Regional Anesthesia Updates - 2026

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Objectives

- Critically evaluate recent (2021–2025) clinical trials and guidelines in regional anesthesia and acute pain medicine, including the updated ASRA anticoagulation and infection control guidelines.
- Identify regional anesthesia techniques ("blocks that matter") that have demonstrated significant patient-centered outcome improvements and distinguish them from procedures with limited or inconclusive evidence ("hype vs. evidence").
- Translate recent literature and guideline updates into practical strategies for perioperative pain management and regional block selection.

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ASRA Anticoagulation Guidelines (5th Edition, 2025)

Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (fifth edition)

Sandra L Kopp,[1] Erik Vandermeulen,[2] Robert D McBane,[3] Anahi Perlas,[4] Lisa Leffert,[5] Terese Horlocker[1]

Kopp SL, *et al. Reg Anesth Pain Med* 2025;**0**:1–29. doi:10.1136/rapm-2024-105766

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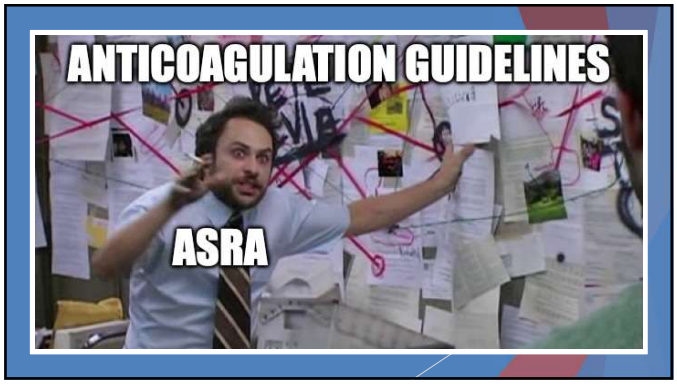

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Why We Care

- Spinal/epidural or deep plexus hematoma is rare but potentially catastrophic
- Guidelines are written from a ***hemorrhage-avoidance (risk-minimization) perspective***
- 5th edition is shorter, reorganized, and more operationally focused than prior editions
- Authors explicitly state a ***conservative*** ("antihemorrhagic") stance relative to thrombosis-focused guidelines

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Evolution of the Guidelines

1998 and 2003
- Original ASRA Guidelines.
- In response to rise of hemorrhagic complications with rollout of enoxaparin.
- Focused on neuraxial blocks and surgical patients

2010
- Added comments on deep plexus blocks and peripheral techniques

2018
- Described growing literature about VTE prevention and hemorrhagic risk in parturients.
- Acknowledged differential risk for interventional pain procedures and pregnant population.
- Great discussion of pharmacokinetics of anticoagulants.

2025
- Current published guidelines

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10,000 ft View: Changes vs 2018 (4th Edition)

- Terminology shift:
  - "Prophylactic/therapeutic" → "low dose/high dose"
  - Aligns with other guidelines and accounts for patient characteristics
- Major expansion and clarification of DOAC sections
- Introduction of acceptable residual drug level thresholds for selected situations
  - New monitoring modalities with expansion of anti-Xa level testing
- More explicit renal-function–based pathways
- Deep plexus/deep peripheral blocks continue to follow neuraxial-style precautions (unchanged)

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Lab Monitoring Changes:

Drug-Level–Based "Off-Ramps"

- New concept: in selected situations, neuraxial/deep blocks may proceed based on measured residual anticoagulant activity
- For several DOACs, guideline now specifies acceptable residual levels
  - DOAC level < 30 ng/mL OR
  - Anti-Xa activity ≤ 0.1 IU/mL
- This is not a mandate to measure levels — it provides a safety target when levels are checked

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Drug	Low Dose (Prophylaxis)	High Dose (Therapeutic)
Apixaban	2.5 mg BID • Post-THA/TKA prophylaxis • Extended VTE prevention	5 mg BID (or 2.5 mg BID if dose-reduced by criteria) • AF stroke prevention • DVT/PE treatment
Edoxaban	N/A	60 mg daily or 30 mg daily if: (1) CrCl 15–50 (2) wt ≤60 kg or (3) P-gp inhibitor
Rivaroxaban	10 mg daily (VTE prophylaxis) 2.5 mg BID + aspirin (CAD/PAD)	20 mg daily (CrCl >50) or 15 mg daily (CrCl 30–50)
Dabigatran	110 → 220 mg daily (THA prophylaxis)	150 mg BID or 75 mg BID if CrCl 15–30)
Enoxaparin (Lovenox)	40 mg once daily or 30 mg q12h • VTE prophylaxis	1 mg/kg q12h or 1.5 mg/kg daily • Treatment dosing / bridging

Terminology: Low Dose vs High Dose

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Dabigatran: Clearer Low-Dose vs High-Dose Pathways

Low-dose dabigatran:
- Hold at least ~48h before neuraxial/deep block (or check level if shorter)
- Avoid neuraxial/deep block in CrCl <30 unless level confirms minimal activity

High-dose dabigatran
- CrCl ≥50: hold ~72h (or check level if shorter)
- CrCl 30–49: hold ~120h (or check level if shorter)
- CrCl <30: generally avoid neuraxial/deep block unless level confirms minimal activity
- Postoperative restart timing is also more conservative for high-dose regimens

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Rivaroxaban: New Guidance for Unanticipated Dosing

- Addresses real-world problem: anticoagulant administered with neuraxial catheter in situ
- If low-dose rivaroxaban already given:
  - Delay catheter removal ≥24h (≥30h if CrCl <30) OR
  - Confirm residual level < ~30 ng/mL or anti-Xa ≤ ~0.1 IU/mL before removal
  - More structured response to medication errors or communication failures

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Low Molecular Weight Heparin (LMWH): What's Not Changed – And Why it's Discussed More

- Most *core timing recommendations are unchanged* from prior editions
  - **Single-daily low-dose LMWH**: similar catheter placement/removal intervals as before
  - **High-dose LMWH**: catheter out before first postoperative dose; delay first dose after placement
- What's expanded: discussion that anti-Xa activity may persist longer than expected in some patients

Implication: timing rules remain ***conservative by design***

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Controversy #1: Conservative vs Thrombosis-Focused Guidelines

- ASRA explicitly states these are **hemorrhage-avoidance guidelines**
- This leads to more conservative timing than many thrombosis-prevention or perioperative medicine guidelines
- Core Tension:

  Delay of surgery / interruption of anticoagulation / VTE

  vs

  Extremely rare but catastrophic neuraxial bleeding

Practical takeaway: anticoagulation planning must include both bleeding and thrombosis perspectives

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Controversy #2: The "<30 ng/mL" and "anti-Xa ≤0.1 IU/mL" Thresholds

- Not all hospitals have rapid or reliable access to calibrated DOAC or anti-Xa assays
- Turnaround time may limit real-world usefulness
- Exact correlation between measured residual level and neuraxial bleeding risk is not definitively proven
- Guideline acknowledges uncertainty, especially after use of reversal agents
- Aligns with emerging European guidance and provides a rational safety target

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Controversy #3: Low Dose vs High Dose — Simpler, But Potentially Confusing

- Pros:
  - Better reflects that dose, indication, and patient factors change pharmacokinetics
  - Harmonizes with European (ESAIC/ESRA) approach
- Cons:
  - Clinicians may misclassify common "reduced dose" or renal-adjusted regimens

Practical solution: each institution should correlate common regimens to "low" vs "high" categories

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Controversy #4: Deep Blocks Treated Like Neuraxial

- ASRA continues to recommend neuraxial-style precautions for deep plexus/deep peripheral blocks
- Some clinicians argue ultrasound guidance and site compressibility should allow more flexibility
  - **Other interventional societies (e.g. interventional radiology) have different guidelines for deep blocks or procedures**
- Guideline remains conservative because bleeding in these sites can be occult and catastrophic
- This remains an area of practice variation and debate

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Controversy #5:
IV Heparin

January 2025

Intravenous heparin

Discontinue heparin infusion for a minimum of 4–6 hours and coagulation status be assessed and normal prior to neuraxial block or deep plexus/peripheral block (grade IA)

Remarks: there is no change in this recommendation.

Delay intravenous heparin administration for a minimum of 1 hour after needle placement (grade IA)

Remarks: there is no change in this recommendation.

It is not recommended to maintain neuraxial or deep plexus catheters in the setting of continuous intravenous heparin administration. In the event of unanticipated heparinization, we recommend monitoring the patient with an indwelling catheter to allow for early detection of motor deficits and consider use of minimal concentration of local anesthetics to enhance early detection of a neuraxial hematoma (grade IA)

Remarks: there is no change in this recommendation.

Although the occurrence of a bloody or difficult neuraxial needle placement may increase the risk of hematoma, there are no data to support mandatory cancellation of a case. Direct communication with the surgeon and a specific risk-benefit decision about proceeding in each case is recommended (grade IA)

Remarks: there is no change in this recommendation.

It is not recommended to maintain neuraxial or deep plexus/peripheral catheters in the setting of full anticoagulation during cardiac surgery. If unanticipated heparinization occurs, we suggest postoperative monitoring of neurological status and consider use of minimal concentration of local anesthetics to enhance early detection of neuraxial hematoma (grade IIC)

Remarks: there is no change in this recommendation.

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Controversy #5:
IV Heparin

September 2025

Intravenous heparin

Discontinue heparin infusion for a minimum of 4–6 hours and coagulation status be assessed and normal prior to neuraxial block or deep plexus/peripheral block (grade IA)

Remarks: there is no change in this recommendation.

Delay intravenous heparin administration for a minimum of 1 hour after needle placement (grade IA)

Remarks: there is no change in this recommendation.

Remove indwelling neuraxial catheters 4 to 6 hours after the last heparin dose (and after assessment of the patient's coagulation status); reheparinize 1 hour after catheter removal (grade 1A).

Remarks: there is no change in this recommendation although it was inadvertently removed from this edition.

Monitor the patient postoperatively to provide early detection of motor blockade and consider use of minimal concentration of local anesthetics to enhance the early detection of a spinal hematoma (grade 1A).

Remarks: There is no change in this recommendation although it was inadvertently removed from this edition

Although the occurrence of a bloody or difficult neuraxial-needle placement may increase the risk of hematoma, there are no data to support mandatory cancellation of a case. Direct communication with the surgeon and a specific risk-benefit decision about proceeding in each case is recommended (grade IA)

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Remarks: this suggestion reflects a change to avoid the use of neuraxial or deep plexus catheters in cardiac surgery patients with full anticoagulation, due to the increased risk of hematoma and the availability of less invasive alternatives.

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> Deviation from suggestions or recommendations contained in this document may be acceptable based on the judgment of the responsible anesthesiologist. The recommendations are designed to encourage safe and quality patient care but cannot guarantee a specific outcome. They are also subject to timely revision as justified by evolution of information and practice.

Special article

Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (fifth edition)

Sandra L Kopp,[1] Erik Vandermeulen,[2] Robert D McBane,[3] Anahi Perlas,[4] Lisa Leffert,[5] Terese Horlocker[1]

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Research

Common interventional procedures for chronic non-cancer spine pain: a systematic review and network meta-analysis of randomised trials

BMJ 2025 ; 388 doi: https://doi.org/10.1136/bmj-2024-079971 (Published 19 February 2025)
Cite this as: *BMJ* 2025;388:e079971

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Strong recommendations AGAINST

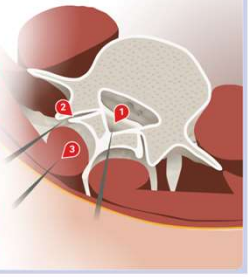
All or nearly all well-informed people would likely not want such interventions. Such interventions should therefore not be offered outside of a clinical trial

Chronic axial spine pain

- Epidural injection of local anaesthetic, steroids, or their combination (1)
- Joint radiofrequency ablation with or without joint targeted injection of local anaesthetic and steroids (2)
- Joint-targeted injection of local anaesthetic, steroids, or their combination (2)
- Intramuscular injection of local anaesthetic with or without steroids (3)

Chronic radicular spine pain

- Dorsal root ganglion radiofrequency with or without epidural injection of local anaesthetic, or local anaesthetic and steroids
- Epidural injection of local anaesthetic, steroids, or their combination (1)



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> […] the substantial reimbursement associated with these procedures may act as a ***perverse incentive*** for their delivery as opposed to less well paying, and more time-consuming, interventions that have evidence of effectiveness (for example, cognitive functional therapy, exercise therapy, pain reprocessing therapy).

RAPID RECOMMENDATIONS

Commonly used interventional procedures for non-cancer chronic spine pain: a clinical practice guideline

Jason W Busse, [1,2,3] Stéphane Genevay, [4] Arnav Agarwal, [2] Christopher J Standaert, [5] Kevin Carneiro, [6] Jason Friedrich, [7] Manuela Ferreira, [8] Hilde Verbeke, [9] Jens Ivar Brox, [10,11] Hong Xiao, [12] Jasmeer Singh Virdee, [13] Janet Gunderson, [14] Gary Foster, [15] Conrad Heegsma, [15] Caroline F Samer, [16,17] Matteo Coen, [18,19] Gordon H Guyatt, [2] Xiaoqin Wang, [2] Behnam Sadeghirad, [2,3] Faheem Malam, [20] Dena Zeraatkar, [2,3] Per O Vandvik, [21] Ting Zhou, [22] Feng Xie, [2] Reed A C Siemieniuk, [2] Thomas Agoritsas [2,23]

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BREAKING NEWS

Pain Management > Back Pain

Another Expert Group Throws Shade at Spinal Injections for Back Pain

— "No more effective than sham procedures," evidence review finds

by John Gever, Contributing Writer, MedPage Today
February 19, 2025 - 5 min read
Last Updated March 5, 2025

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Multisociety Response to *The BMJ* Publications on Interventional Spine Procedures for Chronic Back and Neck Pain (March 18, 2025)

- International Pain and Spine Intervention Society
- American Academy of Pain Medicine
- American College of Radiology
- American Society of Neuroradiology
- American Society of Pain and Neuroscience
- American Society of Regional Anesthesia and Pain Medicine
- American Society of Spine Radiology
- ANQA (Arbeitsgemeinschaft der Nicht Operativen Orthopädischen)
- Association of Pain Program Directors
- Belgian Pain Society
- Boston Pain Society
- Dutch Society of Musculoskeletal Medicine
- Eastern Pain Association
- Flemish Anaesthesiology Association for Pain Management
- GIMDO (Gruppo Italiano Multidisciplinare Dolore Orofacciale)
- IGOST (Interdisziplinäre Gesellschaft für Orthopädische/Unfallchirurgische und Allgemeine Schmerztherapie)
- Indian Society for Study of Pain
- ISAL Foundation - Institute for Pain Research
- Italian Society of Pain Clinicians
- Korean Pain Society
- Latin American Pain Society
- North American Neuromodulation Society
- North American Spine Society
- Oregon Society of Interventional Pain Physicians
- PAIN, Dutch Chapter of the IASP
- Pacific Spine and Pain Society (PSPS)
- Pain Section of the Dutch Society of Anesthesiology
- SIAARTI (Società Italiana di Anestesia Analgesia Rianimazione e Terapia Intensiva)
- Sierra Spine Society
- Society of Interventional Radiology
- Spanish Pain Society
- Turkish Society of Physical Medicine and Rehabilitation Specialists
- World Academy of Pain Medicine United
- World Institute of Pain

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- Balanced Authorship
- Enhanced Study Design and Execution
- Broader Evidence Inclusion When RC Data are Lacking
- Policy Implications Awareness
- The BMJ Clinical Practice Guideline Retraction

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> We agree with Rittenberg and Shanthanna that further research is warranted and acknowledged that ***additional evidence may alter recommendations*** […] However, such claims are ***not supported by the current best evidence***, which shows that all common interventional procedures supported by moderate or low certainty evidence provide little to no improvement in pain relief or physical functioning compared with sham procedures.

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The takeaway…

We must publish what we are doing if we want recommendations/guidelines to reflect actual practice.

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Infection Control Guidelines First Edition (ASRA 2025)

ASRA Pain Medicine consensus practice infection control guidelines for regional anesthesia and pain medicine

David Anthony Provenzano [1], Michael Hanes,[2] Christine Hunt [3], Honorio T Benzon [4,5], Jay S Grider,[6] Kelly Cawcutt [7], Tina L Doshi [8,9,10], Salim Hayek [11,12], Bryan Hoelzer,[13] Rebecca L Johnson [14], Hari Kalagara,[15] Sandra Kopp [16], Randy W Loftus,[14] Alan James Robert Macfarlane [17,18], Ameet S Nagpal [19], Stephanie A Neuman [20], Amit Pawa [21,22], Amy C S Pearson [23], Julie Pilitsis,[24] Eellan Sivanesan [25], Rakesh V Sondekoppam [26], Jan Van Zundert [27,28], Samer Narouze [29]

Provenzano DA, *et al*. *Reg Anesth Pain Med* 2025;**0**:1–50. doi:10.1136/rapm-2024-105651

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Big Picture

- Serious infectious complications after regional anesthesia are **rare but potentially catastrophic**
- Spectrum includes: insertion-site inflammation, local abscess, systemic infection, necrotizing fasciitis, and CNS infection
- Because events are rare, RCTs and databases often miss true risk factors; much evidence comes from case series
- Delayed diagnosis is associated with worse neurologic outcomes and death

Low-probability, high-consequence events → prevention and vigilance matter more than statistics

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Catheter Colonization vs True Infection

- Colonization is common:
  - Epidural/intrathecal catheter colonization ~4–29%; intrathecal anesthesia catheters ~7%
  - Peripheral nerve block (PNB) catheters: colonization ~6–46%
- Colonization ≠ infection; many positive cultures represent contamination during removal
- No reliable CFU threshold predicts clinical infection in RA catheters
- Colonization is influenced by: (1) duration, (2) patient risk factors, (3) tunneling, (4) dressing care, and (5) catheter manipulation

Key concept: colonization is common; true infection is rare; colonization is the gateway.

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Duration Matters (Major Modifiable Risk Factor)

- Insertion-site inflammation is more common than true infection (~5.3% vs 0.5%)
- Infection risk increases with **longer catheter duration**
  - Epidural catheters: ~40% increased risk per additional day in situ
  - Peripheral nerve catheters: risk rises after ~2–4 days
  - Large multicenter study (24,103 PNB catheters): ~2.9% infection rate with max duration 15 days

Simply: The longer a catheter stays in, the less likely it is to remain infection-free.

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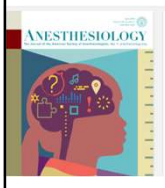

FREE

Perioperative Medicine | April 2018

Prolonged Catheter Use and Infection in Regional Anesthesia: A Retrospective Registry Analysis

Hagen Bomberg, M.D.; Ina Bayer, M.D.; Stefan Wagenpfeil, Ph.D.; Paul Kessler, M.D.; Hinnerk Wulf, M.D.; et al

+ Author Notes

Anesthesiology 4 2018, Vol.128, 764-773. doi:https://doi.org/10.1097/ALN.0000000000002105

- German Network for Regional Anesthesia (25 centers)
- 44,555 patients who had surgery between 2007 and 2014
- Examined the relationship between catheter duration and probability of infection-free catheter use

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Catheter related infection

- Peripheral catheter incidence: 0-7%; Epidural catheter incidence: 0.8-5%
- Rates of infection vary wildly based on placement technique and post-op duration
  - US max duration usually 1-4 days
  - Switzerland 1.5-5 days
  - Australia 1-13 days
  - Germany 1-36 days

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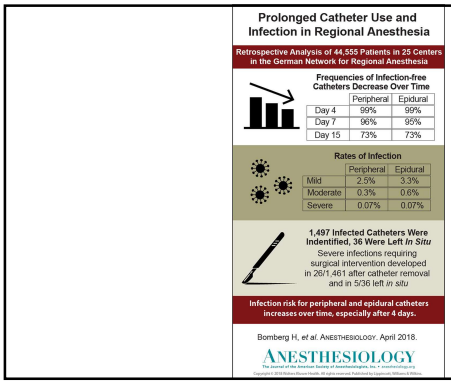

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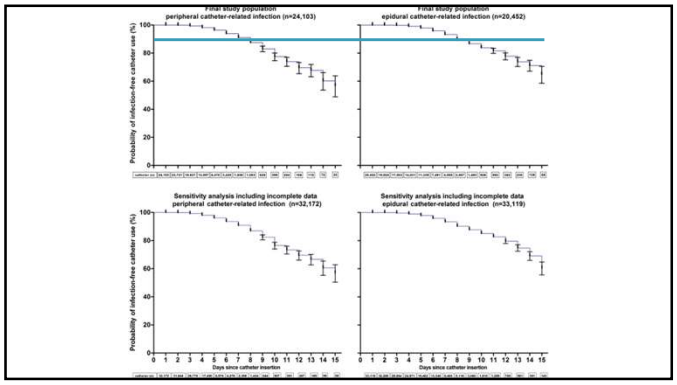

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CNS Infections: Rare but Devastating

- Incidence after neuraxial block ~1–5 per 100,000 (≈8 per million spinals; ≈11 per million epidurals)
- Includes: epidural abscess, meningitis, discitis, osteomyelitis, sepsis, death
- Outcomes are worse with delayed diagnosis or neurologic deficits at presentation

Clinical pearl: fever + back pain + neurologic change after neuraxial = emergency until proven otherwise

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Tunneled vs Non-Tunneled Catheters

- Tunneled catheters are associated with lower infection risk
- Large series (22,411 thoracic epidurals): tunneling strongly associated with fewer catheter-related infections
- Subcutaneous ports: ~50% lower infection rate vs percutaneous exit; no infections before day 70 in one study
- Tunneled epidurals still have mechanical failures and infection risk in long-term use

Bottom line: if it must stay long (or placed in a site at risk for infection), tunnel the catheter.

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Key Evidence-Based Recommendations (From This Section)

- Consider limiting duration of percutaneous tunneled catheters and placing a subcutaneous port to minimize infection risk (Grade B)
- Prolonged use of regional nerve block catheters (>4–5 days) should be **individualized** with close monitoring (Grade C)
- Avoid prolonged use (>2 weeks) of externalized intrathecal catheters due to meningitis risk (Grade B)

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Let's talk ultrasounds…

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How Contaminated Is Ultrasound Equipment?

- Multiple studies show frequent contamination of ultrasound probes and machines
- Reported contamination rates of ultrasound probes after clinical use:
  - 20–60% in various perioperative and ICU studies
  - Common organisms: coagulase-negative Staph, Staph aureus, Enterococcus, Gram-negative bacteria
- Contamination occurs even when probes appear visually clean
- Implication: the ultrasound machine is a major vector if not managed as part of the sterile field

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Probe, Cable, and Gel: Three potential problems

- The ultrasound ***probe, cable,*** and ***gel*** can all act as vectors for pathogen transmission
- Probe covers significantly reduce (but do not eliminate) contamination of the probe head
  - Microperforations in probe covers occur and increase with:
    - Longer procedures
    - Probe manipulation and needle contact
    - Therefore, *sterile gel inside the cover* and skin antisepsis remain critical
- Multiple outbreaks of bacterial infection have been linked to contaminated ultrasound gel
- Both multi-use and single-use gels have been implicated in outbreaks
- Gel can support bacterial growth and transmit organisms to the needle or catheter

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Probe, Cable, and Gel: Three potential problems

- Multiple outbreaks of bacterial infection have been linked to contaminated ultrasound gel
- Both multi-use and single-use gels have been implicated in outbreaks
- Gel can support bacterial growth and transmit organisms to the needle or catheter

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Probe, Cable, and Gel: Three potential problems

CDC UPDATE

Alert: Use Only Sterile Ultrasound Gel for Percutaneous Procedures

For Everyone
MAY 13, 2025

WHAT TO KNOW

- CDC has received reports of *Paraburkholderia fungorum* (an environmental bacterium) associated with the use of ultrasound gel from multiple states from 2024–2025.
- Use of non-sterile ultrasound gel for percutaneous procedures (procedures that involve puncturing the skin) risks patient safety.
- CDC is assisting with an ongoing multistate investigation.

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Cleaning, Disinfection, and Sterilization: Not the Same Thing

- Cleaning: removes visible debris but does not reliably kill microorganisms
  - Low-level disinfection: kills some bacteria and viruses, not spores or mycobacteria
  - High-level disinfection: kills bacteria, viruses, mycobacteria, and most fungi
- Most ultrasound probes used **for regional anesthesia** require at least low- or intermediate-level disinfection between patients
- Probes used **for neuraxial or deep procedures** should follow institutional high-level disinfection policies when applicable

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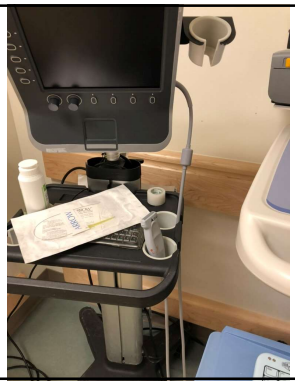

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ASRA Recommendations:

- Use **sterile gel for neuraxial, deep blocks, and catheter procedures**
  - Never reuse gel packets between patients
- Use **sterile probe covers** for:
  - Neuraxial procedures
  - Deep plexus blocks
  - Continuous catheter techniques
  - Use **sterile gel inside the cover**; non-sterile gel may be used on intact skin outside the sterile field only if it does not contact the needle path
- **Disinfect probe and cable** between patients per manufacturer and infection control policy
- Treat the probe, cable, and machine controls as part of the sterile field during the procedure

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Suzetrigine:
A Novel Analgesic Approach

Slides adapted from Kenneth Hunt, MD

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Current State of Play

- Opioids
- NSAIDs
- Acetaminophen
- NMDA inhibitors
- Non-selective Sodium Channel Inhibitors
- Gabapentinoids
- Alpha 2 Agonists
- Antispasticity or Antisposmodic agents

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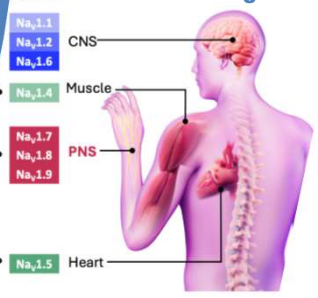
Suzetrigine (Journavx)
"suzzette-tre-gene" ("jor-na-vix")



- Approved Jan 2025 for use in adults with moderate to severe pain
  - 100 mg loading dose followed by 50 mg Q12 for up to 14 days
- First non-opioid analgesic approved in 25 years
- First in class
  - Highly selective NaV1.8 inhibitor (31,000:1 selectivity)
  - Stabilizes the closed state of Na channel
- NaV1.8 is Expressed in peripheral sensory neurons including dorsal root ganglion
  - Expressed in intracardiac ganglia in animals
- Does not appear to have addictive properties

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Suzetrigine - Pharmacology

Pharmacokinetics

- Metabolized Via CYP3A and is **inducer** of CYP3A
- Has active but less potent metabolite (M6-SUZ)
- Excretion:
  - Feces: 49.9%
  - Urine: 44.0%
- Half life elimination: 23.6 hours
  - 33 hr for M6-SUZ

Contraindications and special considerations

- Avoid strong CYP3A4 inhibitors
  - Grapefruit juice, clarithromycin, azole antifungals
- May interact with hormonal contraceptives
  - **Use alternative contraceptives for 28 days after last dose**
- Dose adjustments needed for Child Pugh B
- No dose adjustments for eGFR >15ml/min

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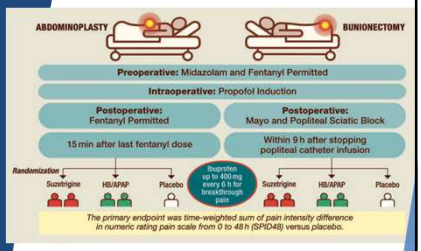
Suzetrigine – Gimme the data

- Two phase 3 clinical trials
  - Over 1000 patients in each trial
  - Abdominoplasty and Bunionectomy
  - Excluded patients that had painful physical conditions, sensory abnormalities, long term use of opioids or NSAIDs
  - Randomization occurred post operatively
- Comparators:
  - Suzetrigine vs.
  - Hydrocodone/acetaminophen (5-325 q6) vs.
  - Placebo
- Outcomes: Reported pain on numeric rating scale at 19 time points (0.5-48 hours)



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Outcomes

Primary outcome

- Time-weighted sum of the pain intensity difference for **suzetrigine compared to placebo** over 48 hours after first dose of study drug (SPID48)

Secondary outcomes

- SPID48 for **suzetrigine compared to hydrocodone-acetaminophen**
- Time to 2 point or greater reduction in numeric pain rating scale from baseline
  - AKA: time to clinically meaningful pain relief

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Results

- Suzetrigine vs. placebo
  - Abdominoplasty 48.4 (P <0.0001)
  - Bunionectomy 29.3 (P=0.0002)
- Suzetrigine vs. HB/APAP
  - Abdominoplasty 6.6 (**p=0.278**)
  - Bunionectomy –20.2 (P= 0.0016)

Table 2. Primary Endpoint: SPID48 Compared to Placebo

	Abdominoplasty		Bunionectomy	
	Suzetrigine N = 447	Placebo N = 223	Suzetrigine N = 426	Placebo N = 216
Prespecified analysis with rescue imputation (imputed)				
LS mean ± SE	118.4 ± 4.3	70.1 ± 6.1	99.9 ± 4.5	70.6 ± 6.3
LS mean difference from placebo	48.4	—	29.3	—
95% CI	(33.6–63.1)	—	(14.0–44.6)	—
P value vs. placebo	<0.0001	—	0.0002	—
Post hoc analysis without rescue imputation (as treated)				
LS mean ± SE	153.0 ± 4.5	105.4 ± 6.4	128.8 ± 4.7	100.1 ± 6.6
LS mean difference from placebo	47.7	—	28.8	—
95% CI	(32.4–62.9)	—	(12.9–44.6)	—
Nominal *P* value vs. placebo*	< 0.0001	—	0.0004	—

Table includes participants who were randomized and received at least one dose of study drug. Participants were analyzed according to their randomized treatment.
*Analyses for SPID48 compared to placebo without rescue imputation are *post hoc*; therefore, *P* values are nominal.
LS mean, least squares mean; N, number of participants in the analysis set; SE, standard error; SPID48, time-weighted sum of the pain intensity difference as recorded on the numeric pain rating scale from 0 to 48 h.

Table 3. First Key Secondary Endpoint: SPID48 Compared to HB/APAP

	Abdominoplasty		Bunionectomy	
	Suzetrigine N = 447	HB/APAP N = 448	Suzetrigine N = 426	HB/APAP N = 431
Prespecified analysis with rescue imputation (imputed)				
LS mean ± SE	118.4 ± 4.3	111.8 ± 4.3	99.9 ± 4.5	120.1 ± 4.5
LS mean difference from HB/APAP	6.6	—	−20.2	—
95% CI	(−5.4 to 18.7)	—	(−32.7 to −7.7)	—
P value vs. HB/APAP	0.2781	—	0.0016	—
Post hoc analysis without rescue imputation (as treated)				
LS mean ± SE	153.0 ± 4.5	141.0 ± 4.5	128.8 ± 4.7	140.6 ± 4.7
LS mean difference from HB/APAP	12.0	—	−11.8	—
95% CI	(−0.5 to 24.4)	—	(−24.8 to 1.2)	—
Nominal *P* value vs. HB/APAP*	0.0595	—	0.0752	—

Table includes participants who were randomized and received at least one dose of study drug. Participants were analyzed according to their randomized treatment.
*Analyses for SPID48 compared to HB/APAP without rescue imputation are *post hoc*; therefore, *P* values are nominal.
HB/APAP, hydrocodone bitartrate/acetaminophen; LS mean, least squares mean; N, number of participants in the analysis set; SE, standard error; SPID48, time-weighted sum of the pain intensity difference as recorded on the numeric pain rating scale from 0 to 48 h.

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Results

- Secondary Outcome:
  Time to 2-point or greater reduction in numeric pain rating scale

Abdominoplasty
- Suzetrigine 119 min
- Placebo 480 min

Bunionectomy
- Suzetrigine 240 min
- Placebo 480 min

Table 4. Second Key Secondary Endpoint: Time to 2-Point or Greater Reduction in NPRS from Baseline Compared to Placebo

	Abdominoplasty		Bunionectomy	
	Suzetrigine N = 447	Placebo N = 223	Suzetrigine N = 426	Placebo N = 216
Prespecified analysis with rescue imputation (imputed)				
Median time, min	119	480	240	480
95% CI	(90–180)	(477–705)	(117–477)	(476–716)
Nominal *P* value vs. placebo* (log-rank test)	<0.0001	—	0.0016	—
Post hoc analysis without rescue imputation (as treated)				
Median time, min	91	180	122	180
95% CI	(89–116)	(175–235)	(115–177)	(120–240)
Nominal *P* value vs. placebo† (log-rank test)	< 0.0001	—	0.0353	—

Table includes participants who were randomized and received at least one dose of study drug. Participants were analyzed according to their randomized treatment.
*,† *P* values for the secondary endpoint of time to ≥2-point reduction in NPRS from baseline were nominal due to the break in hierarchical testing. §Analyses for time to ≥2-point reduction in NPRS from baseline without rescue imputation are *post hoc*; therefore, *P* values are nominal.
N, number of participants in the analysis set; NPRS, numeric pain rating scale.

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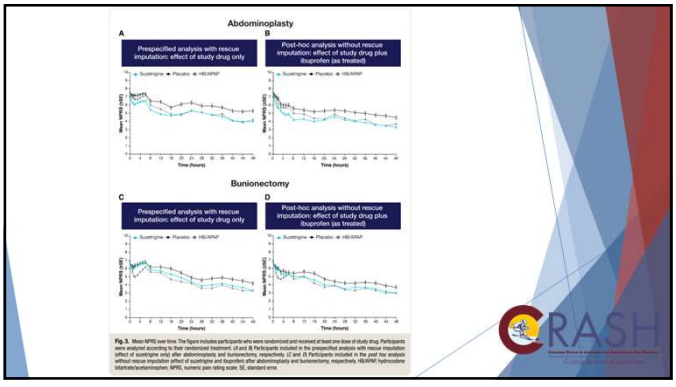

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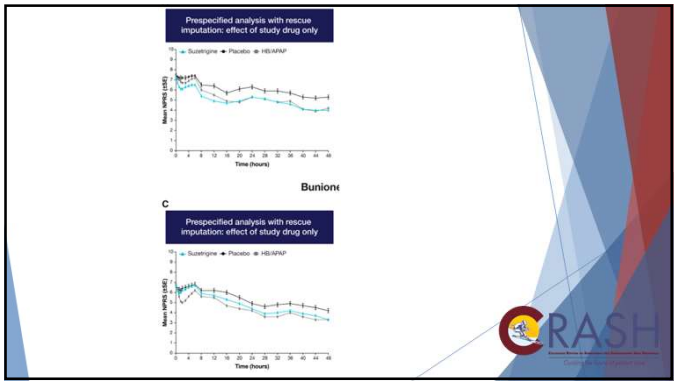

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Safety

- Proportion of patients with AE's after Abdominoplasty
  - Suzetrigine 50.0%
  - Hydrocodone-acetaminophen 60.7%
  - Placebo 56.3%
- Proportion of patients with AE's after bunionectomy
  - Suzetrigine 31.0%
  - Hydrocodone-acetaminophen 41.8%
  - Placebo 35.2%

Table 6. Summary of Adverse Events

	Abdominoplasty			Bunionectomy		
	Suzetrigine N = 448	HB/APAP N = 448	Placebo N = 222	Suzetrigine N = 426	HB/APAP N = 431	Placebo N = 216
Participants with any AEs, n (%)	224 (50.0)	272 (60.7)	125 (56.3)	132 (31.0)	180 (41.8)	76 (35.2)
Participants with AEs by maximum severity, n (%)						
Mild	131 (29.2)	149 (33.3)	72 (32.4)	104 (24.4)	134 (31.1)	61 (28.2)
Moderate	83 (18.5)	112 (25.0)	46 (20.7)	27 (6.3)	42 (9.7)	15 (6.9)
Severe	8 (1.8)	9 (2.0)	6 (2.7)	1 (0.2)	4 (0.9)	0
Life-threatening*	2 (0.4)	2 (0.4)	0	0	0	0
Death†	0	0	1 (0.5)	0	0	0
Participants with SAEs, n (%)	11 (2.5)	7 (1.6)	5 (2.3)	0	0	0
Participants with AEs leading to treatment discontinuation‡, n (%)	5 (1.1)	5 (1.1)	1 (0.5)	0	0	0
AEs (≥ 4% in any treatment group in either trial), n (%)						
Nausea	85 (19.0)	147 (32.8)	56 (25.2)	35 (8.2)	62 (14.4)	23 (10.6)
Constipation	47 (10.5)	39 (8.7)	24 (10.8)	15 (3.5)	22 (5.1)	9 (4.2)
Headache	19 (4.2)	32 (7.1)	11 (5.0)	21 (4.9)	45 (10.4)	20 (9.3)
Dizziness	18 (4.0)	24 (5.4)	17 (7.7)	15 (3.5)	23 (5.3)	11 (5.1)
Hypotension	11 (2.5)	16 (3.6)	15 (6.8)	0	6	1 (0.5)
Vomiting	10 (2.2)	18 (4.0)	3 (1.4)	7 (1.6)	19 (4.4)	6 (2.8)

Table includes participants who received at least one dose of study drug. Participants were analyzed according to the treatment they received. In the abdominoplasty trial, one participant was randomized to receive placebo but received one dose of suzetrigine due to an error in dispensing study drug kits at one site.
*In the abdominoplasty trial, life-threatening SAEs were pulmonary embolism (suzetrigine), anemia (suzetrigine), pulmonary embolism (HB/APAP), and intraabdominal hematoma (HB/APAP); all SAEs were considered unlikely related or not related to study drug. †In the abdominoplasty trial, one participant who received placebo had an SAE of pulmonary embolism that led to death; the SAE was considered not related to study drug. ‡In the bunionectomy trial, one participant who received HB/APAP discontinued due to a pronounced AE (hypotension).
AE, adverse event; HB/APAP, hydrocodone bitartrate/acetaminophen; N, number of participants in the analysis set; n, number of participants; SAE, serious adverse event.

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Summary and Thoughts

- Novel therapeutic option for moderate to severe pain
- Superior to placebo but similar to lower end of dosing with hydrocodone-acetaminophen
- Time to clinically meaningful change to pain scores likely unacceptably long in post operative setting
- Encouraging safety profile
  - No changes to PR, QRS, or QTc was observed at twice max recommended dose
  - Not centrally acting
  - Decreased N/V compared to hydrocodone-acetaminophen
  - Does not appear to be addictive in animal studies
- Expensive: ~ $550 for 14 day course vs ~ $25 for hydrocodone-acetaminophen

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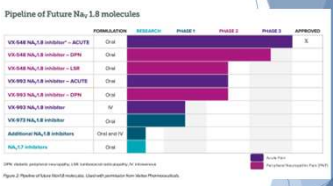
The Future

- Request to be added to formulary at our institution was recently declined by pharmacy and therapeutics committee
- *Starting to see some patients come in with outpatient prescriptions (TJA)*
- Other active studies looking at suzetrigine's utility in the setting of diabetic peripheral neuropathy and lumbosacral radiculopathy



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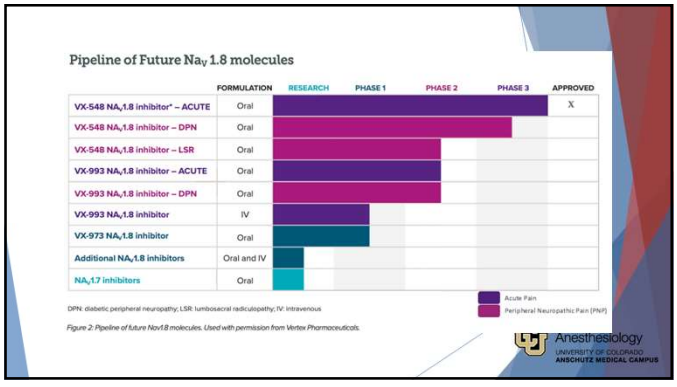

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Citations

- Ahmad S, Tirlomis P, Pabel S, et al.: The functional consequences of sodium channel Na(V) 1.8 in human left ventricular hypertrophy. ESC Heart Fail. 2019; 6:154–63. doi:10.1002/ehf2.12378
- Bertoch, Todd et al. "Suzetrigine, a Nonopioid Na V 1.8 Inhibitor for Treatment of Moderate-to-severe Acute Pain: Two Phase 3 Randomized Clinical Trials." *Anesthesiology* vol. 142,6 (2025): 1085-1099. doi:10.1097/ALN.0000000000005460
- Jones J, Correll DJ, Lechner SM, et al.: Selective inhibition of NaV1.8 with VX-548 for acute pain. N Engl J Med 2023; 389: 393–405
- Lee P, Kim M, Szakol J, Bottros M. Suzetrigine: a novel, peripherally acting analgesic. *APSF Newsletter*. 2025;2:32,36–37
- Minkowitz, Harold et al. "Intravenous Tramadol Is Effective in the Management of Postoperative Pain Following Abdominoplasty: A Three-Arm Randomized Placebo- and Active-Controlled Trial." *Drugs in R&D* vol. 20,3 (2020): 225-236. doi:10.1007/s40268-020-00309-0
- Osteen JD, Immani S, Tapley TL, et al.: Pharmacology and mechanism of action of suzetrigine, a potent and selective Na(V)1.8 pain signal inhibitor for the treat- ment of moderate to severe pain. Pain Ther 2025; 14:655–74. doi:10.1007/s40122-024-00697-0.
- Rathmell, James P., et al. "Suzetrigine: First in a New Class of Nonopioid Analgesics for Acute Pain." *Anesthesiology*, vol. 142, no. 6, May 2025, pp. 989–91, doi:10.1097/ALN.0000000000005465.
- *Suzetrigine: Drug information* (no date) *UpToDate*. Available at: https://www.uptodate.com/contents/suzetrigine-drug-information?source=auto_suggest&selectedTitle=1~1---1~4---suzetr&search=suzetrigine (Accessed: 06 November 2025).

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Let's talk blocks

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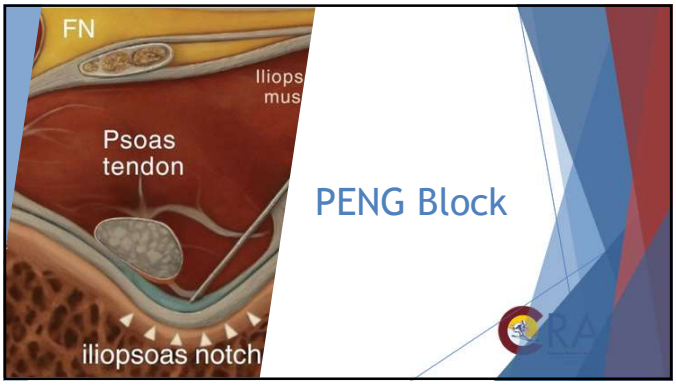

PENG Block

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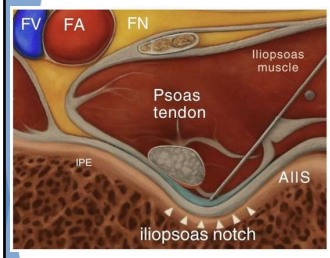

PENG Block

- Motor sparing (theoretically) analgesic block for medial and anterior hip capsule
- Useful for hip fracture and THA analgesia

NYSORA

https://www.nysora.com/education-news/new-insights-into-peng-block/

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Pericapsular nerve group (PENG) block: what have we learned in the last 5 years?

Laura Girón-Arango, Philip Peng

Girón-Arango L, Peng P. *Reg Anesth Pain Med* 2025;**50**:402–409. doi:10.1136/rapm-2024-105427

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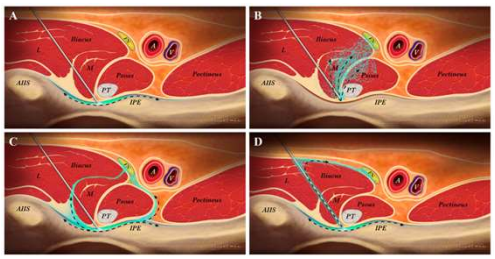
Lesson 1:

Spread Patterns



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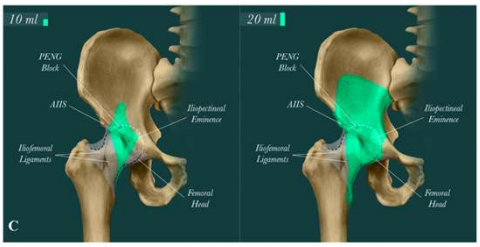
Lesson 2:

Optimal Volume



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Lesson 2:

Optimal Volume

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Lesson 2b:

What do we mean by "optimal"?

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Lesson 2b:

Balancing act between:

(1) analgesic efficacy
and
(2) motor sparing

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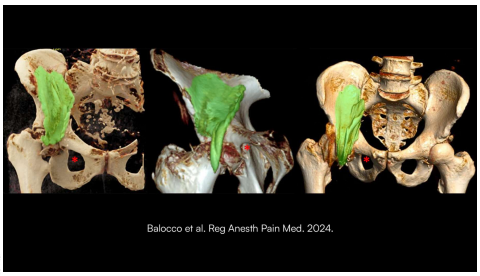
Lesson 2b:

Optimal Volume



20 mL volume (18 mL ropivacaine with 2 mL contrast)

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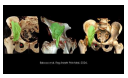
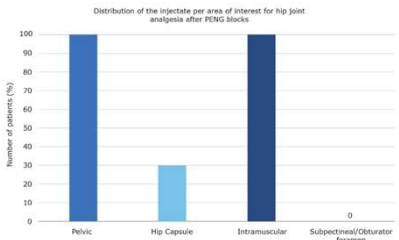
Lesson 2b:

Optimal Volume





- Pelvic and Intramuscular spread: *possible* femoral nerve or lumbar plexus involvement → motor block
- Hip capsule and Obturator spread: ideal (intended) spread pattern

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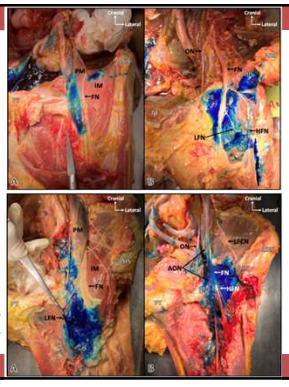
Lesson 2b:

Optimal Volume



Cadaveric study investigating the femoral nerve-sparing volume for pericapsular nerve group (PENG) block

- 32 cadaver specimens – 45 randomized blocks
- Dye injected (0.1% methylene blue)
- Volumes 2-22 mL

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Lesson 2b:

Optimal Volume

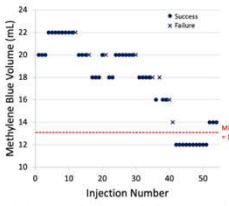

Figure 5 The bias coin design up-and-down sequence for ultrasound-guided pericapsular nerve group block. MEV90, maximum effective volume of dye in 90% of cases.

Cadaveric study investigating the femoral nerve-sparing volume for pericapsular nerve group (PENG) block

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Lesson 2b:

Optimal Volume

Similar incidence of quadriceps weakness ***WITH AND WITHOUT*** block…

Table 1 Motor weakness PENG block compared with no nerve block

Authors	Comparator	Measurement	PENG	Comparator
Bravo *et al*[22]	PAI	Motor scale	3 hours=25%; 6 hours=13%	3 hours=33%; 6 hours=23%
Lin *et al*[18]	Sham block	Motor scale	PACU=23%; day 1=20%	PACU=20%; day 1=24%
Hu *et al*[21]	Sham block+LIA	Motor scale[1]	Day 1=3.3 (3-4)	Day 1=3.4 (3-4)
Zheng *et al*[17]	Sham block+IA	Dynamometer	30 min and PACU ND[2]	30 min and PACU ND[2]
Domagalska *et al*[20]	Sham block	Active elevation of operated limb	6 hours postoperative=47%	6 hours postoperative=89%
Kukreja *et al*[19]	Sham block	Distance of ambulation	Day 1=121.3 (75.3)	Day 1=104.0 (72.0)
Pascarella *et al*[16]	No block	Unspecified[3]	No motor block	No motor block

IA, intra-articular injection; LIA, local infiltration analgesia; ND, no difference; PACU, postanesthetic care unit; PAI, periarticular infiltration; PENG, pericaspular nerve group.

Pericapsular nerve group (PENG) block: what have we learned in the last 5 years?

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Lesson 2b:

Optimal Volume

Takeway: **volumes of 15-20 mL seem appropriate to balance analgesic efficacy with motor sparing.**

If we want to truly avoid motor block, volumes should be decreased to around 10 mL

Cadaveric study investigating the femoral nerve-sparing volume for pericapsular nerve group (PENG) block

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Lesson 3:

Perioperative applications:

Hip Arthroplasty

Table 2 Analgesic efficacy of PENG block in hip arthroplasty versus other techniques

Authors	+	=	−	Observations
Placebo or no block				
Pascarella *et al*[16]				Compared with no block
Domagalska *et al*[20]				Compared with sham block
Suprainguinal fascia iliaca block				
Aliste *et al*[15]				40 mL for suprainguinal FIB
Carella *et al*[18]				40 mL for suprainguinal FIB
Choi *et al*[41]				30 mL for suprainguinal FIB
Duan *et al*[27]				Continuous analgesia through catheter
Vamshi *et al*[39]				30 mL for both blocks/Clonidine as adjuvant
Liang *et al*[40]				Plus LFCN block
Infiltration techniques				
Bravo *et al*[22]				Compared with PAI
Hu *et al*[21]				Added to LIA
Lin *et al*[42]				Added to LIA
Zheng *et al*[17]				Added to IA

In green are the RCTs that reported a superior analgesic profile with PENG block; In yellow are the RCTs that reported similar results; In red are the RCTs that reported inferiority of PENG block.
FIB, fascia iliaca block; IA, intra-articular injection; LFCN, lateral femoral cutaneous nerve; LIA, local infiltration analgesia; PAI, periarticular infiltration; PENG, pericaspular nerve group; RCT, randomized controlled trial.

Pericapsular nerve group (PENG) block: what have we learned in the last 5 years?

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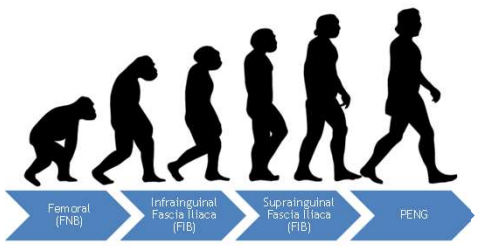
Lesson 3:

Perioperative applications:

Hip Fracture



Pericapsular nerve group (PENG) block: what have we learned in the last 5 years?

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Lesson 3:

Perioperative applications: Hip Fracture

FNB < Infra FIB << Supra FIB ≈ PENG

Pericapsular nerve group (PENG) block: what have we learned in the last 5 years?

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A hip fracture aside…

ANESTHESIOLOGY

Pain as a Driver of Myocardial Injury in Hip Fracture Patients: A Hip Fracture Accelerated Surgical Treatment and Care Track (HIP ATTACK) Trial Secondary Analysis

James S. Khan, M.D., M.Sc., Francesca Mulazzani, M.D., P. J. Devereaux, M.D., Ph.D., Mohit Bhandari, M.D., Ph.D., Ernesto Guerra-Farfan, M.D., Ameen Patel, M.D., Harsha Shanthanna, M.D., Ph.D., Gerard Slobogean, M.D., Aiben Sigamani, M.D., Masood Umer, M.B.B.S., Robert J. Ferbel, M.D., Maria E. Tibero, M.D., Vikas Tandon, M.D., Valerie Harvey, B.Sc., Kumar Balasubramanian, M.Sc., Jessica Vincent, M.Sc., Ana Claudia Torelli, M.D., Ph.D., Ian Ginsn, M.D., M.Sc., Arissa M. Torrie, M.D., Ph.D., Flavia K. Borges, M.D., M.Sc., Ph.D., on behalf of the HIP ATTACK Investigators*

Anesthesiology 2020; 144:289–300

Table 3. Multivariable logistic regression models for the Primary and Secondary Outcomes

	OR (95% CI)	P Value	Adjusted OR (95% CI)	P Value
Outcome: Troponin elevation from any cause (1,098 events of 2,430 complete cases)*				
Moderate pain	1.96 (1.64–2.33)	< 0.001	3.90 (3.02–5.05)	< 0.001
Severe pain	13.08 (9.12–18.71)	< 0.001	29.24 (17.7–48.29)	< 0.001
Outcome: Myocardial injury (768 events of 2,430 complete cases)*				
Moderate pain	1.71 (1.41–2.07)	< 0.001	2.09 (1.71–2.57)	< 0.001
Severe pain	5.09 (3.78–6.61)	< 0.001	6.04 (4.49–8.12)	< 0.001
Outcome: Myocardial infarction (125 events of 2,430 complete cases)*				
Moderate pain	1.36 (0.89–2.09)	0.1580	1.41 (0.94–2.14)	0.0997
Severe pain	2.18 (1.25–3.79)	0.0057	2.33 (1.35–3.99)	0.0022
Outcome: Composite of myocardial injury and myocardial infarction (874 events of 2,430 complete cases)				
Moderate vs. mild	1.68 (1.39–2.02)	< 0.0001	2.16 (1.77–2.64)	< 0.001
Severe vs. mild	5.25 (3.96–6.95)	< 0.0001	6.83 (5.11–9.41)	< 0.001

*Adjusting covariates: age, sex, history of myocardial infarction, stable angina, unstable angina, hypertension, diabetes, stroke, peripheral vascular disease, renal failure, treatment group, type of anesthesia, and centers.
OR, odds ratio.

More pain → myocardial injury

So maybe: less pain (via regional anesthesia) could lead to improved end-organ outcomes

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External Oblique Intercostal (EOI) Fascial Plane Block

The External Oblique Intercostal Block: Anatomic Evaluation and Case Series

Hesham Elsharkawy, MD, MBA, MSc, FASA,*,† Sree Kolli, MD,‡ Loran Mounir Soliman, MD,‡ John Seif, MD, MBA,‡ Richard L. Drake, PhD,§ Edward R. Mariano, MD, MAS, FASA,¶,‖ and Kariem El-Boghdadly, MBBS, BSc (Hons), FRCA, EDRA, MSc‖,**

Pain Medicine, 22(11), 2021, 2436–2442
https://doi.org/10.1093/pm/pnab296
Advance Access Publication Date: 9 October 2021
Technical Note
OXFORD

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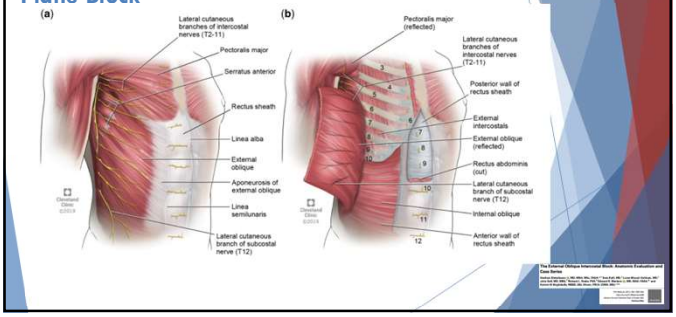
External Oblique Intercostal (EOI) Fascial Plane Block



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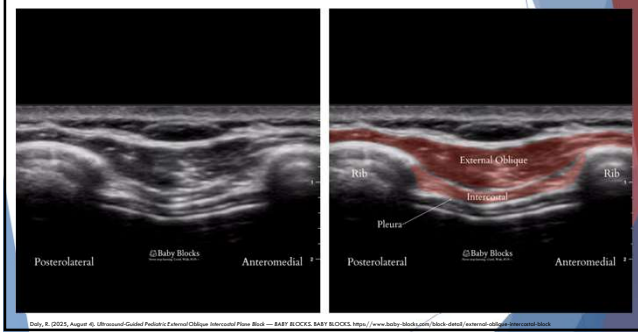
External Oblique Intercostal (EOI) Fascial Plane Block: Ultrasound View



Doty, R. (2025, August 4). *Ultrasound-Guided Pediatric External Oblique Intercostal Plane Block — BABY BLOCKS*. BABY BLOCKS. https://www.baby-blocks.com/block-detail/external-oblique-intercostal-block

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External Oblique Intercostal (EOI) Fascial Plane Block:

Dermatomal Coverage

Doty, R. (2025, August 4). *Ultrasound-Guided Pediatric External Oblique Intercostal Plane Block — BABY BLOCKS*. BABY BLOCKS. https://www.baby-blocks.com/block-detail/external-oblique-intercostal-block

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External Oblique Intercostal (EOI) Fascial Plane Block

Table 1. Summary of patients' demographic data and cutaneous blockade 15–30 minutes after an EOI block.

						Bilateral Thoracic Dermatomal Sensory Coverage*					
						Anterior to Posterior Axillary Lines			Midline		
	Age	Sex	Operation	EOI Technique	Upper	Lower	Number of Dermatomes	Upper	Lower	Number of Dermatomes
1	73	F	Small bowel resection	Single injection	6	9	3	6	10	4
2	70	F	Partial colectomy	Catheters	6	10	4	7	9	2
3	70	M	Laparoscopic Whipple's	Single injection	6	10	4	6	9	3
4	36	M	Ileocolectomy	Single injection	6	11	5	5	10	5
5	68	M	Retroperitoneal mass excision	Single injection	6	11	5	7	9	2
6	62	F	Laparoscopic sigmoidectomy	Single injection	7	11	4	6	9	3
7	62	M	Liver transplantation	Catheters	6	11	5	7	9	2
8	63	F	Laparoscopic gastrectomy	Single injection	6	11	5	6	9	3
9	57	F	Laparoscopic proctopexy	Single injection	5	10	5	5	8	3
10	70	M	Exploratory laparotomy	Catheters	5	11	6	6	9	3
11	44	M	Partial colectomy	Single injection	5	10	5	7	10	3
12	58	M	Small bowel resection	Single injection	7	11	4	6	9	3
13	59	F	Exploratory laparotomy	Single injection	6	10	4	7	10	3
14	67	F	Liver transplant	Single injection	5	11	6	6	9	3
15	53	F	Donor nephrectomy	Catheters	6	10	4	6	8	2
16	69	M	Nissen fundoplication	Single injection	5	10	5	4	10	6
17	31	M	Donor hepatectomy	Catheters	5	10	5	6	9	3
18	58	M	Revision biliary anastomosis	Catheters	6	10	4	7	9	2
19	66	M	Biliary-enteric anastomosis	Single injection	6	10	4	8	10	2
20	65	M	Excision of ampulla of Vater	Single injection	6	10	4	7	9	2
21	47	M	Renal transplantation	Single injection	7	10	3	7	10	3
22	47	F	Closure enterostomy	Single injection	6	10	4	7	9	2

*Bilateral dermatomal coverage was reported approximately, with inconsistencies between each side averaged.

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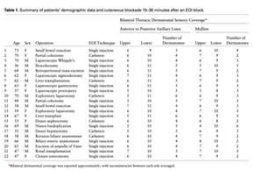
External Oblique Intercostal (EOI) Fascial Plane Block



- Upper abdominal coverage from midline to roughly midaxillary line
  - Open cholecystectomy
  - Hepatic resection
  - Bariatric surgery
- Similar coverage to subcostal TAP block (dermatomal coverage roughly 6-10)
- Can be single injection of catheter techniques

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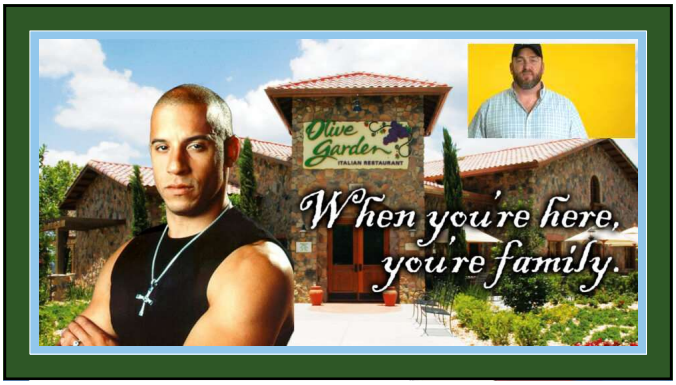

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