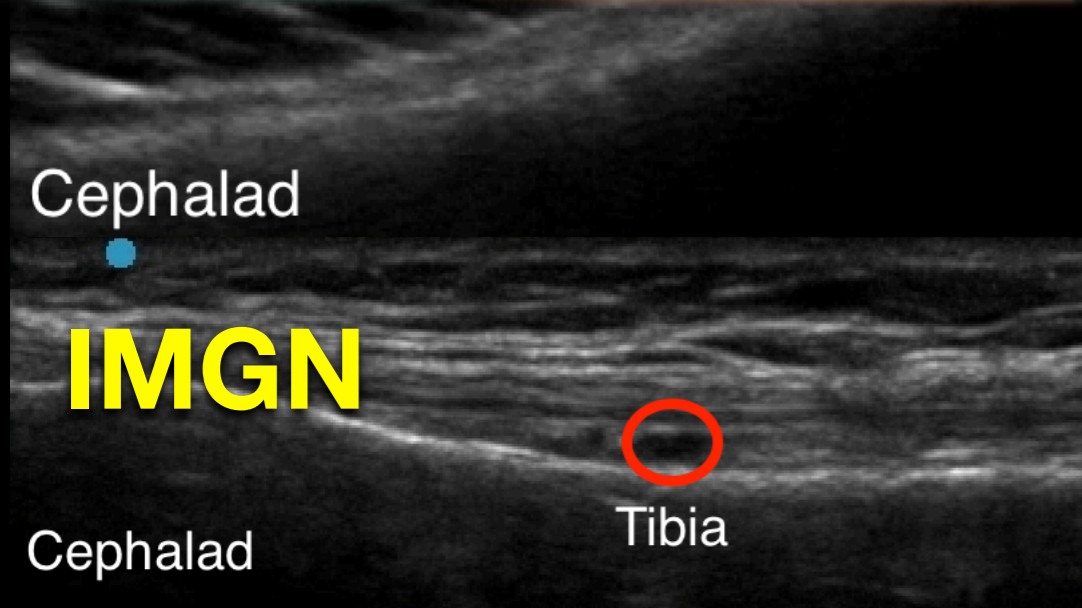
Annotate

Settings

DR 0

U/L ●●●●

Res ●●●



Res MB

Transducer

Patient

Annotate

Settings

DR 0

U/L ●●●●

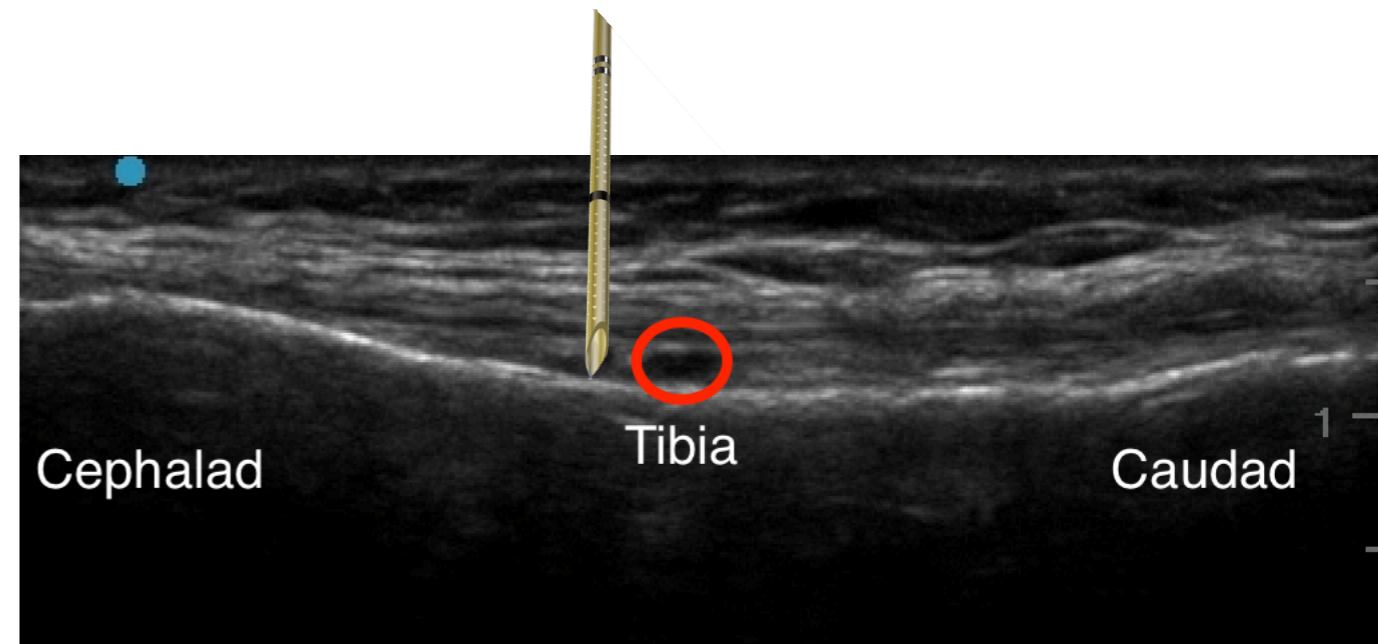
Res ●●●

Auto Gain



# Block Tips

- Knee slightly flexed
- Identify metaphysis, may identify genicular artery
- Inject on bony contact next to artery
- Volume: 5 mL each injection



# Intraoperative Anesthesia

- Spinal
  - Drug (bupivacaine vs chloroprocaine vs mepivacaine)
  - Sedation
- General
- Combination
- Opioid-sparing
- Dexamethasone

# 2-Chloroprocaine for SAB

- 30-60 mg most common in literature
- Less intraop hypotension, lower EBL, shorter LOS compared to bupivacaine  
Herndon C, et al. Arthroplasty Today 2020;6:305-308
- Time to ambulation and micturition significantly shorter than bupivacaine  
Lacasse MA, et al. Can J Anesth 2011;58:384-391
- No incidence of TNS, neuropraxia, or urinary retention  
Kim D, et al. HSS J. 2021;16:280-284

# Mepivacaine for SAB

- 30-60 mg most common in literature
- Shorter time to ambulate and LOS vs bupivacaine
- Decreased time to void Mahan C, et al. J Arthroplasty 2018;33(6):1699-1704  
Calkins T, et al. J Arthroplasty xxx (2021):1-5
- No differences in TNS vs bupivacaine Schwenk E, Anesthesiology 2020:133(4):801-811
- Increased pain in early postop period - clinically significant? Schwenk E, Anesthesiology 2020:133(4):801-811

Winner of the Clinical Award

## Dexamethasone Reduces Length of Hospitalization and Improves Postoperative Pain and Nausea After Total Joint Arthroplasty A Prospective, Randomized Controlled Trial

Jeffrey R. Backes, MD <sup>a</sup>, Jared C. Bentley, MD <sup>a</sup>, Joel R. Politi, MD <sup>a,b</sup>, Bryan T. Chambers, MD <sup>a,b</sup>

- 120 patients undergoing TJA
- Control, dex intraop 10 mg, dex intraop 10 mg + postop (24 h) 10 mg
- **Dex reduced rescue anti-emetic and analgesic meds, superior VAS nausea and pain scores, ambulated further, shorter LOS (3 vs 3.97 d)**
- **24 h postop dose provided significant pain and nausea control and further reduced LOS (2.57 d)**
- No adverse effects in either group

# Postop Pain Management

- Adductor canal or femoral triangle block/catheter
- IPACK (especially if no LIA)
- Genicular nerve blocks
- Acetaminophen/celexocib/gabapentin
- Oral opioid if needed



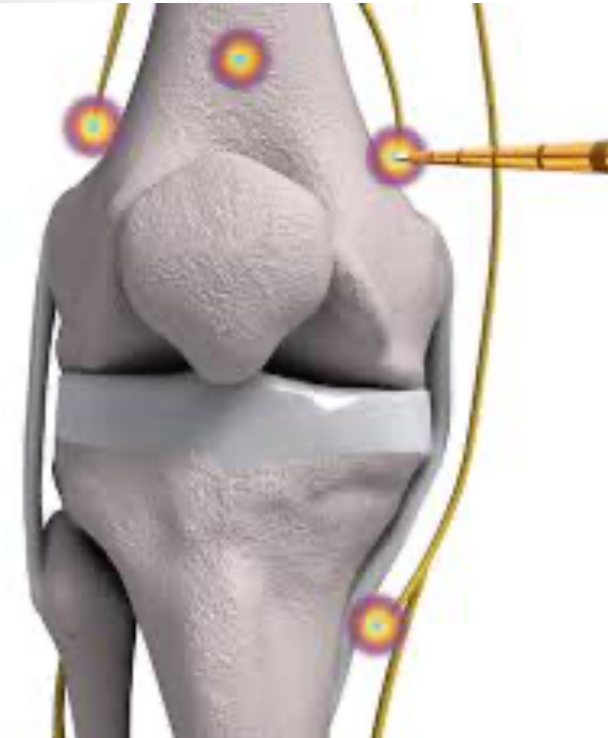
# Our Protocol

- Periop acetaminophen 1000 mg & celecoxib 200 mg
- Preop femoral triangle catheter + IPACK + geniculars
- Spinal
- Intraop dexamethasone (10 mg) + 24 h postop (10 mg)
- Femoral triangle catheter x 4 days (ropivacaine 0.2% @ 8 mL/h)
- Oxycodone 5-10 mg PRN every 4 hrs for moderate to severe pain



# Considerations

- Local infiltration by surgeon
  - Liposomal bupivacaine (Exparel)
- Intrathecal narcotic
- Cryotherapy (Iovera)
- Radiofrequency ablation
- Duration of multimodal analgesia



# Clinical Pearls

- Multidisciplinary approach
- Medically optimize patient
- Education
- Anesthetic technique
- Multimodal analgesia

# Thank You

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**garner.shaned@gmail.com**