

Advances in Regional Anesthesia for Orthopedics:

New Blocks and New Tricks for Old Blocks

Shane Garner, CRNA

Disclosures

- None

Enhanced Recovery After Surgery (ERAS)

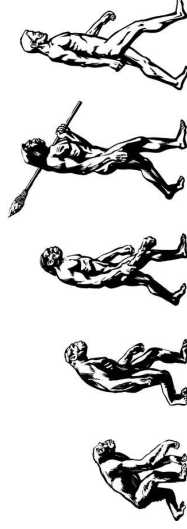
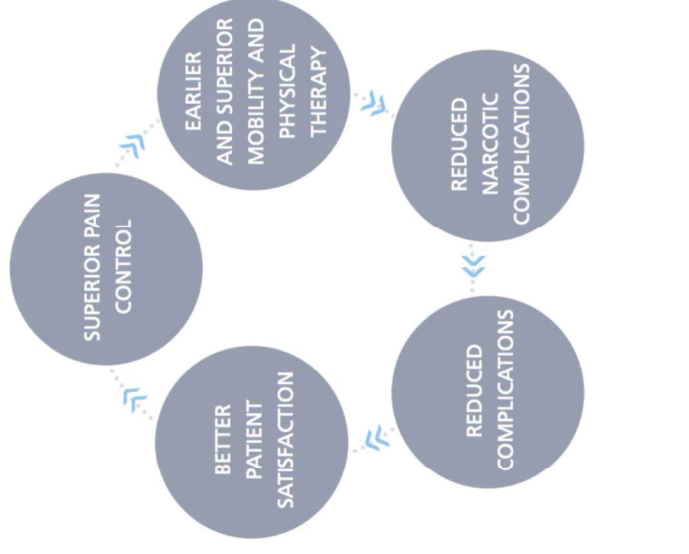
Multimodal, opioid-sparing techniques

- NSAIDs, acetaminophen, gabapentin, opioids - Side effects?
- Epidurals/intrathecal narcotics - Delay discharge?
- Local infiltration analgesia (LIA) - Inconsistent and short-lived?
- Peripheral nerve blocks/catheters -



Regional Anesthesia - Creating Value

- Improved quality of analgesia and patient satisfaction
- Reduced PACU stays and post-op cognitive dysfunction/delirium
- Early rehabilitation
- Fewer complications
- Cost savings
- Constantly evolving techniques



Regional Anesthesia - Utilization

Use of Regional Anesthesia for Outpatient Surgery Within the United States: A Prevalence Study Using a Nationwide Database

Rodney A. Gabriel, MD,*† and Brian M. Ifield, MD, MS (Clinical Investigation)*

Peripheral nerve block use in inpatient and outpatient shoulder arthroplasty: a population-based study evaluating utilization and outcomes

Jimmy J Chan,¹ Carl M Cirino ,¹ Lully Vargas,¹ Jashvant Poeran ,² Nicole Zubizarreta,² Madhu Mazumdar,² Leesa M Galatz,¹ Paul J Cagle¹

Regional anesthesia is underutilized

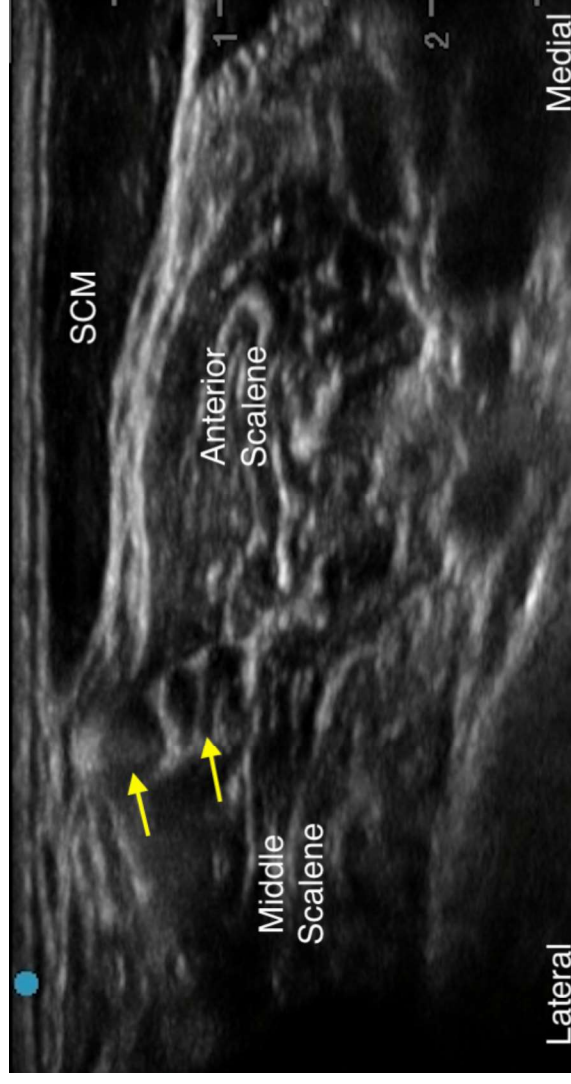
- 25.5% of cases were amenable to a PNB
- *Overall PNB frequency was only 3.3% of possible cases, shoulder arthroscopies 41%, ACLR 32%*
- Brachial plexus > sciatic nerve > femoral nerve
- Significant increase in overall PNB utilization

19.1% inpatient

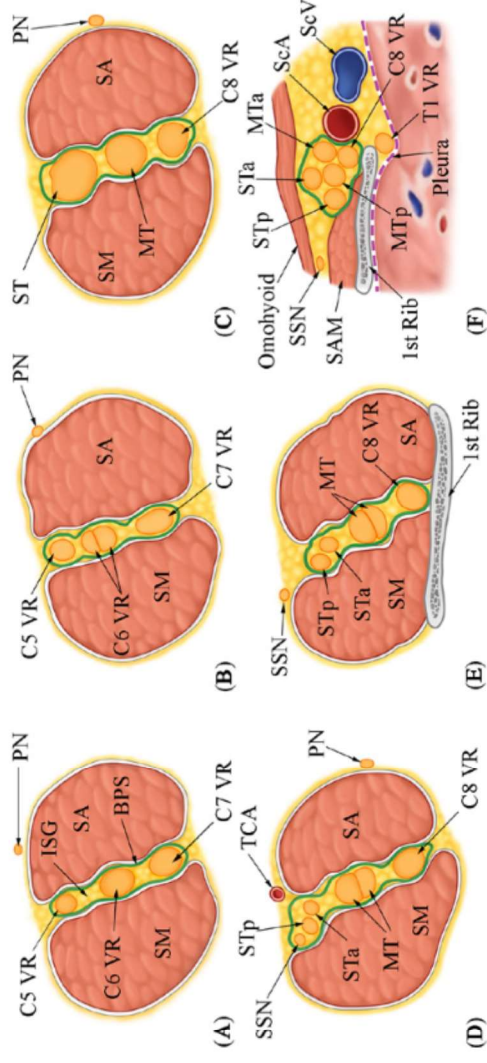
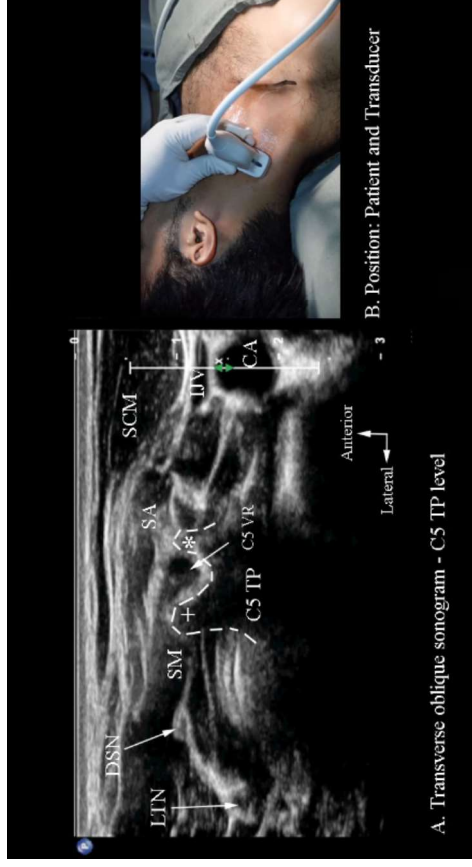
20.8% outpatient

Brachial Plexus Imaging

- Evolution from blindly injecting 30-40 mL into the neck to using ultrasound to visualize individual nerves and anesthetize with lower volumes
- Greater margin of safety
- ***Closer is not always better***



Brachial Plexus Imaging



- High-quality US imaging and cadaver studies have allowed us to visualize and study specific components of the brachial plexus
- This has lead to a plethora of new techniques

Brachial Plexus - New Block Techniques

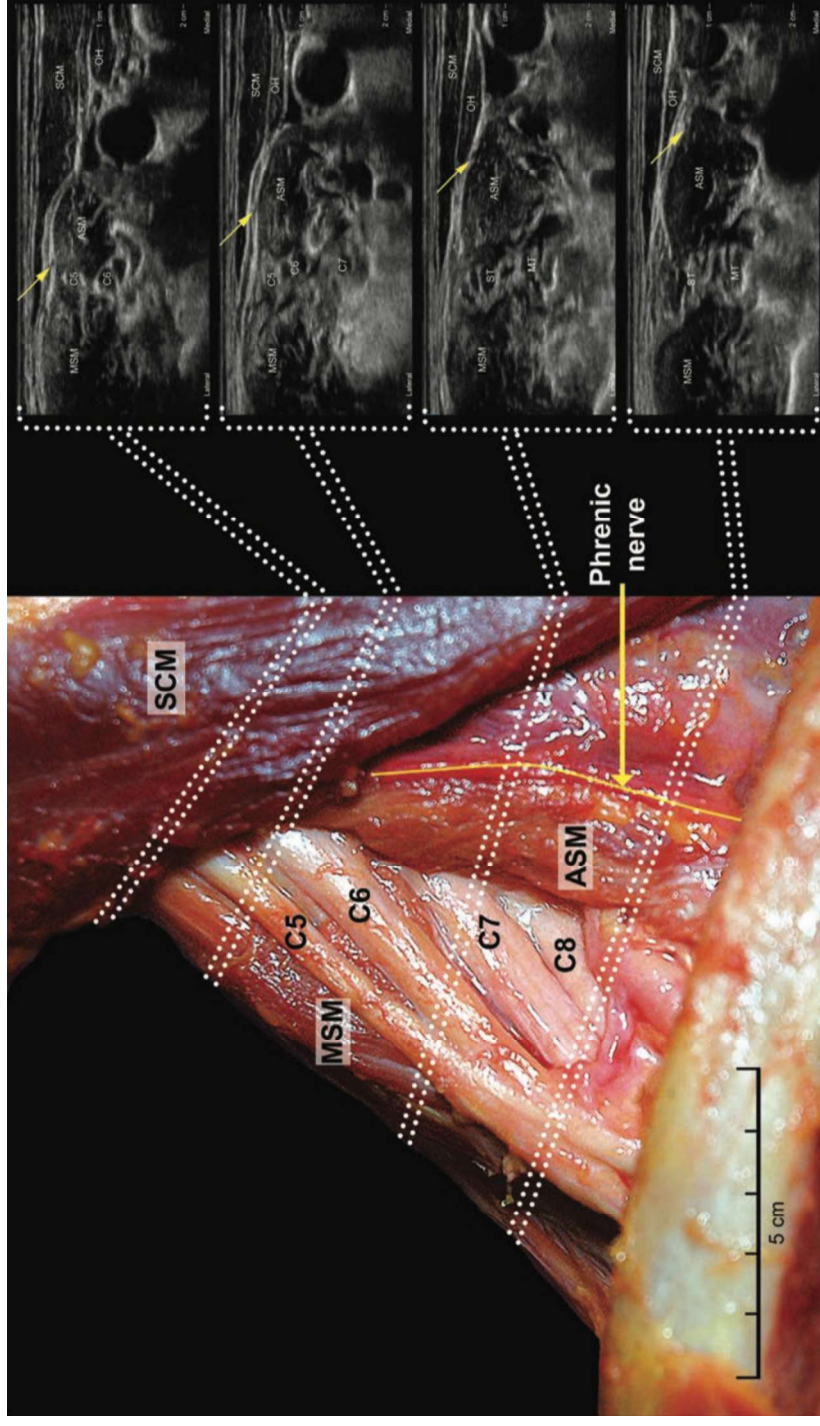
- Superior trunk
- Anterior suprascapular
- Posterior suprascapular and selective axillary, aka “the shoulder block”
- Costoclavicular
- Over-the-needle catheters
- Ideal local anesthetic volume while avoiding/minimizing side effects extensively studied

Avoiding Phrenic Nerve Palsy

Difficult to do with interscalene block

- Smaller volumes (< 10 mL) and distal techniques reduce PhN palsy

- Safety = combined suprascapular and axillary blocks



Avoiding Phrenic Nerve Palsy



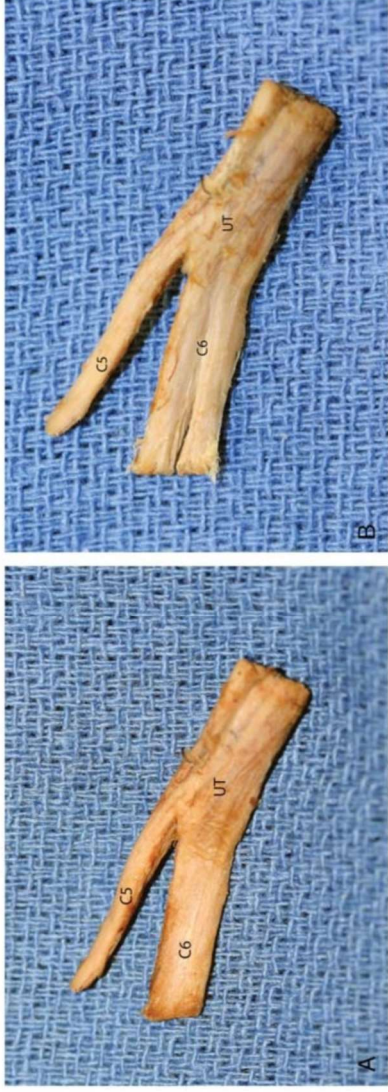


FIGURE 7. C5 to C6 roots forming upper trunk (UT), left side. A, With intact epineurium. B, After partial removal of the epineurium.

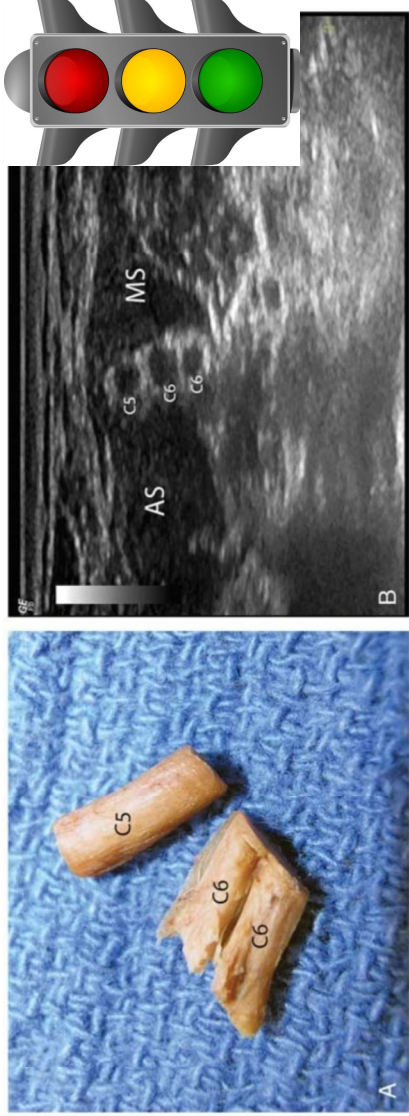
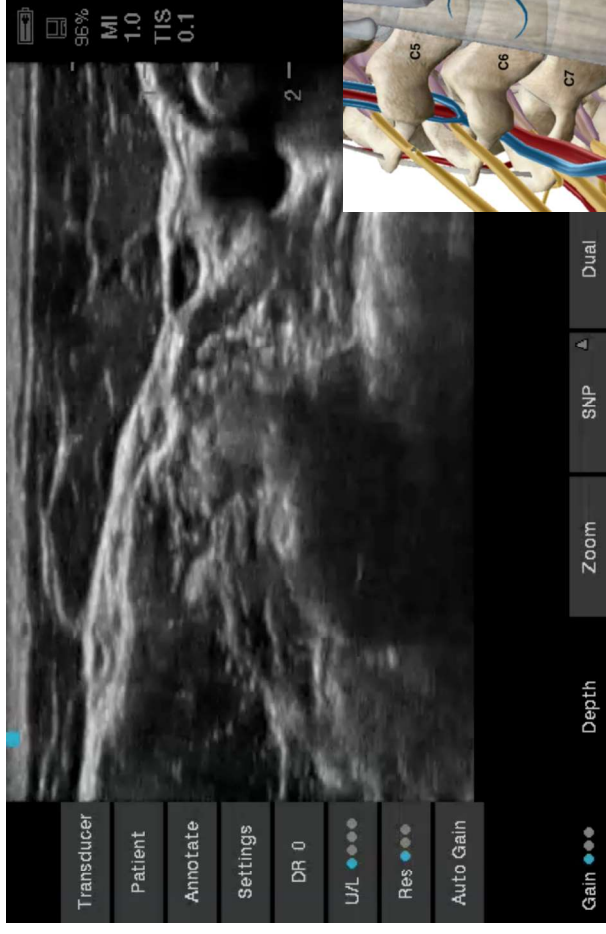


FIGURE 9. Ultrasound-anatomy correlation of the stoplight sign. A, Depiction of a short segment of roots of C5 and C6 as they converge to form the upper trunk (UT). The splitting of C6 is clear after removal of the epineurium. B, Ultrasound image depicting the stoplight sign formed by 3 hypoechoic dots between the anterior scalene (AS) and the middle scalene (MS) muscles.

***Do not stick your needle
between a split C6!***



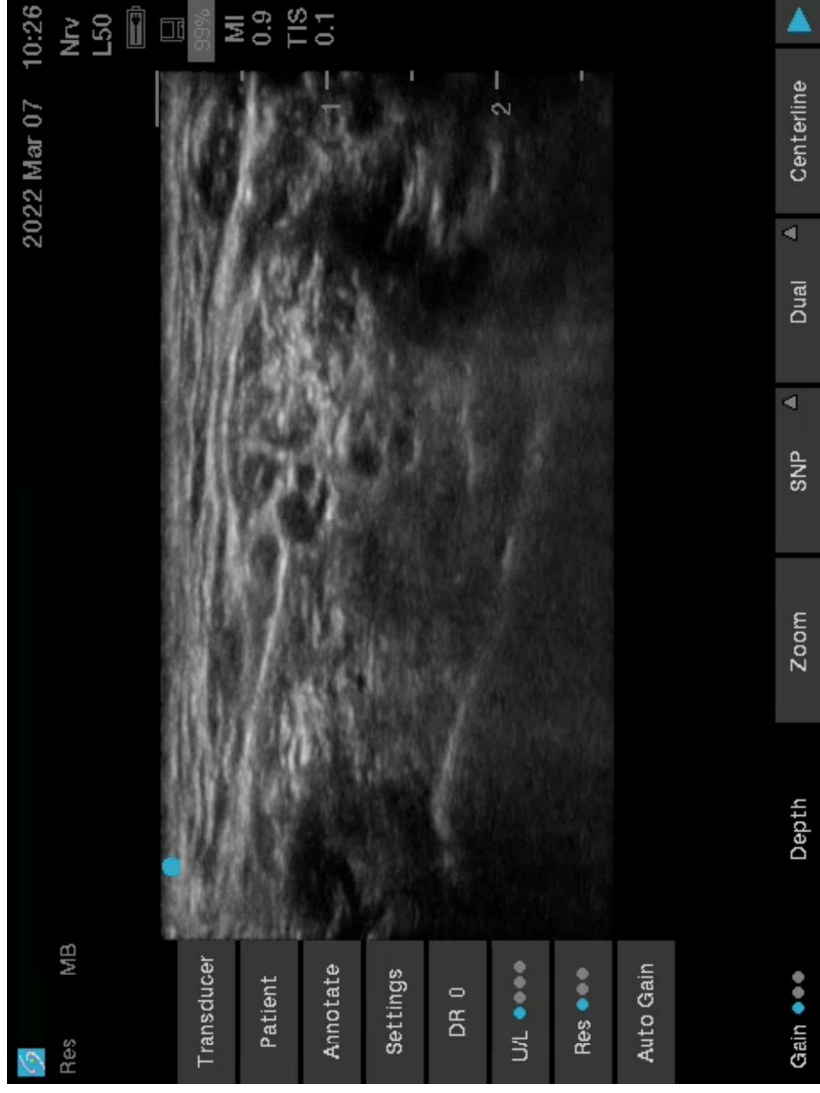
- 20 dissections of the brachial plexus in 10 cadavers
- C5 root is significantly smaller than either C6 or C7
- C6 and C7 frequently present visible intraroot splitting
- C5 and C6 present frequent variations in their relationship with the scalene muscles
- ***The “stoplight” sign is a combination of C5 and a split of C6***

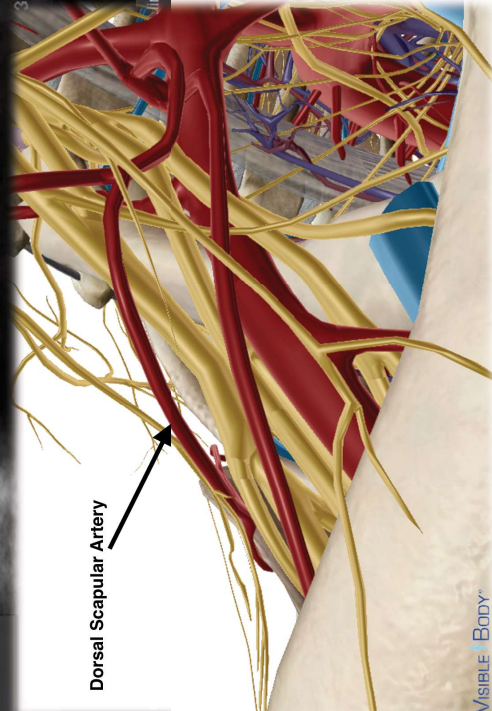
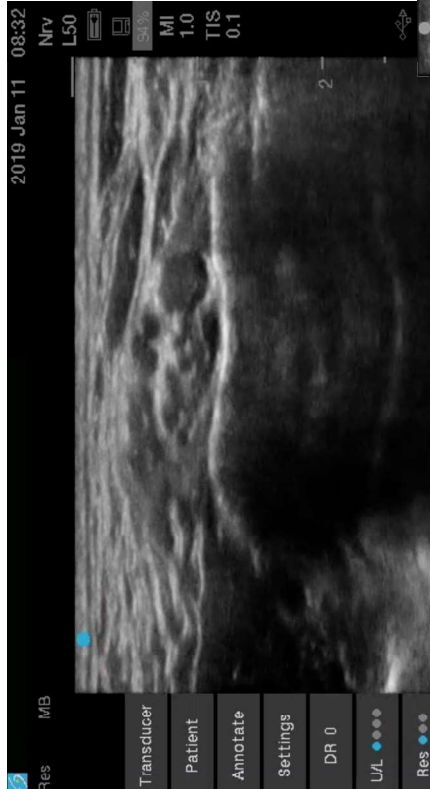
Close Enough?

Intrafascial injection between C5 and C6 vs extrafascial injection 4 mm lateral to BP sheath

- 20 mL bupivacaine 0.5% with epi 1:200k

HDP 90% vs 21%, similar analgesia





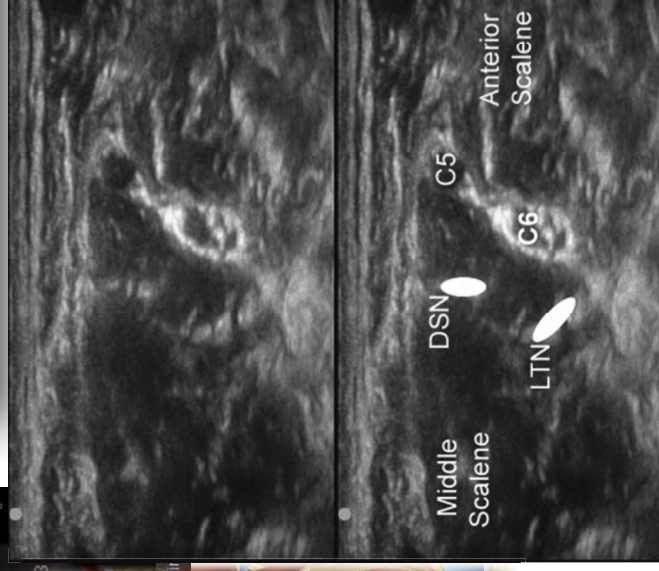
**Be aware of nerves
and vessels**

BRIEF TECHNICAL REPORT

Systematic Ultrasound Identification of the Dorsal Scapular and Long Thoracic Nerves During Interscalene Block

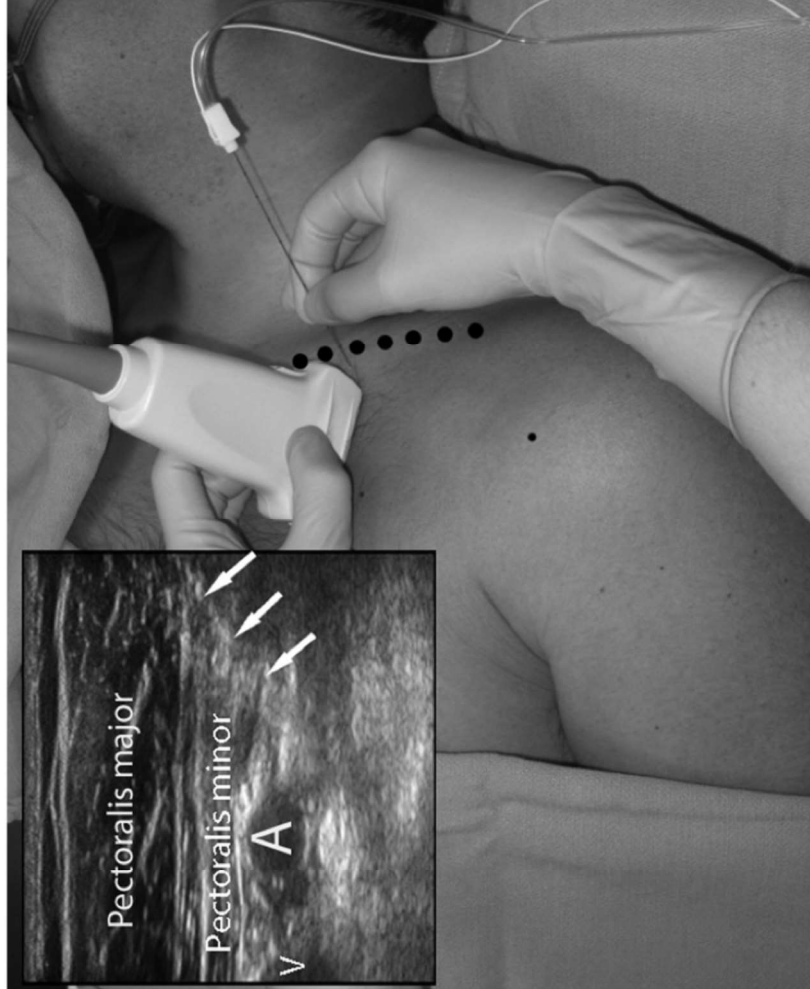
Neil A. Hanson, MD and David B. Auyong, MD

- 50 patients undergoing shoulder surgery
- US assessment of DSN (rhomboids/levator scapulae) and LTN (serratus anterior) before block placement
 - If nerves identified, they were stimulated to confirm nerve
- **90% had a nerve visible under US within or superficial to the MSM**
 - Stimulation identified DSN (77%) or LTN (23%)



Infraclavicular - “Houdini clavicle”

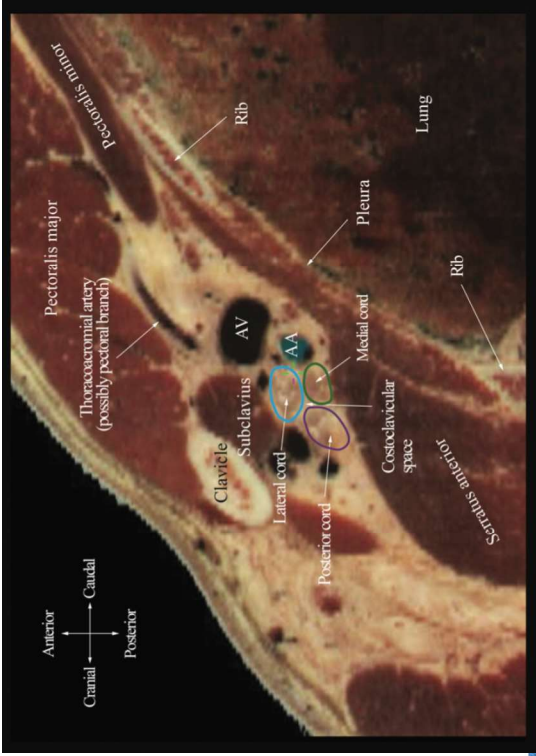
*Displaces clavicle and
buys more real estate for
shallower needle angle*



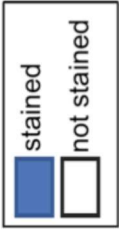
Costoclavicular

- Targeting cords immediately distal to clavicle
- ***Cords are superficial (compared to paracoracoid infraclavicular approach), clustered together just lateral to the vessels, and share consistent triangular arrangement***
 - Advantages for catheter insertion and obese patients
- Able to cover all 3 cords with less volume and a single needle pass
 - Literature describes typical range of volumes as other brachial plexus blocks
- No significant differences when compared to traditional paracoracoid approach

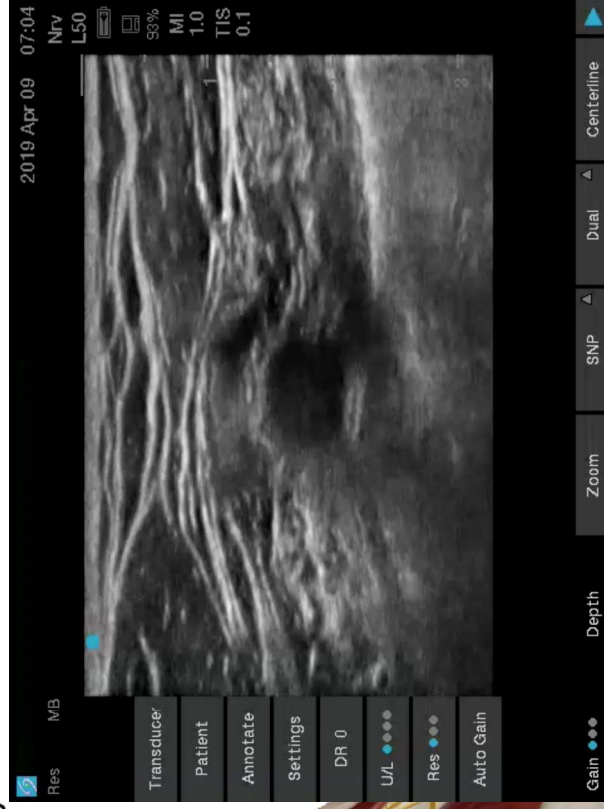
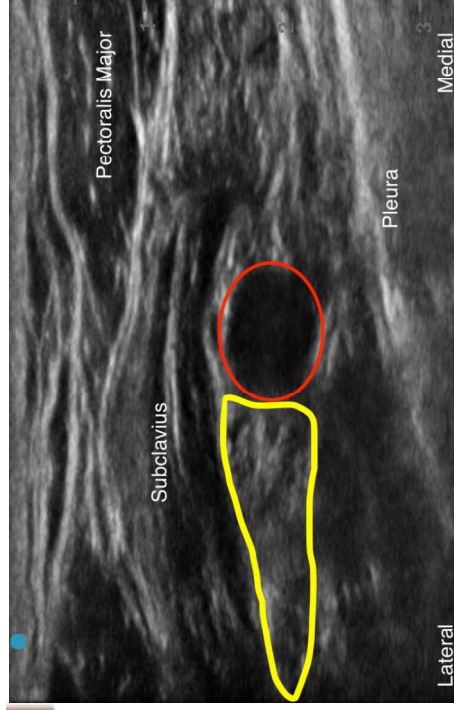
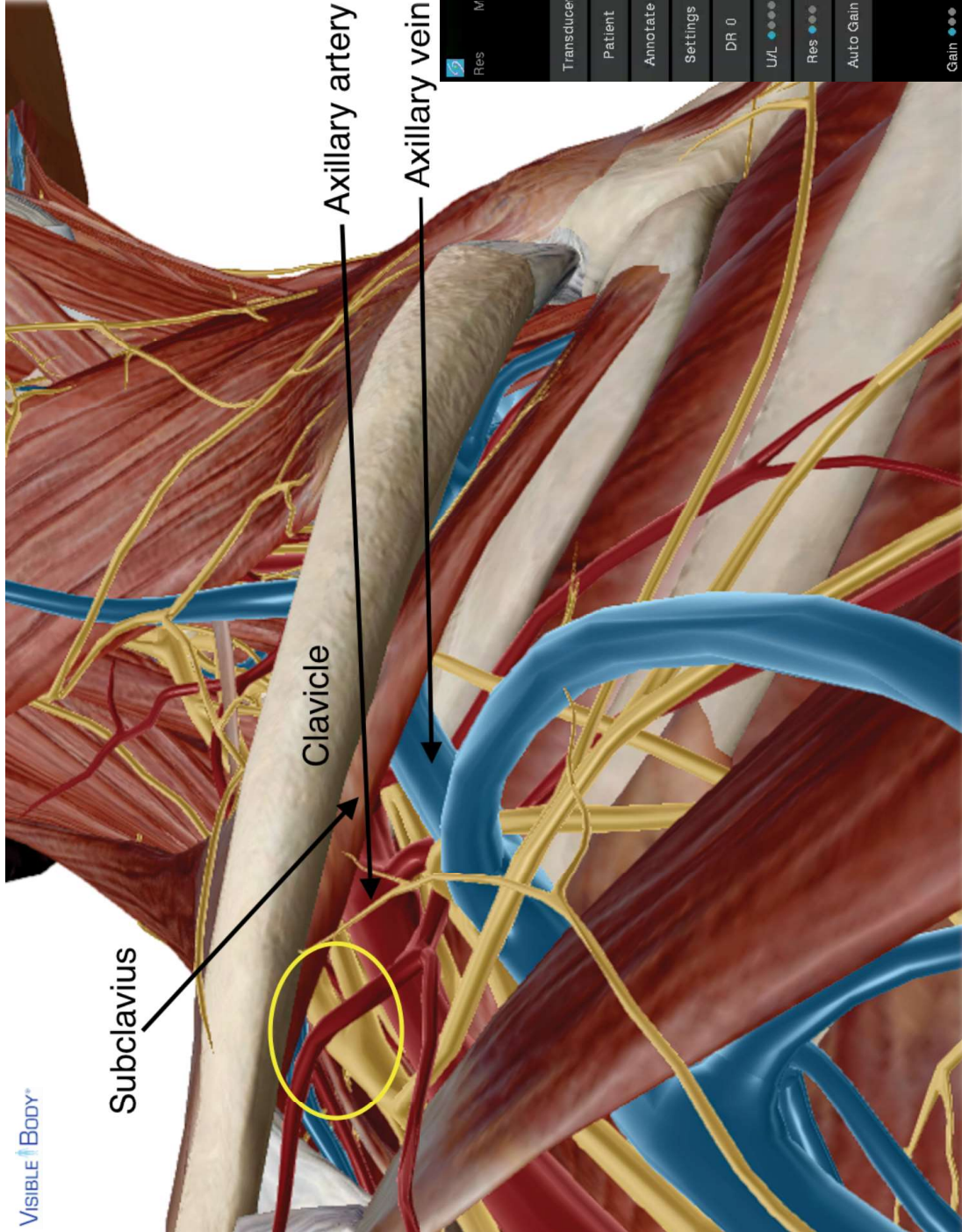




	Injection	1	2	3	4	5
ROOTS	C5-C6					
	C7-T1					
TRUNKS	Superior					
	Middle					
	Inferior					
Suprascapular nerve						
CORDS	Lateral					
	Medial					
	Posterior					
BRANCHES	Axillary					
	Radial					
	Ulnar					
	Musculocutaneous					
	Median					
	Phrenic nerve					



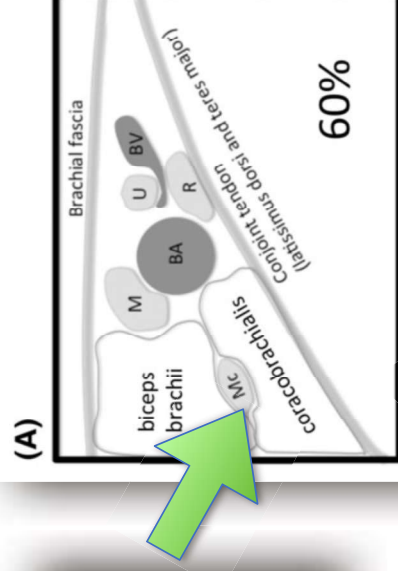
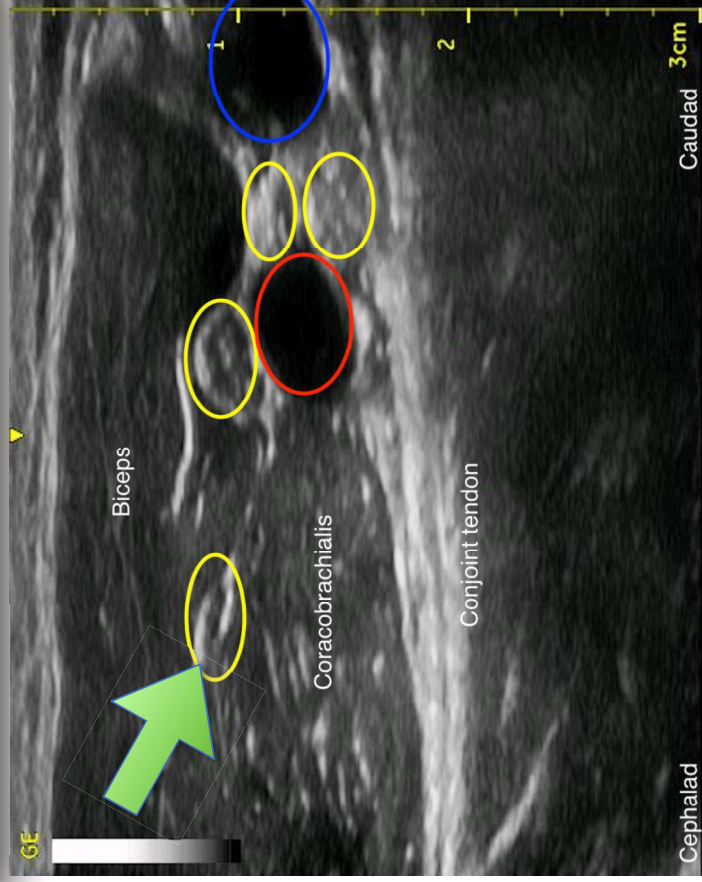
**20 mL of 0.1%
methylene blue**



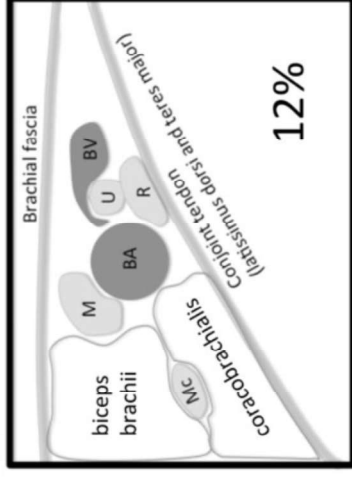
ORIGINAL COMMUNICATION

Patterns of Distribution of the Nerves Around the Axillary Artery Evaluated by Ultrasound and Assessed by Nerve Stimulation During Axillary Block

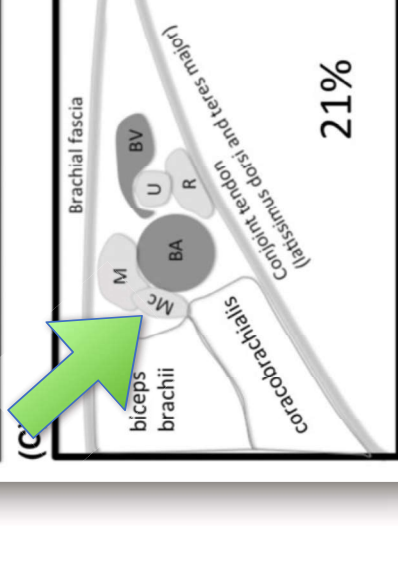
SARA GILL,¹ ANGELICA ABREO,² MIGUEL GÓMEZ-FERNÁNDEZ,³ ROMA SOLÀ,⁴ CARLOS MORROS,⁵ AND XAVIER SALA-BLANCH^{6*}



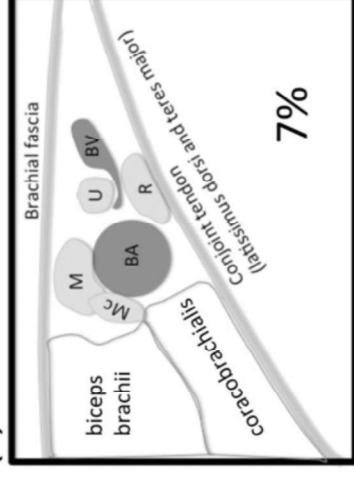
(A)



(B)



(C)



(D)

Musculocutaneous nerve was close to artery in 28%, verify its course so you don't miss it

Intercostobrachial Nerve

- Lateral cutaneous branch of T2
- Innervates skin of the axilla and medial aspect of proximal arm, often interconnected with MBCN
- ***Not covered by brachial plexus block techniques***
- Indicated for upper medial arm (AV fistula, biceps tenodesis) and elbow surgery
- Traditionally blocked with blind infiltration

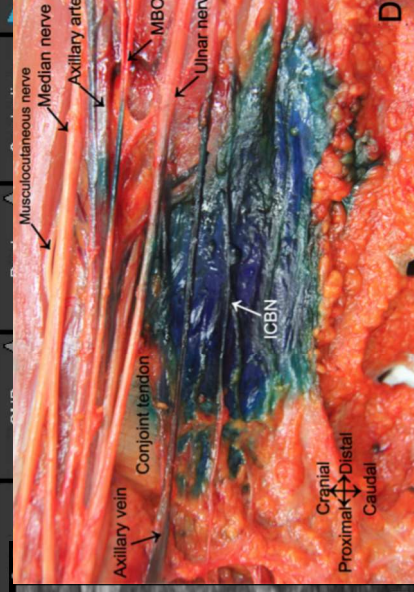
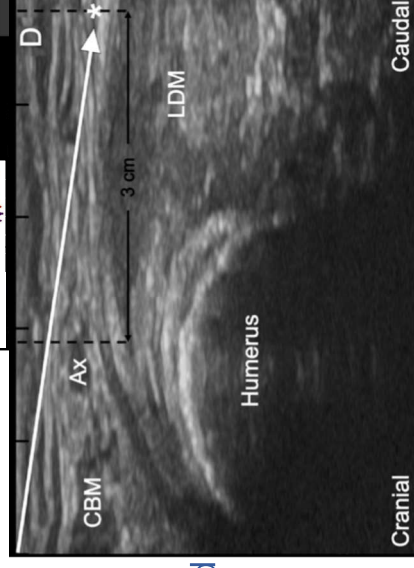
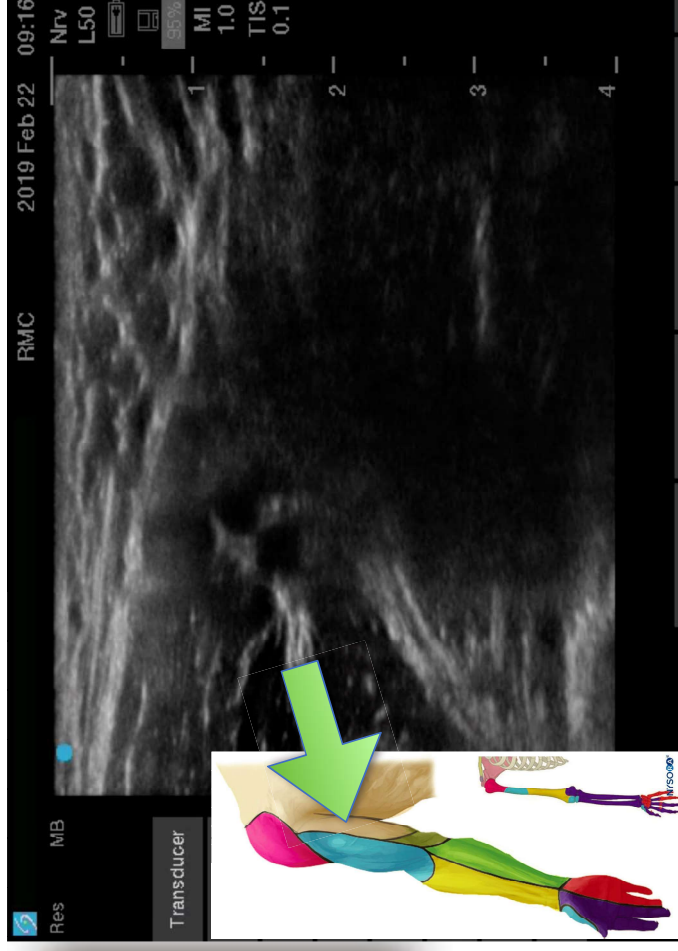


Ultrasound-Guided Selective Versus Conventional Block of the Medial Brachial Cutaneous and the Intercostobrachial Nerves *A Randomized Clinical Trial*

Philippe Magazzeni, MD,* Denis Jochum, MD,† Gabriella Iohom, MD,‡ Gérard Mekler, MD,*
 Eliane Albuissou, MD, PhD,§ and Hervé Bouaziz, MD, PhD*

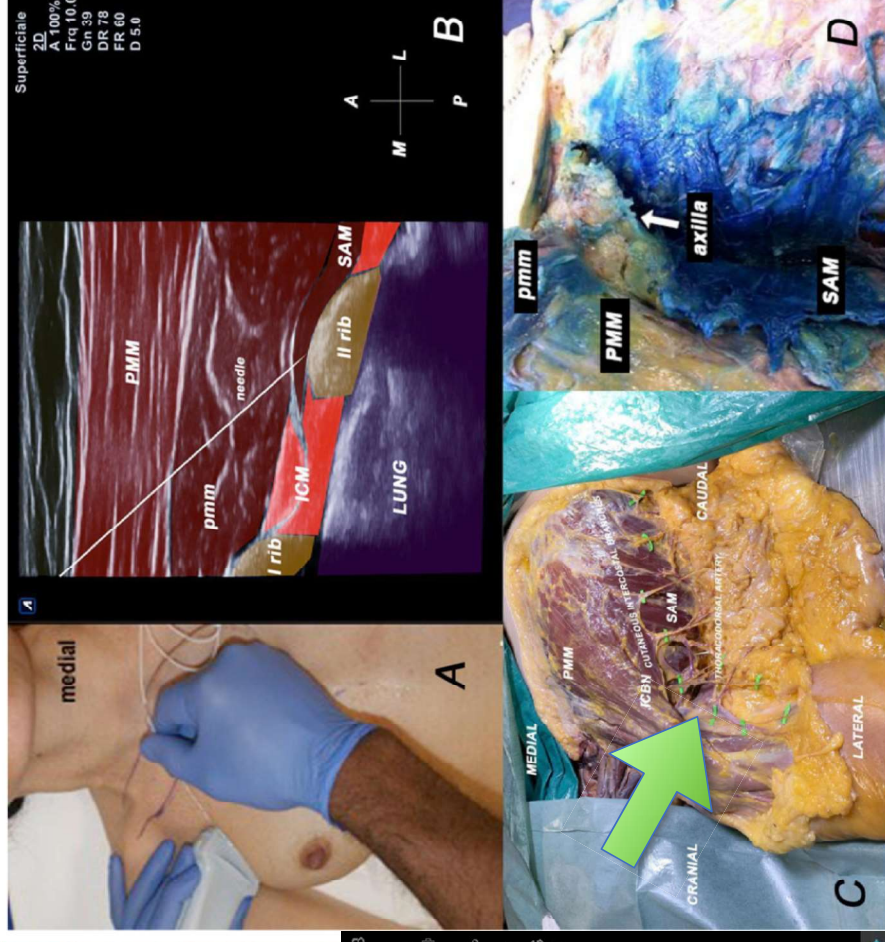
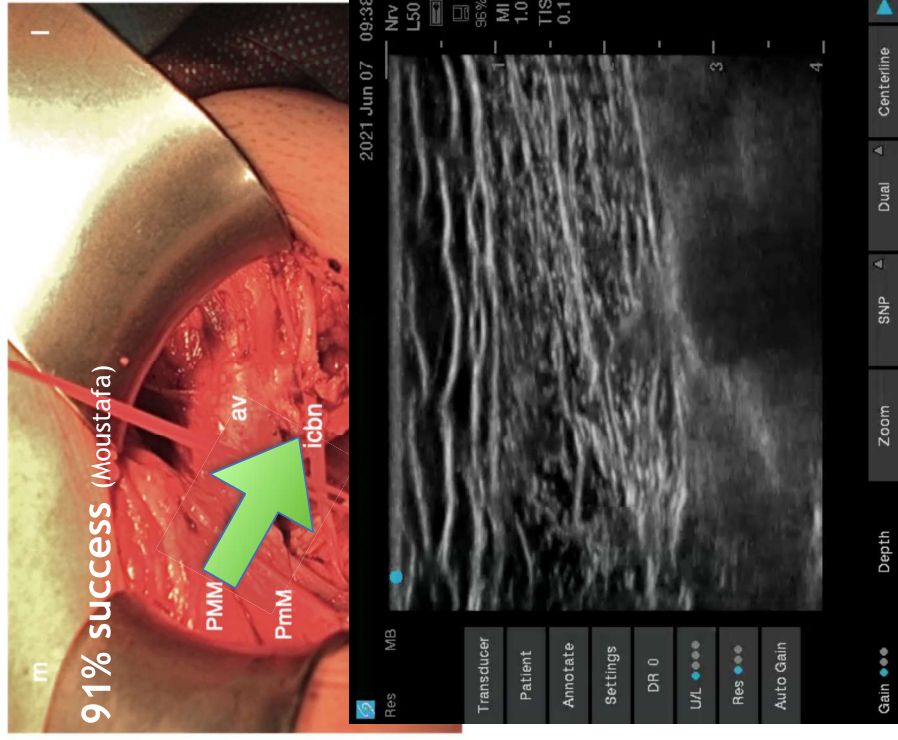


- 84 patients undergoing upper limb surgery
- 5 mL of LA infiltrated blindly subQ vs USG injection around MBCN and ICBN or subQ injection above brachial fascia with a posterior direction (if nerves not visible)
- **USG 88% no sensation at 20 min vs conventional 19%**



Intercostobrachial Nerve Block at 2nd Rib

***10 mL
off 2nd
rib or
between
PmM
and
SAM***



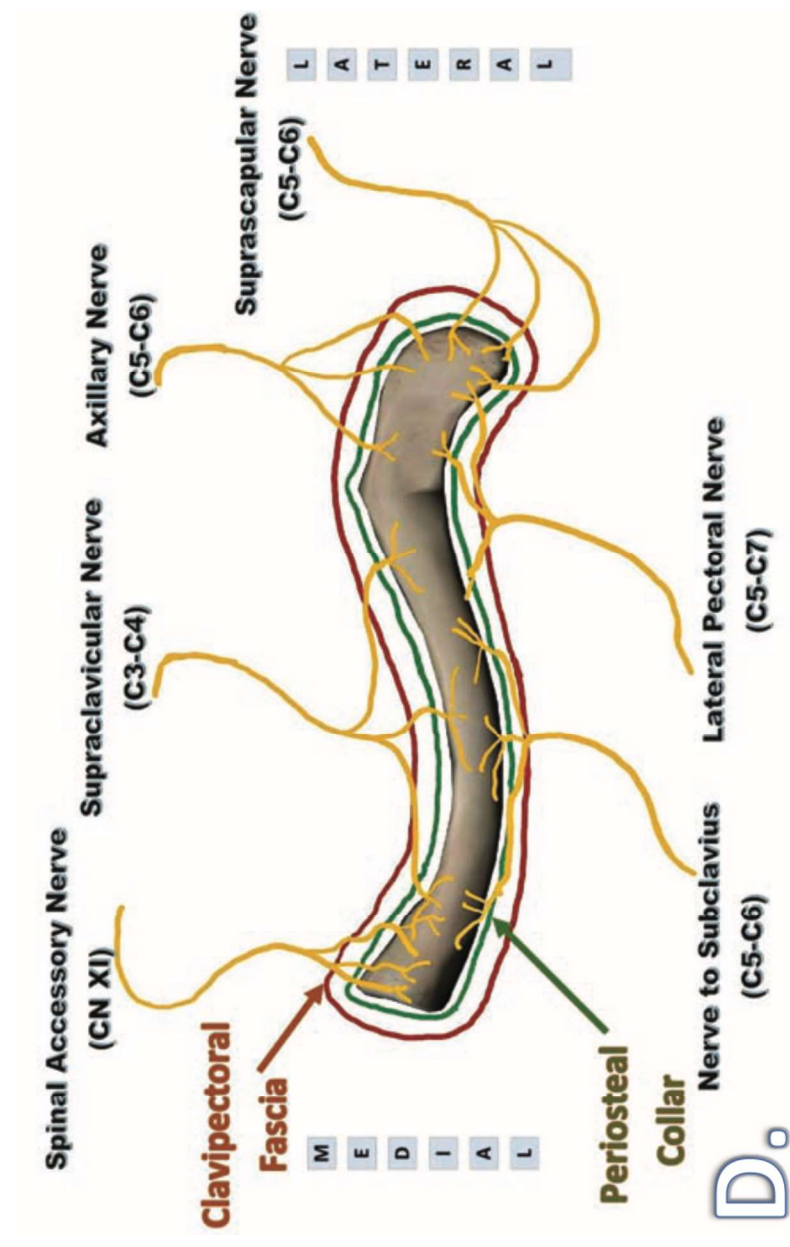
Clavicle Fractures

- Type I involves middle third of the clavicle (75%)
- Type II involves lateral third of the clavicle (20%)
- Type III involves medial third of the clavicle (5%)
- Most clavicle fractures can be treated conservatively as most with significant deformity (>90%) unite despite displacement
- ***Complex sensory innervation derived from the cervical plexus and brachial plexus***
 - *Innervation comes from the anterior rami of C3-C7*

Clavicle Innervation

PNB options

- Superficial cervical plexus block
- Interscalene block
- Selective superior trunk block
- Selective supraclavicular block
- Combination techniques
- **Clavipectoral fascial plane block**
 - Clavipectoral fascia completely surrounds the clavicle and the nerve endings of the clavicle pierce it



Clavipectoral Fascial Plane Block

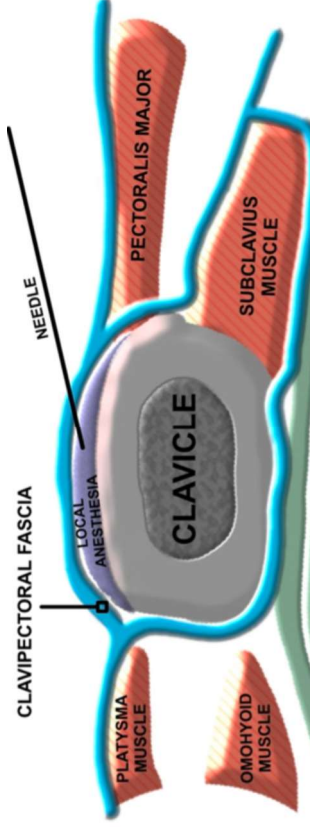
- Able to block all the neural innervation of the clavicle while avoiding brachial plexus side effects

- ***Deposit local anesthetic on the medial and lateral third of the clavicle between the fascia and the periosteum***

- 20-30 mL, add cervical plexus block for skin coverage over clavicle (1st)

- The typical myofascial plane may be disrupted causing inadequate spread of drug

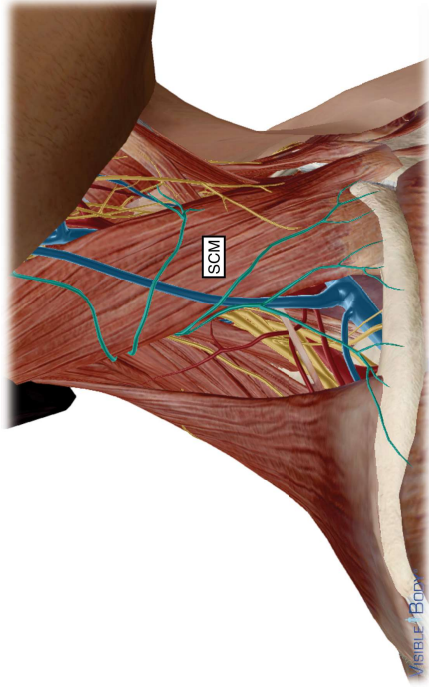
- Consider plexus blocks in cases not involving acute trauma and for cases involving the scapula



Superficial Cervical Plexus Block

C2-C4 nerve roots

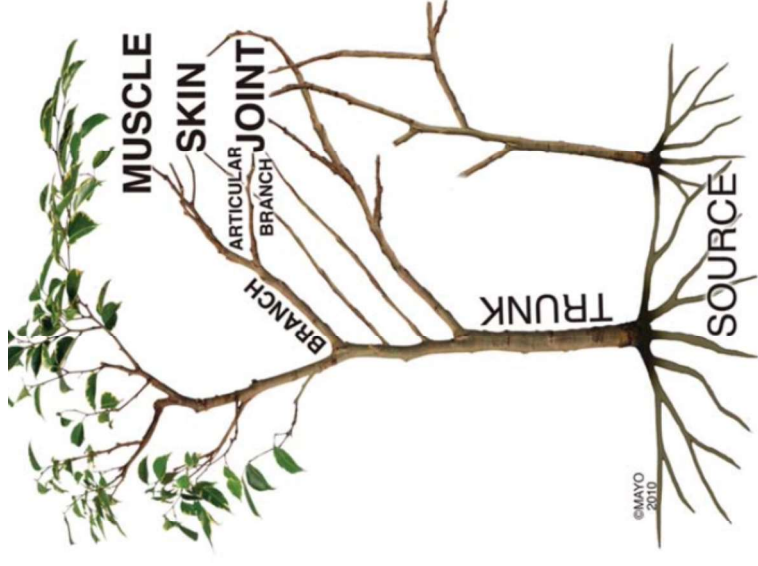
- Lesser occipital
- Greater auricular
- Transverse cervical
- *Supraclavicular*



Volume: 5-8 mL

Blocks for Knees

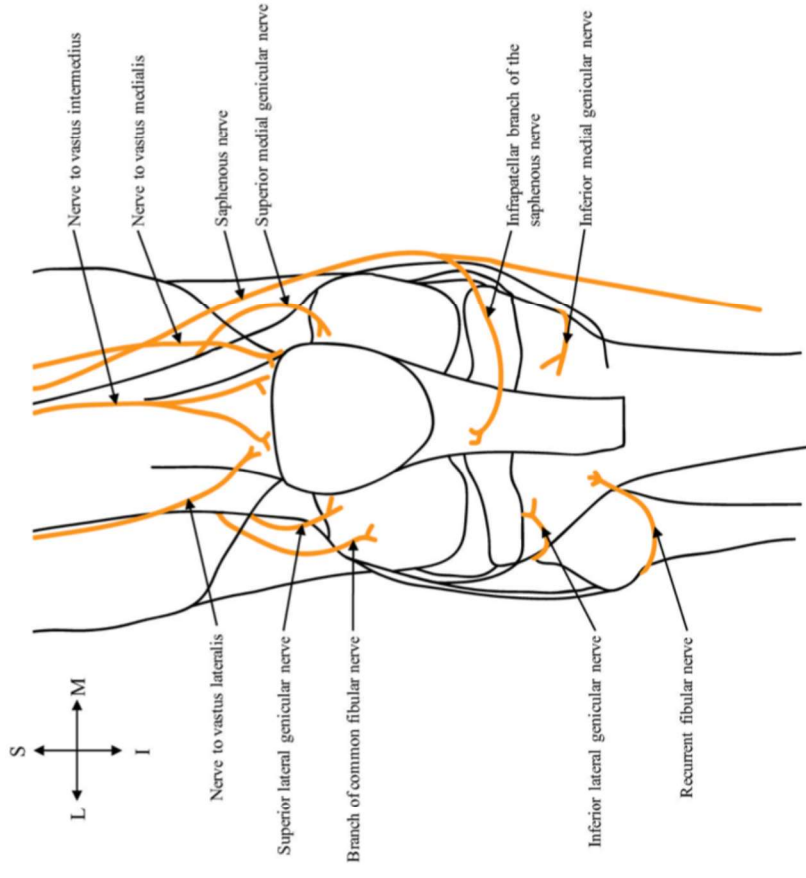
- Quality US imaging and studies have opened the door for the discovery of new blocks and improvements in established techniques
- ***“The same trunks of nerves whose branches supply the groups of muscles moving a joint furnish also a distribution of nerves to the skin over the insertions of the same muscles; and —what at this moment more especially merits our attention—the interior of the joint receives its nerves from the same source.”***
Hilton’s Law (1863)



Blocks for Knees

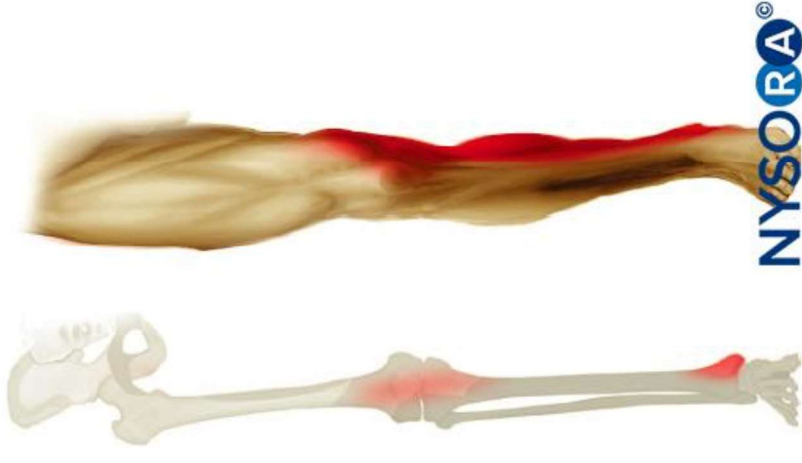
- Evolution from femoral and sciatic nerve blocks to motor-sparing techniques

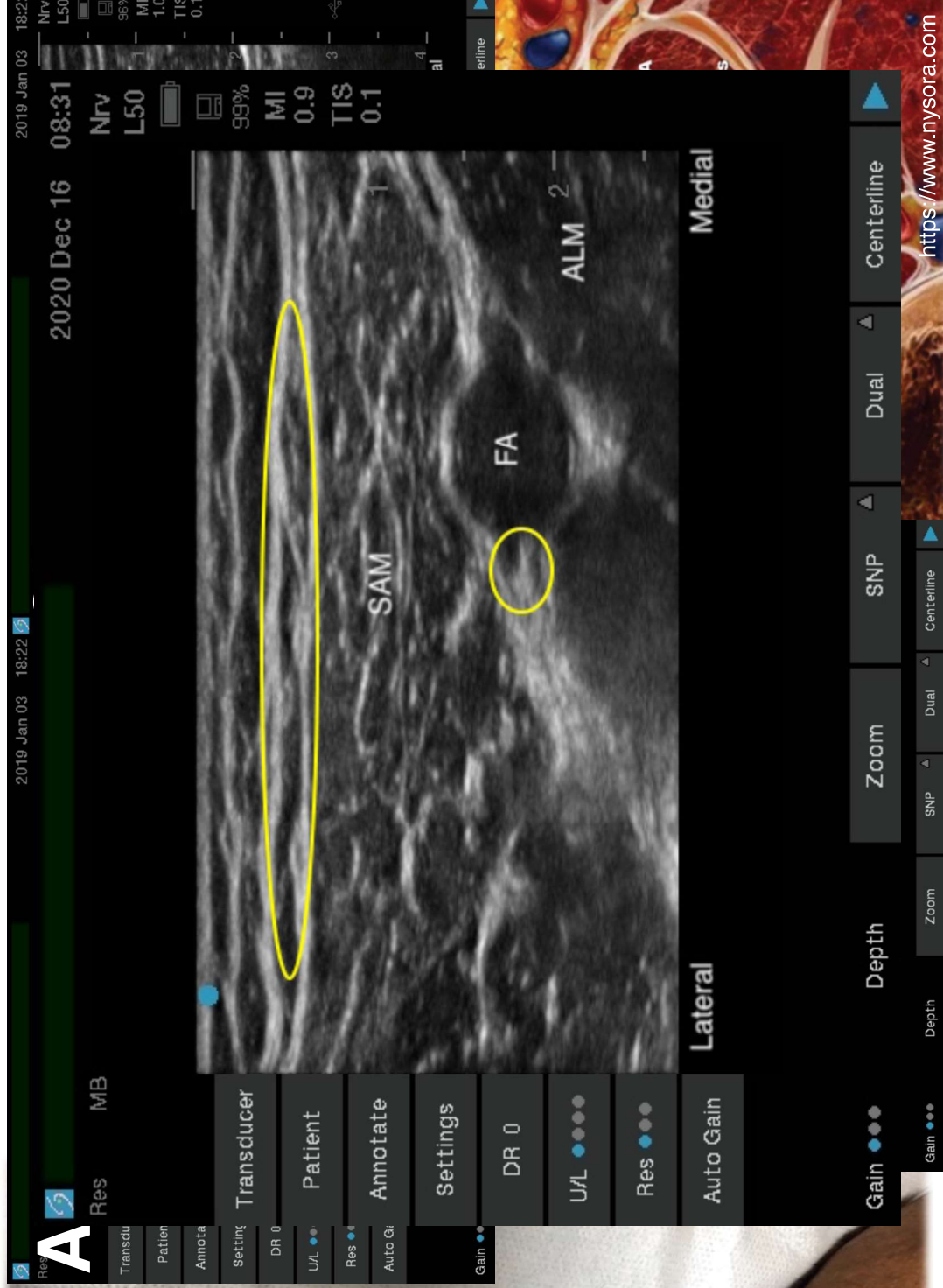
- *The knee is complicated*



Adductor Canal

- Contains saphenous nerve
 - Nerve to vastus medialis (NVM) in separate fascial sheath in true adductor canal - important for knee analgesia
- ***A well placed “adductor canal block” is really a femoral triangle block - not all “adductor canal blocks” are created equal***
- Indicated for surgery for knee, in combo with sciatic nerve block for surgery below knee
- Well studied
 - ***Similar pain scores to femoral nerve block***
 - ***Quad strength preserved***





What Is Your Goal?

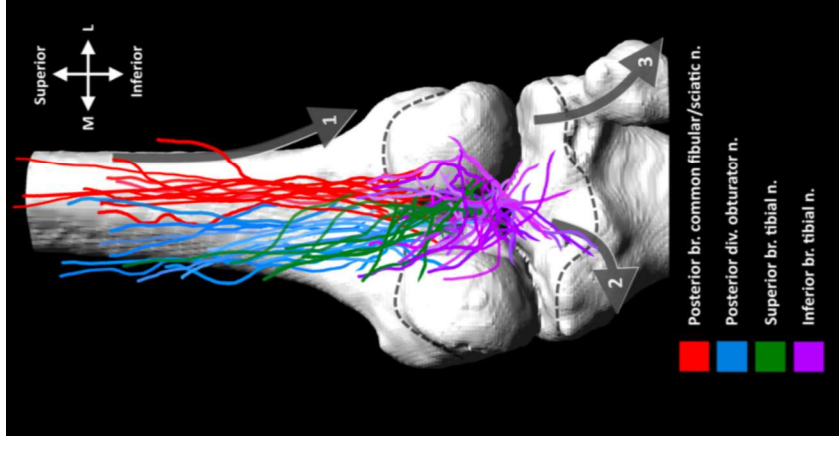
Consider location and volume

- Saphenous nerve - go distal and use low volumes
- Knee analgesia - go proximal and use higher volumes



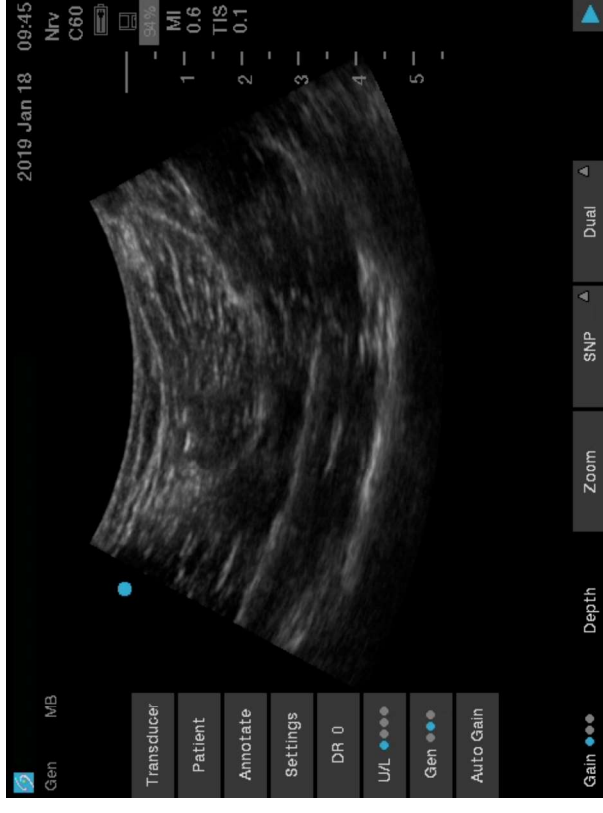
IPACK (Interspace between the popliteal artery and posterior Capsule of the knee

- Posterior knee analgesia
 - *Genicular branches of the obturator, tibial, common peroneal, and sciatic*
- Motor-sparing compared to sciatic popliteal block



IPACK

- Literature is promising
- ***ACB + IPACK = better analgesia + improved PT***
- Earlier hospital discharge? (Thobhani)
- More consistent and reproducible alternative to surgeon LIA
- ***USG > surgical infiltration***



4 in 1 block/Popliteal Plexus Block

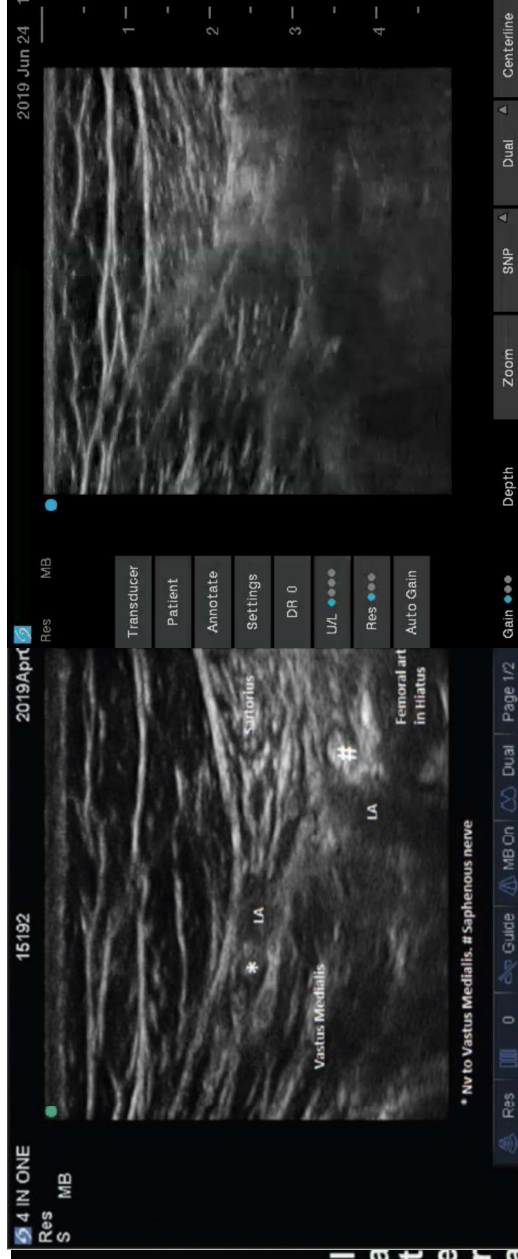
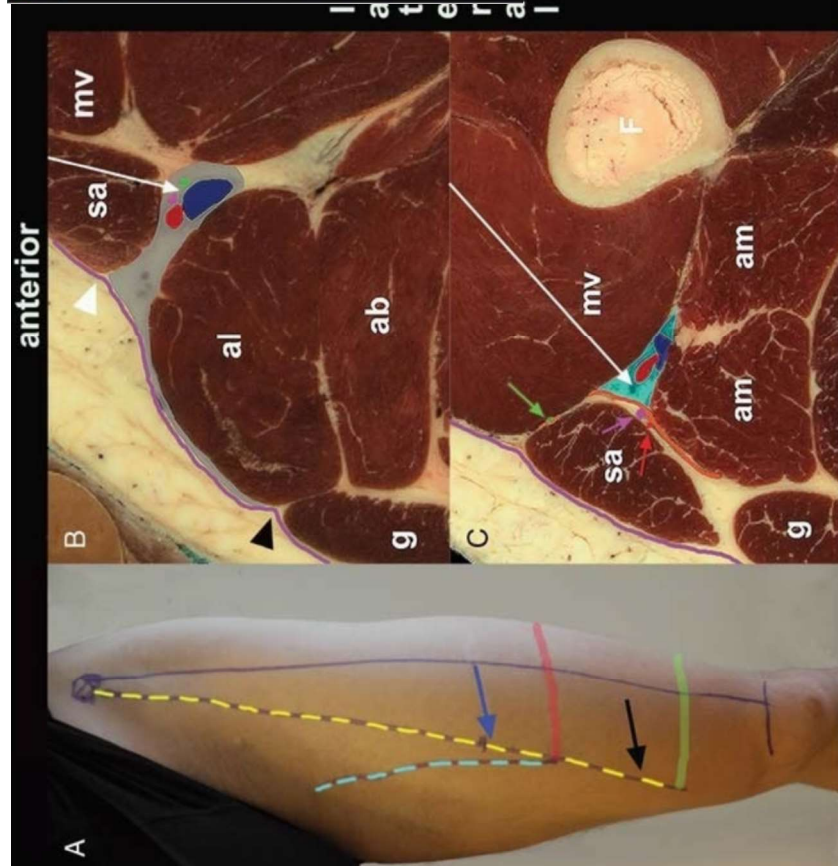
4 nerves to block in the distal adductor canal

- Saphenous, obturator, NVM, sciatic genicular branches
- Locate descending genicular artery branching from superficial femoral artery
- 35 mL + NVM (5 mL)
- Good postop analgesia following TKA

Popliteal plexus entwines the vasculature in the distal adductor canal

- 10 mL of dye spreads via the adductor hiatus to the popliteal fossa
- Provided effective rescue analgesia after TKA

4 in 1 block/Popliteal Plexus Block



Further studies are needed

Genicular Nerve Blocks

Radiofrequency ablation with fluoroscopic guidance for chronic knee osteoarthritis described in 2011 (Choi, et al. Pain 2011;152(3))

USG techniques described for osteoarthritis and TKA analgesia (Sotelo, et al. Rev Esp Anesthesiol Reanim 2017;64(10))

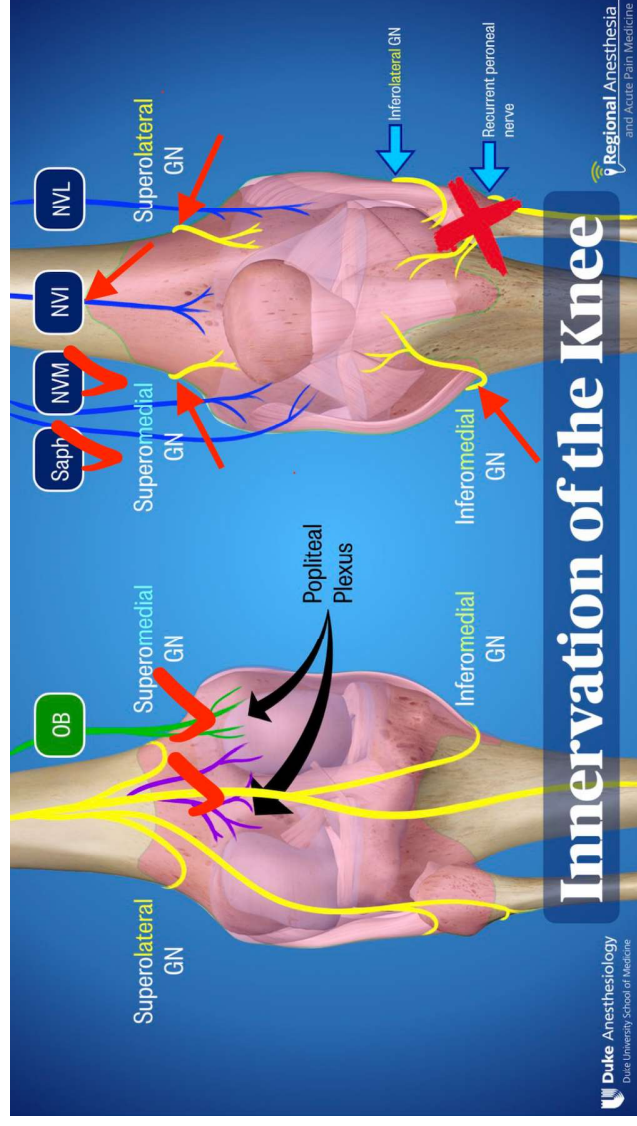
USG technique with lidocaine + triamcinolone alleviated intense pain for up to 2 weeks (Kim, et al. Pain Physician 2018;21)

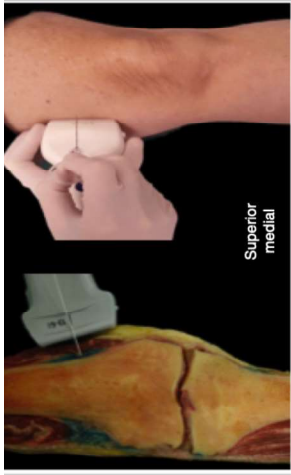
USG shows similar pain relief without radiation exposure (Kim, et al Pain Physician 2019;22)

SLGN: formed from either sciatic or CPN

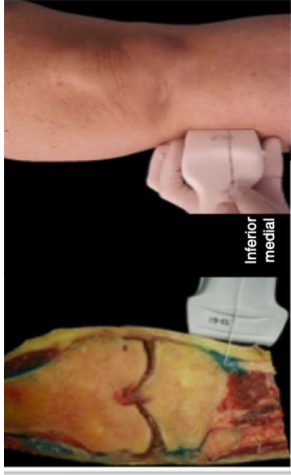
SMGN: formed from femoral or tibial nerve

IMGN: formed from branch of tibial nerve





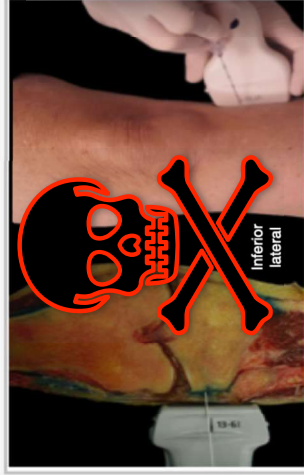
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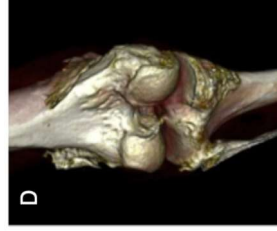
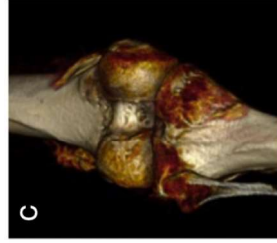
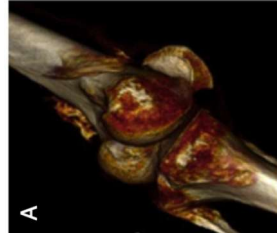
2



3



4



Extensive periarticular distribution of contrast with 4mL at femur and tibia

Case series of 12 patients undergoing TKA

- 4 mL of bupivacaine 0.25% suggests clinical effectiveness

Sotelo V, et al. Rev Esp Anesthesiol Reanim 2017;64(10):568-576

Original research

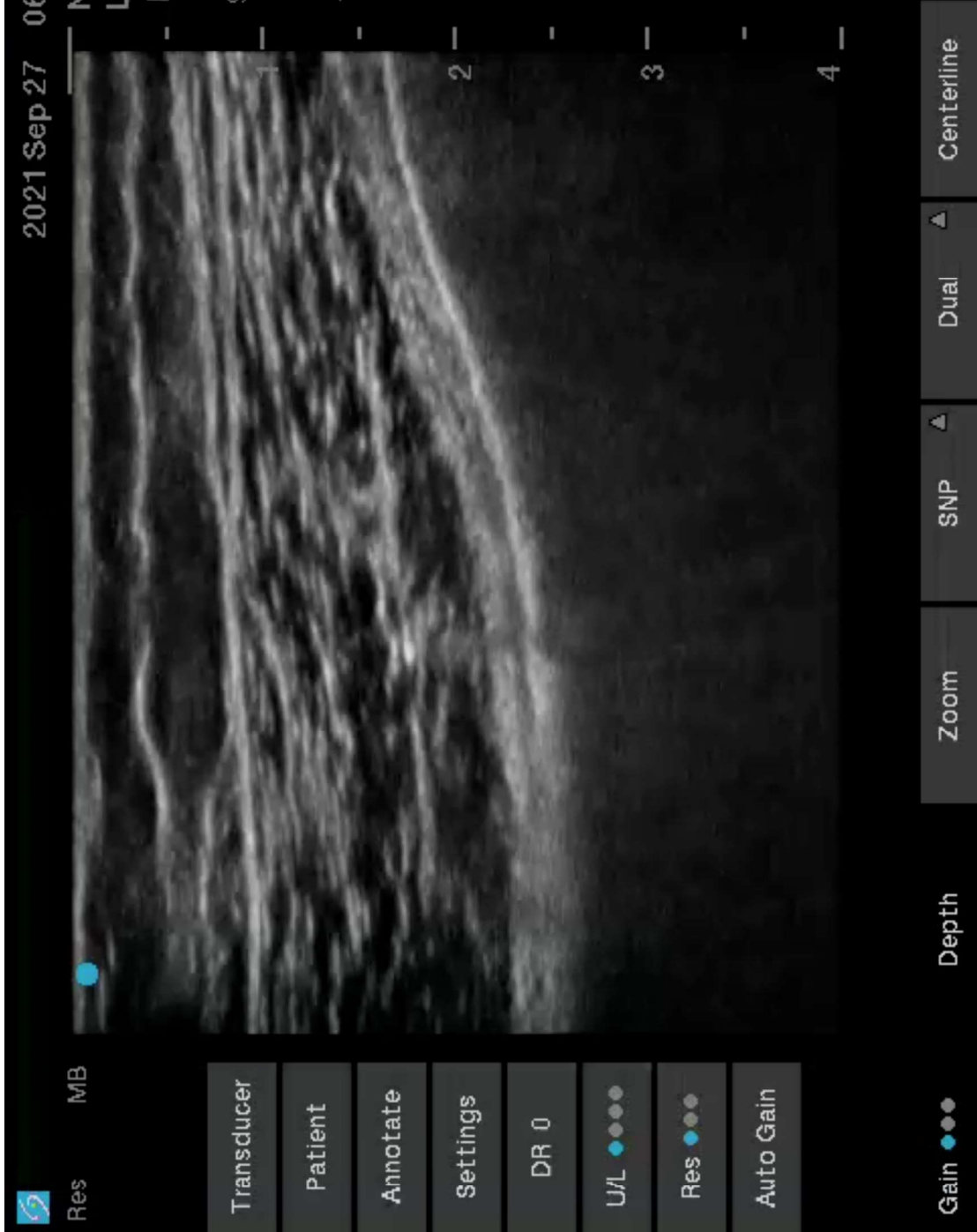
Ultrasound-guided genicular nerve blocks following total knee arthroplasty: a randomized, double-blind, placebo-controlled trial

Milly Rambhia,¹ An Chen,¹ Amanda H Kumar,² W Michael Bullock^{1,2},
Michael Bolognesi,³ Jeffrey Gadsden^{1,2}

Genicular nerve blocks reduced 24 hr opioid use by 60%

- 5 mL bupivacaine 0.25% with dexamethasone

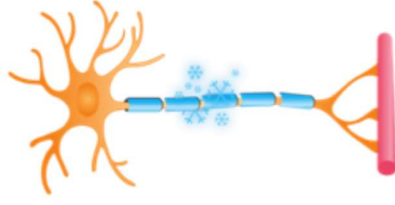
Rambhia M, et al. Reg Anesth Pain Med 2021;46:862-866



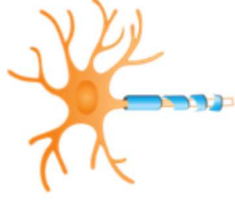
Cryoneurolysis

Treating nerves between -20° to -60 C° results in Wallerian degeneration (2nd degree injury)

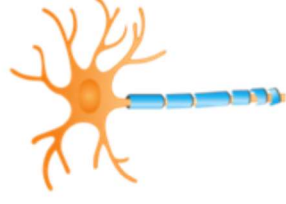
- Results in loss of axon continuity but preserves surrounding endo-/peri-/epineurium
- Normal axonal regeneration and myelination occurs over next several weeks to months



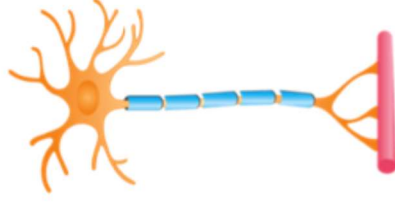
TREATMENT
A cold zone is created, lowering the temperature to below -20°C.



DEGENERATION
Cold zone causes degeneration of the axon and myelin sheath, temporarily blocking nerve signals.



REGENERATION
Post-treatment, the axon regenerates at the rate of about 1mm per day.

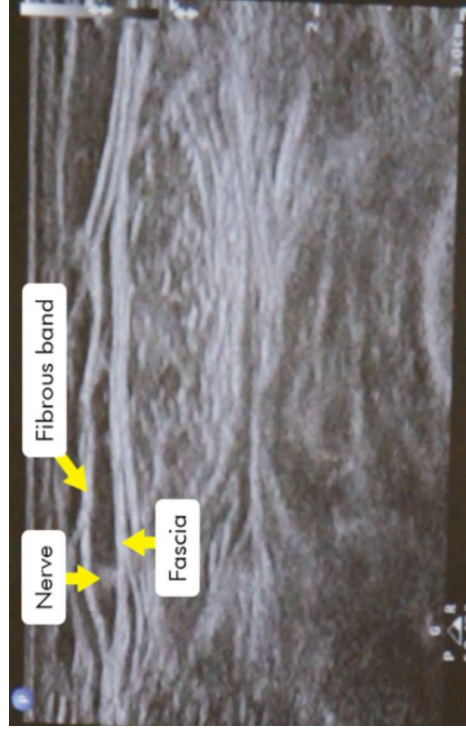
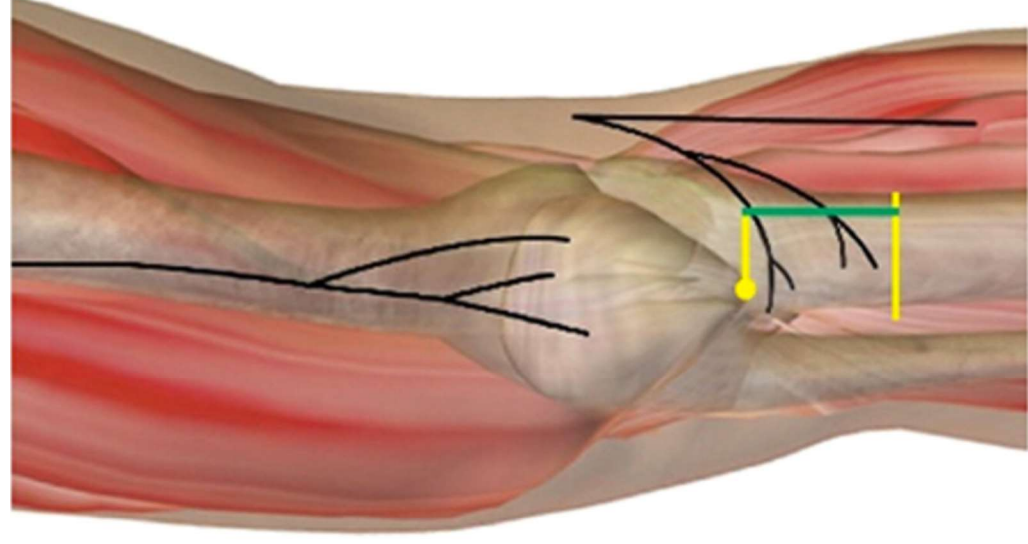
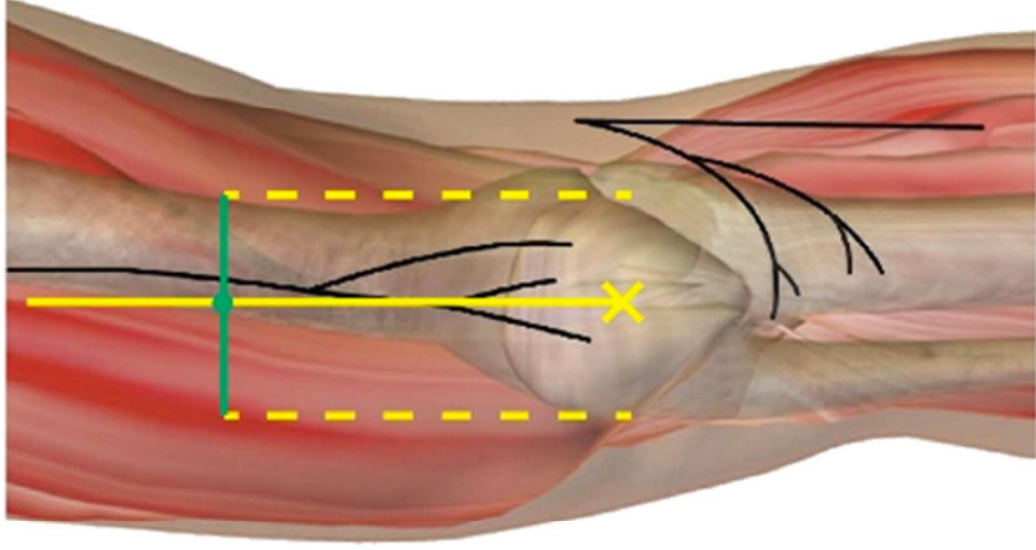


REINNERVATION
The axon and myelin sheath are fully regenerated and nerve signalling is restored.

lovera - Cryoneurolysis

- FDA approved in 2012
- *Device converts liquid nitrous oxide into a gas, creating temperatures below -20° C along hollow needles to create an “ice ball”*
- Landmark and ultrasound-guided techniques described





Targeted nerves

- Anterior femoral cutaneous (AFCN)
- Infrapatellar branch of saphenous (ISN)
- Lateral femoral cutaneous (LFCN)
(ultrasound only)

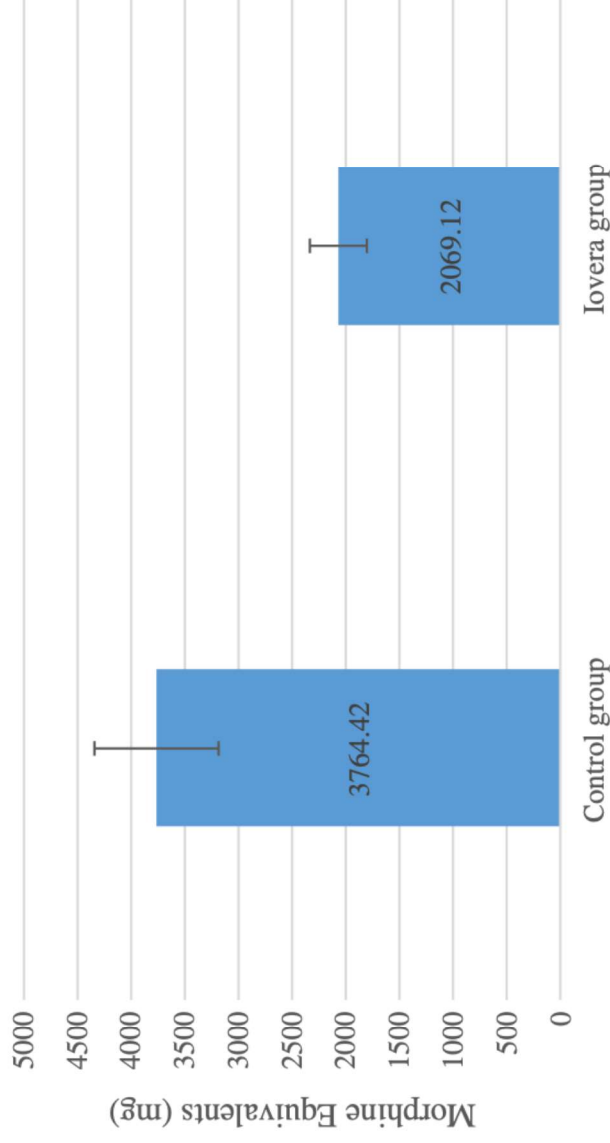
Cryoneurolysis

**45% less opioids 12 weeks
after surgery with treatment
of AFCN and ISN**

Part of multimodal pain management
protocol

***Need for non-industry-
sponsored high-quality RCTs***

Is this the wave of the future?
Other indications?

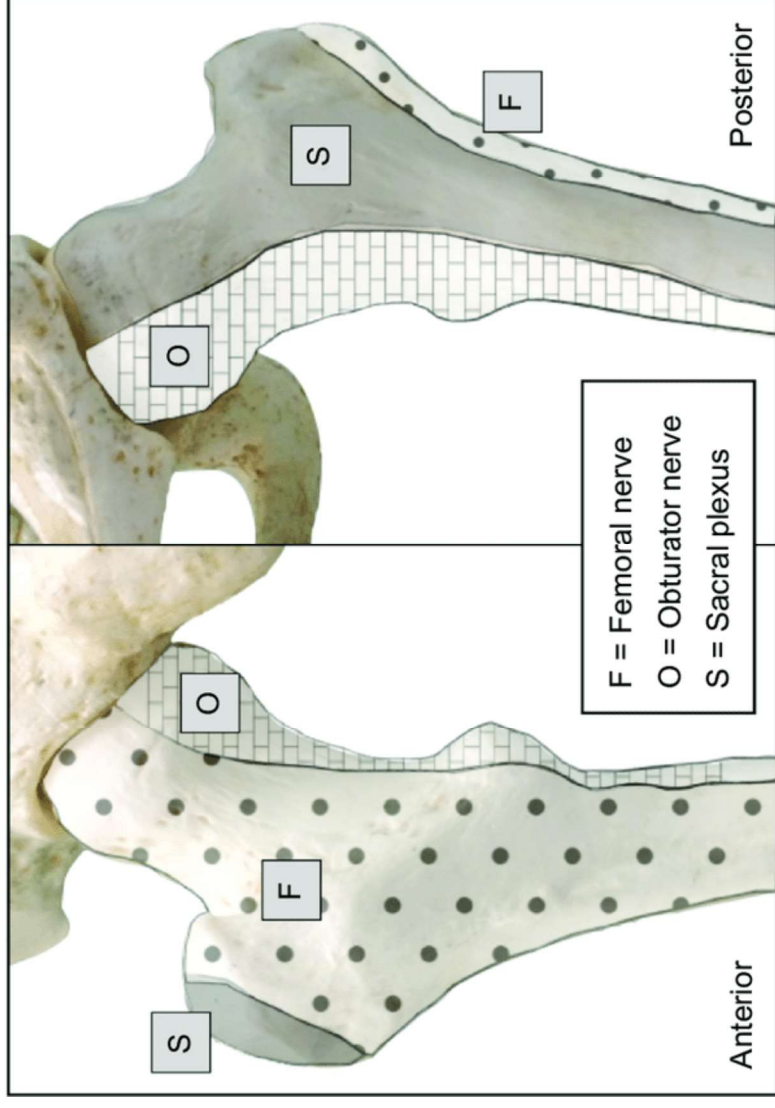


Motor-Sparing Blocks for TKA

- *Femoral triangle (FT) blocks outperform adductor canal and LIA*
- Continuous FT blocks provide superior analgesia than SSBs
- *The optimal analgesic strategy may be a combination of techniques*
- More investigation needed of IPACK, popliteal plexus, and genicular nerve blocks

Blocks for Hips

- Evolution from blind “2 pops” fascia iliaca block to targeted USG techniques
- Anterior capsule is the most richly innervated section of the joint



Fascia Iliaca

- Targeting LFCN, femoral, and obturator nerves
- Indicated for hip reductions, analgesia for thigh, hip, knee surgery
- ***Potential for quad weakness***



Fascia Iliaca - Two Techniques

- Start with probe in femoral nerve view
- Scan lateral until SAM in view and turn probe to face umbilicus

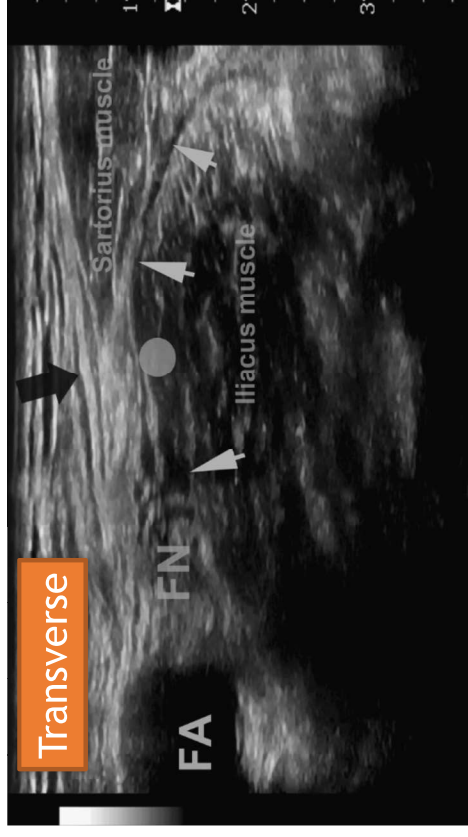
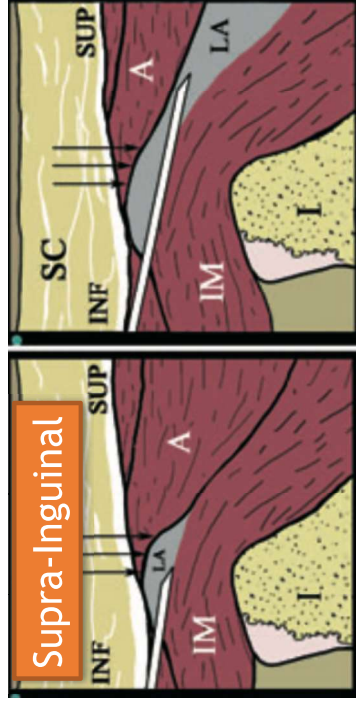


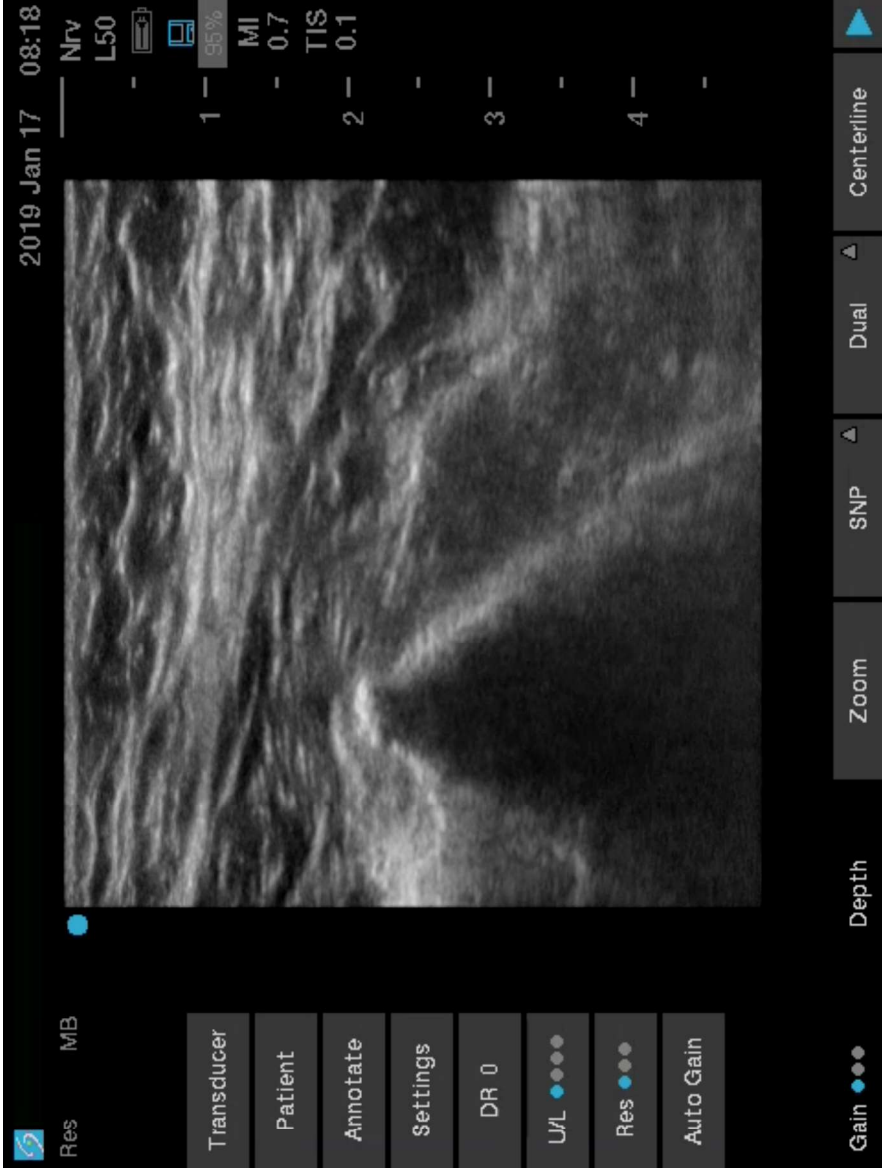
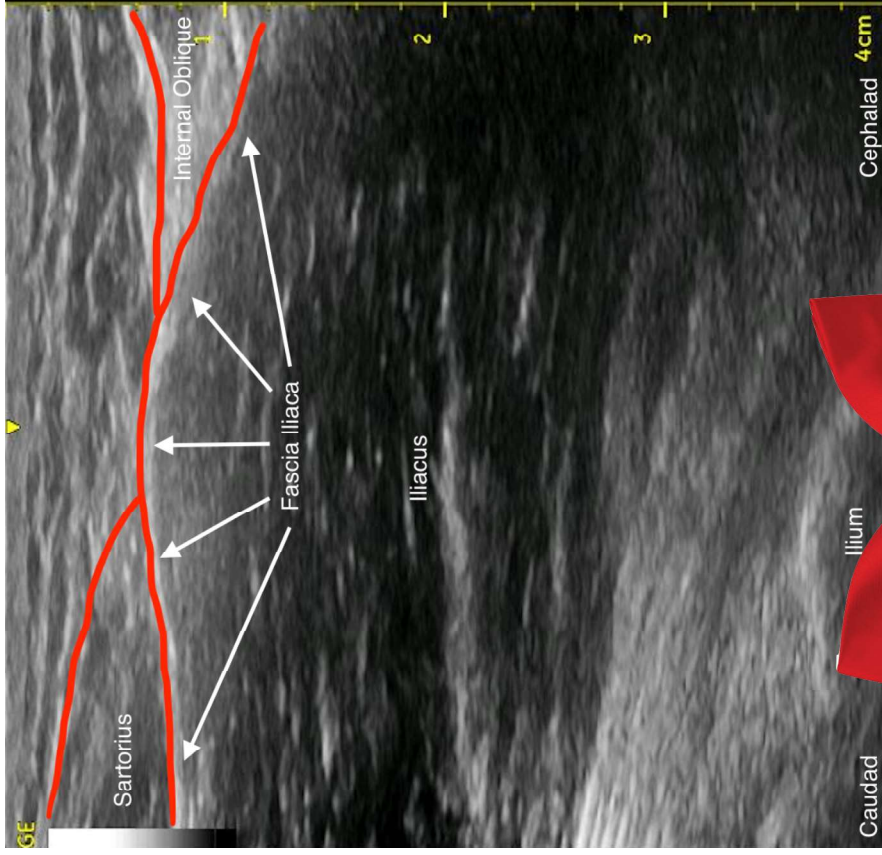
Diagram illustrating the anatomy of the right hemipelvis, focusing on the iliacus and psoas major muscles, major blood vessels, and nerves. The diagram shows the following structures and labels:

- AO**: Aorta
- CIA**: Common iliac artery
- IIA**: Internal iliac artery
- EIA**: External iliac artery
- ON**: Obturator foramen
- IPB**: Iliopubic band
- LFCN**: Lateral femoral cutaneous nerve
- FNA**: Femoral nerve
- GFN**: Genitofemoral nerve
- ILACUS**: Iliacus muscle
- PSOAS MAJOR**: Psoas major muscle
- Sacral ala**: Ala of the sacrum
- Fascia iliaca**: Iliac fascia
- Pelvic fascia**: Pelvic fascia

Arrows indicate the direction of blood flow and nerve conduction.

/F local anesthetic is to reach the ON it must travel via the creation of artificial pathways

 GARNER ANESTHESIA SERVICES



***Inject on cephalad side of ilium -
Volume block!***



A Longitudinal Supra-Inguinal Fascia Iliaca Compartment Block Reduces Morphine Consumption After Total Hip Arthroplasty

Matthias Desmet, MD,* Kris Vermeulen, MD,† Inné Van Herreweghe, MD,‡ Laurence Carlier, MD,‡
Filiep Soetens, MD,† Stijn Lambrecht, PharmD, PhD,§ Kathleen Croes, PharmD, PhD,§
Hans Pottel, PhD,|| and Marc Van de Velde, MD, PhD‡

- 88 patients undergoing anterior THA

- FICB: 40 mL ropiv 0.5%

- *Reduced mean morphine consumption at 24 h & 48 h postop*

- *Obturator nerve blocked in 86%*

- *All 3 nerves blocked in 67%*

Ali N. Shariat, MD,* Admir Hadzic, MD, PhD,† Daquan Xu, MD,† Uma Shastri, MD,†
Kwesi Kwofie, MD,† Kishor Gandhi, MD,‡‡ Colleen Mitgang McCally, MD,† Kimberly Gratenstein, MD,†
Catherine Vandepitte, MD,†§ Jeff Gadsden, MD,† and Douglas Unis, MD||

- 32 patients undergoing THA

- FICB: 30 mL ropiv 0.5%

- *No difference in pain intensity or in morphine consumption at 24 h postop*

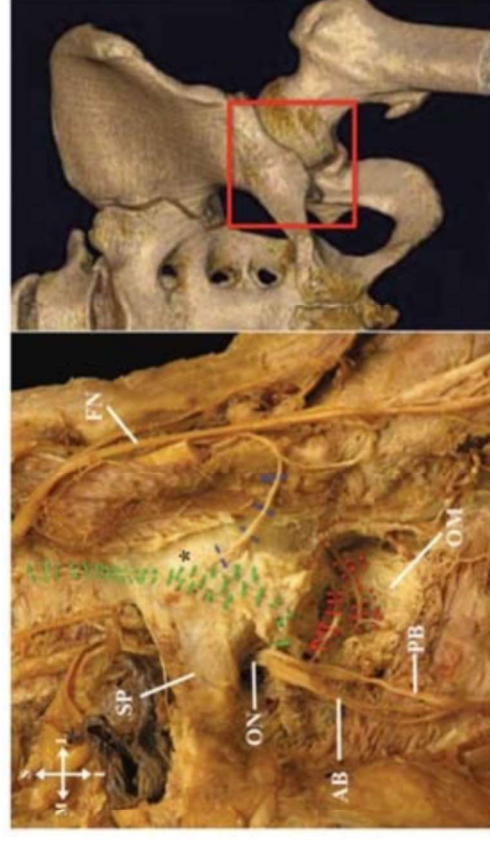
- *Obturator nerve blocked in 25%, femoral in 38%, LFCN in 31%*



Anatomic Study of Innervation of the Anterior Hip Capsule *Implication for Image-Guided Intervention*

Anthony J. Short, MBBS,* Jessi Jo G. Barnett,† Michael Gofeld, MD,‡ Elitesham Baig, MD,‡ Karen Lam, MD,‡
Anne M.R. Agur, PhD,† and Philip W.H. Peng, MBBS, FRCPC, Founder (Pain Medicine)‡§

- 13 hemipelvises
- ***Femoral (FN), obturator (ON), and accessory obturator nerves (AON)*** innervating the anterior capsule were documented
- The anterior capsule supplied by FN and ON in all specimens and AON in 7 of 13 specimens



Articular branches :

■ Femoral nerve

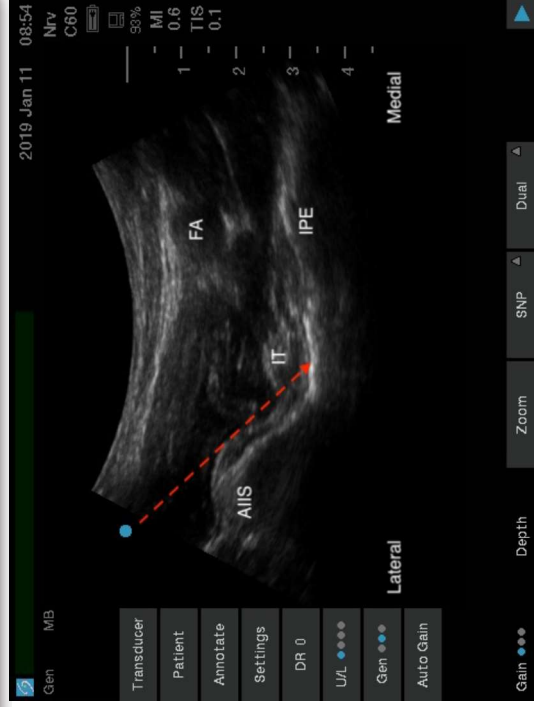
■ Obturator nerve

■ Accessory Obturator Nerve

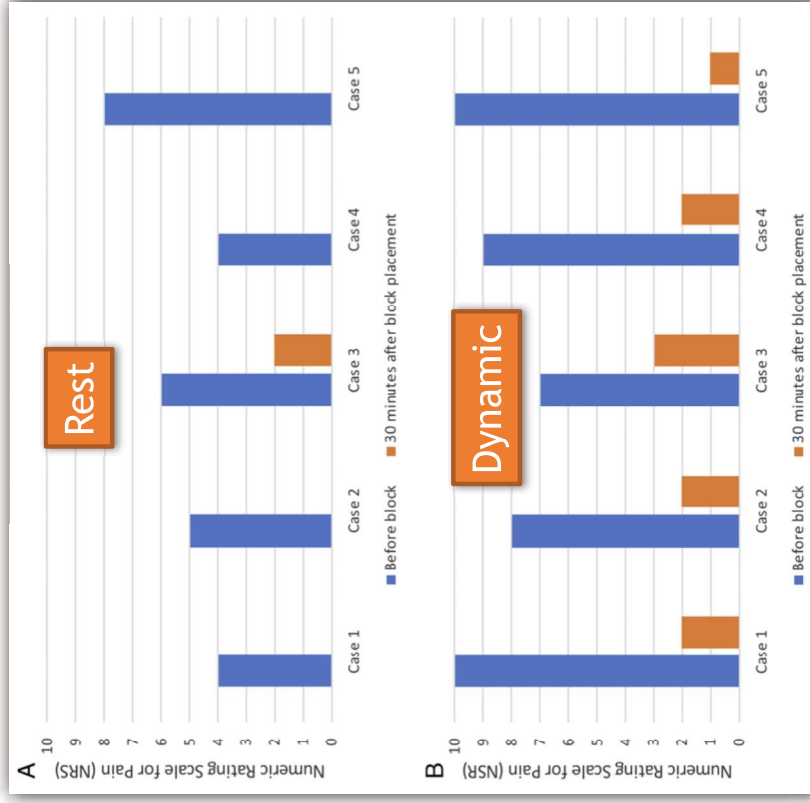
FIGURE 2. Anterior view of the hip shows the innervation of the hip joint capsule by articular branches of the FN (blue), ON (red), and AON (green). The location of this anterior view is indicated by the red square on the right figure. AB indicates anterior branch of ON; L, inferior; M, medial; OM, obturator membrane; PB, posterior branch of ON; S, superior; SP, superior ramus of pubis. Reproduced with permission from Philip Peng Educational Series.

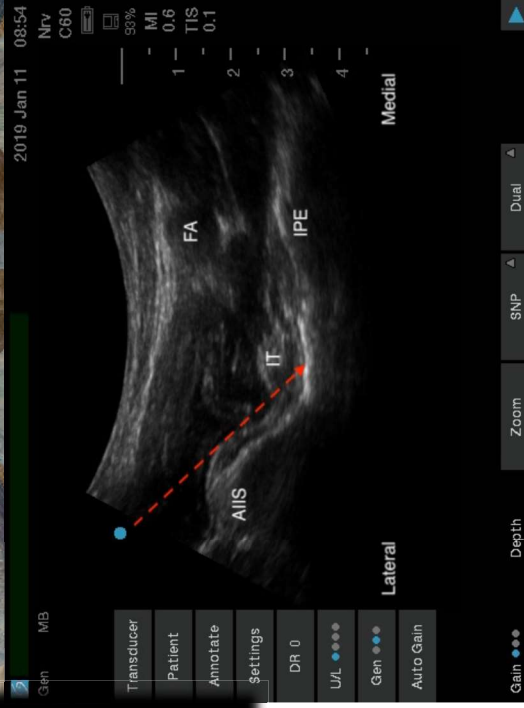
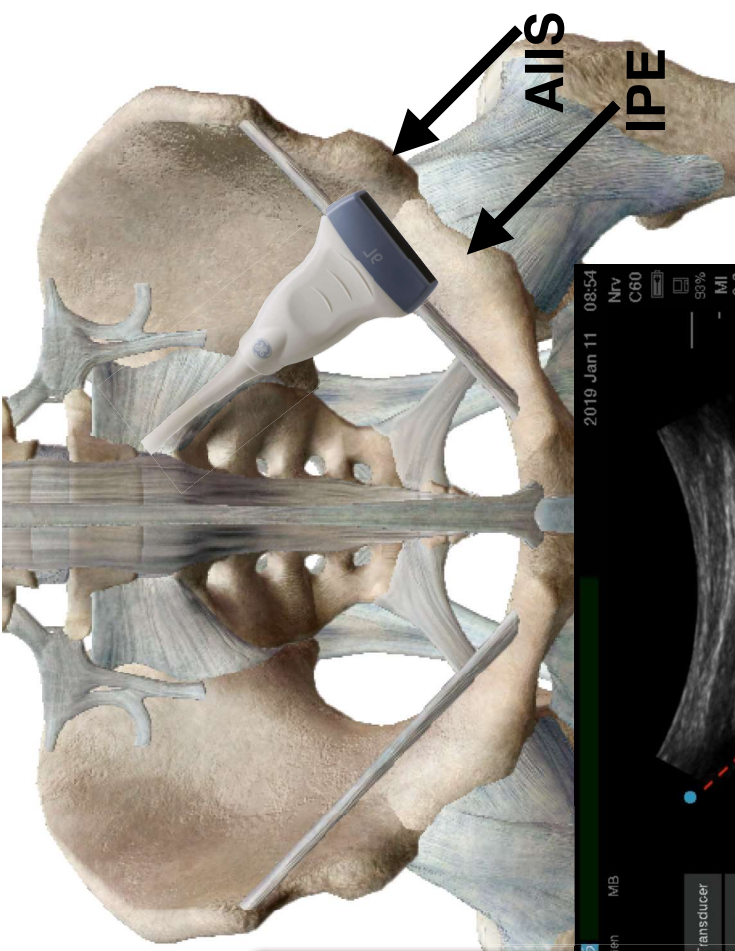
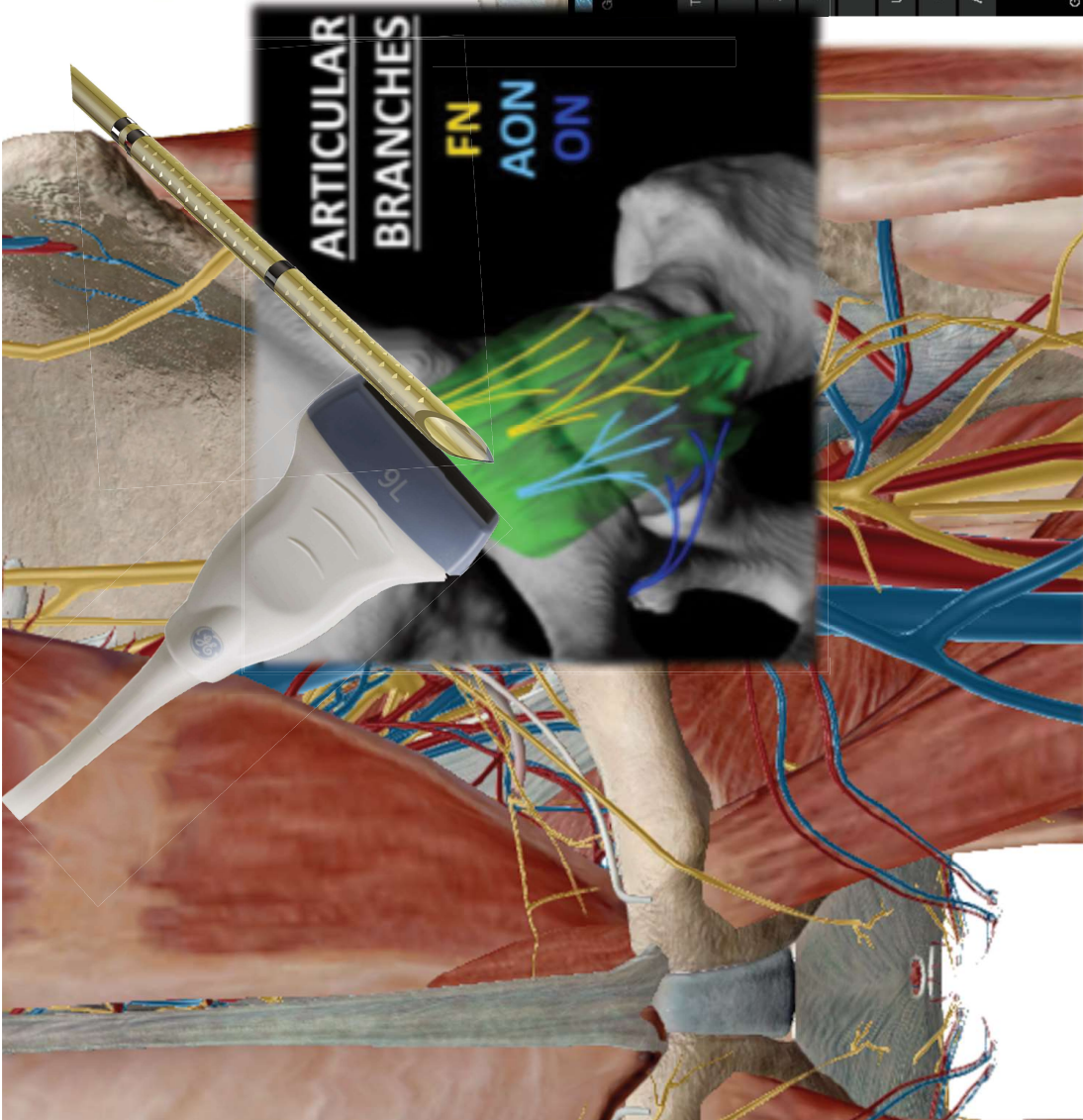
Pericapsular Nerve Group (PENG) Block

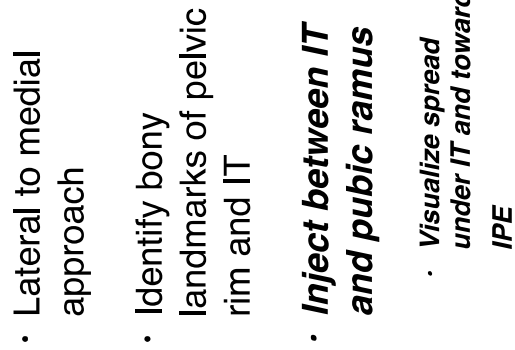
Cases	Sex	Age, y	ASA	Side	Hip Pathology	Type of Surgery	Type and Volume of Local Anesthetic
1	F	70	III	L	Intertrochanteric fracture	DHS fixation	Bupivacaine 0.25% with epinephrine 1:400,000 20 mL
2	F	80	III	L	Subcapital fracture	Hip hemiarthroplasty	Bupivacaine 0.25% with epinephrine 1:400,000 20 mL
3	M	68	IV	R	Metastatic tumor in femoral head and acetabulum	Total hip arthroplasty	Bupivacaine 0.25% with epinephrine 1:400,000 20 mL
4	M	62	II	L	Intertrochanteric fracture	DHS fixation	Bupivacaine 0.25% with epinephrine 1:400,000 20 mL
5	F	72	III	R	Subcapital fracture	Total hip arthroplasty	Ropivacaine 0.5% with epinephrine 1:200,000 20 mL and 4 mg of dexmedetomidine



30 min after
block all patients
were able to flex
hip and raise leg
- *reduced pain*
scores and *NO*
quad weakness







Pericapsular nerve group (PENG) block provides improved short-term analgesia compared with the femoral nerve block in hip fracture surgery: a single-center double-blinded randomized comparative trial

D-Yin Lin ¹, Craig Morrison ¹, Brigid Brown,¹ Alexander Andrew Saies,² Reshma Pawar,¹ Marthinus Vermeulen,¹ Stewart Robert Anderson,¹ Tsai Sheng Lee,¹ Job Doornberg,² Hidde Maarten Kroon,^{3,4} Ruurd Lukas Jaarsma⁵

- 60 patients with hip fracture
- PENG block or FNB: 20 mL ropivacaine 0.75%
- PENG block group had less postop pain in recovery room, no difference on day 1
- Quad strength was better preserved with PENG block

Table 2 Postoperative pain and motor outcomes

	Femoral nerve block (n=30)	PENG (n=30)	P value
Maximum postoperative pain score (NRS) in recovery unit (day 0), n (%) [*]			
None (0)	9 (30)	19 (63)	0.04
Mild (1–4)	8 (27)	8 (27)	
Moderate (5–7)	7 (23)	1 (3)	
Severe (8–10)	4 (13)	2 (7)	
Unable to assess due to delirium	2 (7)	0 (0)	
Quadriceps strength in recovery, n (%) [*]			
Intact	0 (0)	18 (60)	<0.001
Reduced	11 (37)	8 (26)	
Absent	12 (40)	2 (7)	
Unable to assess	7 (23)	2 (7)	
Maximum postoperative pain score (NRS) on day 1, n (%) [*]			
None (0)	2 (7)	6 (20)	0.53
Mild (1–4)	11 (37)	12 (40)	
Moderate (5–7)	7 (23)	7 (23)	
Severe (8–10)	7 (23)	5 (17)	
Unable to assess due to delirium	3 (10)	0 (0)	
Quadriceps strength on day 1, n (%) [*]			
Intact	15 (50)	27 (90)	0.004
Reduced	10 (33)	2 (7)	
Absent	0 (0)	0 (0)	
Unable to assess	5 (17)	1 (3)	

^{*} χ^2 test used.

[†] Fisher's exact test used.

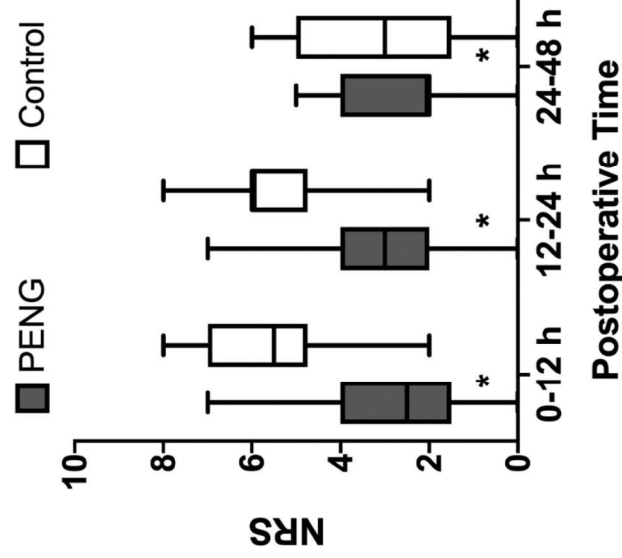
NRS, Numeric Rating Scale; PENG, pericapsular nerve group block.

Original Article

Impact of the pericapsular nerve group (PENG) block on postoperative analgesia and functional recovery following total hip arthroplasty: a randomised, observer-masked, controlled trial

G. Pascarella,¹ F. Costa,¹ R. Del Buono,² R. Pulitano,³ A. Strumia,⁴ C. Piliego,⁴ E. De Quattro,⁴ R. Cataldo,¹ F. E. Agrò,⁵ M. Carassiti⁶ and collaborators*

- 60 patients
- PENG: 20 mL ropiv 0.375%
- PENG < pain, opioids



Original research

Randomized comparison between pericapsular nerve group (PENG) block and suprainguinal fascia iliaca block for total hip arthroplasty

Julián Aliste¹, Sebastián Layera¹, Daniela Bravo¹, Álvaro Jara¹, Gonzalo Muñoz¹, Cristián Barrientos², Rodrigo Wulf², Julián Brañez², Roderick J Finlayson³, De Q Tran⁴

- 40 patients
- PENG block (20 mL) or FIB (40 mL): levobupivacaine 0.5% with epi
- **PENG < motor block at 3 and 6 hr**
- No significant differences in postop pain and opioid consumption

Lateral Femoral Cutaneous Nerve

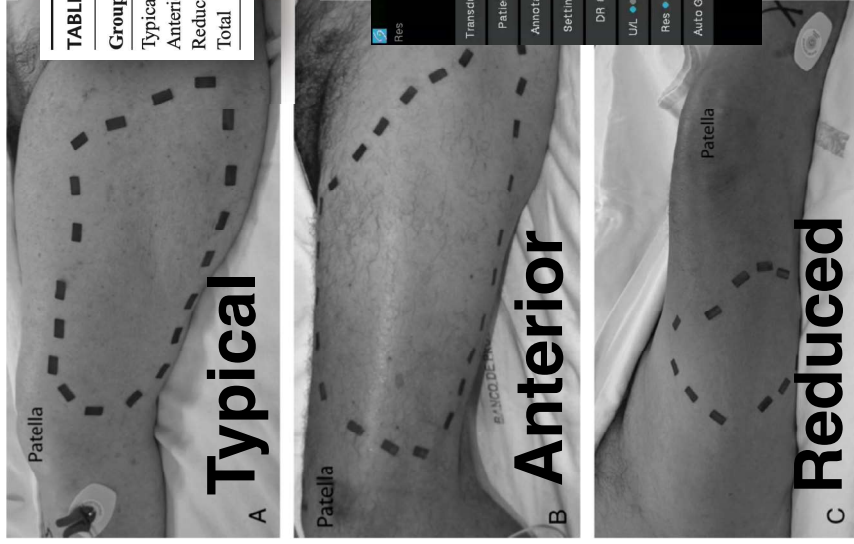
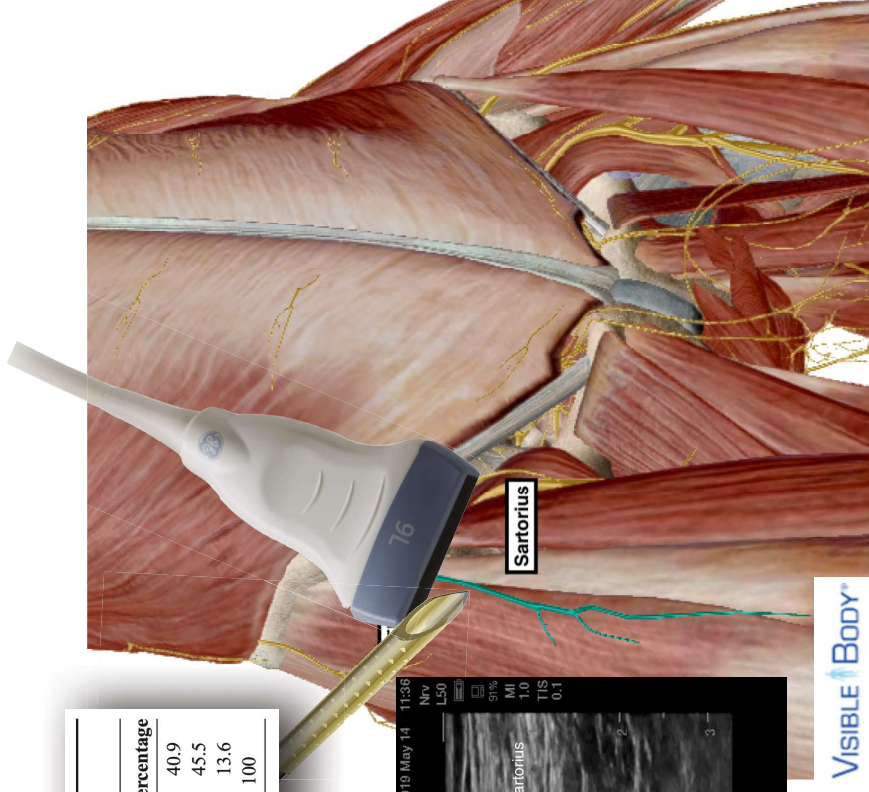


TABLE 1. Sensory Area of the LCN

Group Name	No. Patients	Percentage
Typical	9	40.9
Anterior	10	45.5
Reduced	3	13.6
Total	22	100



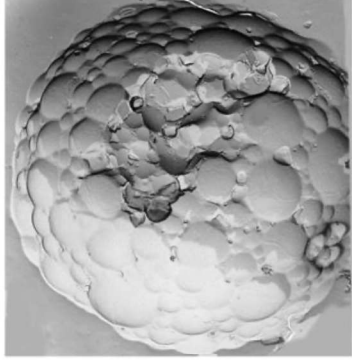
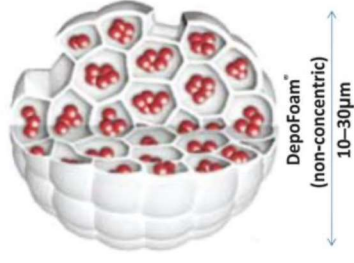
Lateral Femoral Cutaneous Nerve

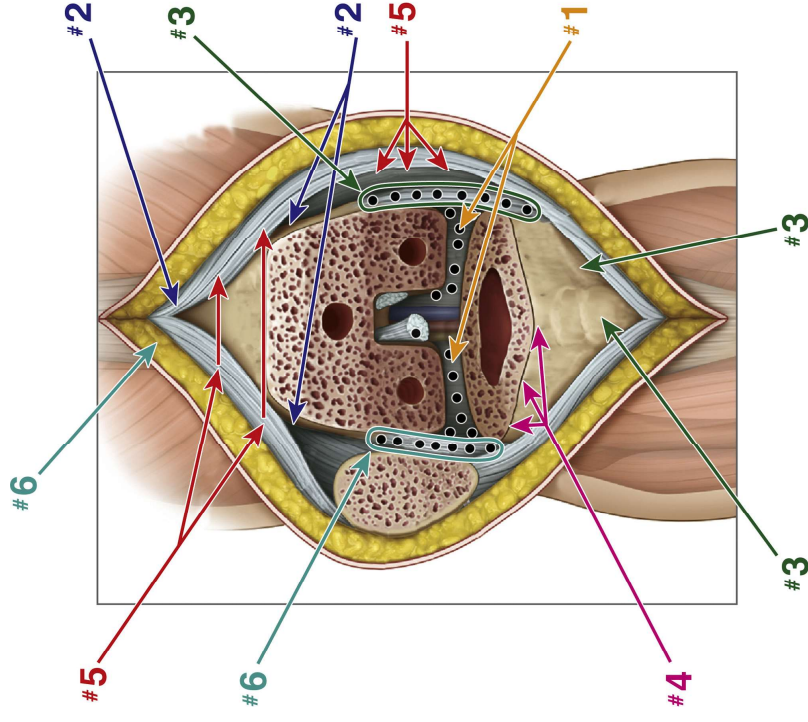
- Combine with PENG block
- Anterior thigh analgesia?



Liposomal Bupivacaine

- Liposomes entrap drugs allowing controlled delivery of local anesthetic
- FDA approved for wound infiltration (2011) and interscalene block (2018), femoral and sciatic blocks (2023)





PRIOR TO CEMENTATION

Syringe #1

- Posterior capsule (8-10 sticks medial and 8-10 sticks lateral)

Syringe #2

- Femur – medial and lateral periosteum, posterior periosteum, suprapatellar/quadriceps tendon

Syringe #3

- Tibia – fat pad (5 sticks)
- Pes anserinus, medial collateral ligament, and gutter (15 sticks)

Syringe #4

- Circumferential periosteum (~5-20 sticks)

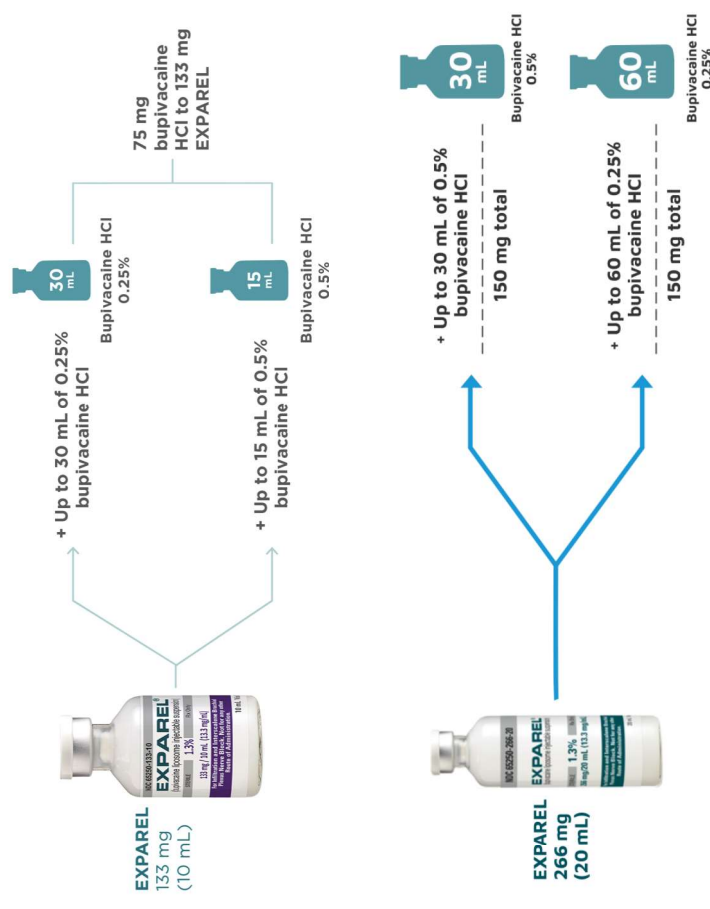
AFTER CEMENTATION

Syringe #5

- Midline quadriceps tendon (10 sticks)
- Retinaculum, medial gutter, femoral to tibia (10 sticks)

Syringe #6

- Lateral gutter, femoral to tibial (10 sticks)
- Subcutaneous/closure (10 sticks)



The mornings after—periarticular liposomal bupivacaine infiltration does not improve analgesic outcomes beyond 24 hours following total knee arthroplasty: a systematic review and meta-analysis

Nasir Hussain ¹, Richard Brull ², Brendan T Sheehy,¹ Michael Kushelev,¹ Michael K Essandoh,¹ Faraj W Abdallah ³

- 17 trials (1836 patients)
- ***Lack of difference compared to plain bupivacaine in pain control and opioid consumption on POD 2 and 3***
- ***No further postoperative analgesic, functional, or safety outcomes***

ANESTHESIOLOGY

Perineural Liposomal Bupivacaine Is Not Superior to Nonliposomal Bupivacaine for Peripheral Nerve Block Analgesia

A Systematic Review and Meta-analysis

Nasir Hussain, M.D., M.Sc., Richard Brull, M.D.,
Brendan Sheehy, M.D., Michael K. Essandoh, M.D.,
David L. Stahl, M.D., Tristan E. Weaver, M.D.,
Faraj W. Abdallah, M.D., M.Sc.

ANESTHESIOLOGY 2021; 134:147–64

- 9 trials (619 patients)
- ***Not superior for postop pain and all other analgesic and functional outcomes***
- ***Local anesthetic-induced inflammatory changes?***



EDITORIAL

Liposomal Bupivacaine

Effective, Cost-effective, or (Just) Costly?

Mary Ellen McCann, M.D.

- New drugs can be approved by FDA as long as they show efficacy compared to placebo

- *Single dose of 266 mg of Exparel \$334 vs Bupivacaine \$3*

ANESTHESIOLOGY

Interscalene Brachial Plexus Block with Liposomal Bupivacaine versus Standard Bupivacaine with Perineural Dexamethasone: A Noninferiority Trial

David H. Kim, M.D., Jiabin Liu, M.D., Ph.D., Jonathan C. Beathe, M.D., Yi Lin, M.D., Ph.D., Douglas S. Wetmore, M.D., Sang J. Kim, M.D., Stephen C. Haskins, M.D., Sean Garvin, M.D., Joseph A. Oxendine, M.D., Michael C. Ho, M.D., Answorth A. Allen, M.D., Marko Popovic, B.S., Ejiro Gbaje, M.P.H., Christopher L. Wu, M.D., Stavros G. Memtsoudis, M.D., Ph.D., M.B.A.

ANESTHESIOLOGY 2022; 136:434–47

- Liposomal bupivacaine group (10 mL of 133 mg liposomal + 5 mL of 0.5% bupivacaine) vs 15 mL of 0.5% bupivacaine + 4 mg dexamethasone
- *No significant difference in duration of analgesia, motor and sensory resolution, opioid consumption*

Final Thoughts

- Focus on patient-centered outcomes
- Focus on high-yield blocks
- PNBs are part of a multimodal analgesic regimen
- Further research needed comparing new techniques and investigating outcomes

Thank You

Shane Garner, CRNA
garner.shaned@gmail.com