

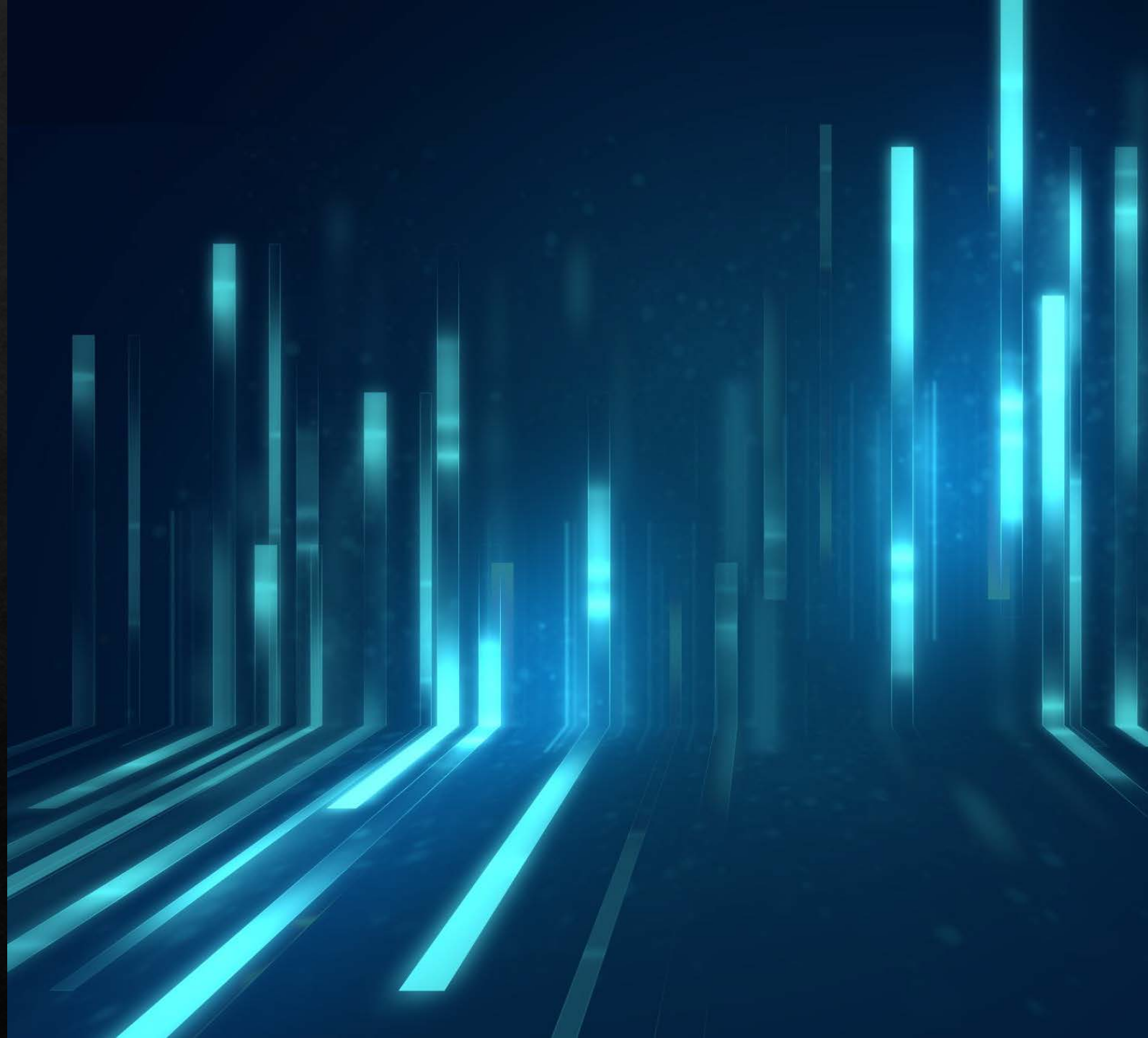
*Truncal Blocks:
Regional Anesthesia
Techniques for
Analgesia and
Review of Evidence*

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University of Wisconsin School
of Medicine and Public Health

November 9, 2019

I have no disclosures.



Objectives



Discuss evolution of regional anesthesia for management of post-operative analgesia



Review innervation of the abdomen and chest wall



Describe ultrasound-guided regional anesthesia techniques



Understand clinical applications of USGRA for abdominal and breast surgery



Discuss current literature for fascial plane blocks

THE OPIOID EPIDEMIC BY THE NUMBERS



130+

People died every day from opioid-related drug overdoses³
(estimated)



10.3 m

People misused prescription opioids in 2018¹



47,600

People died from overdosing on opioids²



2.0 million

People had an opioid use disorder in 2018¹



808,000

People used heroin in 2018¹



81,000

People used heroin for the first time¹



2 million

People misused prescription opioids for the first time¹



15,349

Deaths attributed to overdosing on heroin (in 12-month period ending February 2019)²



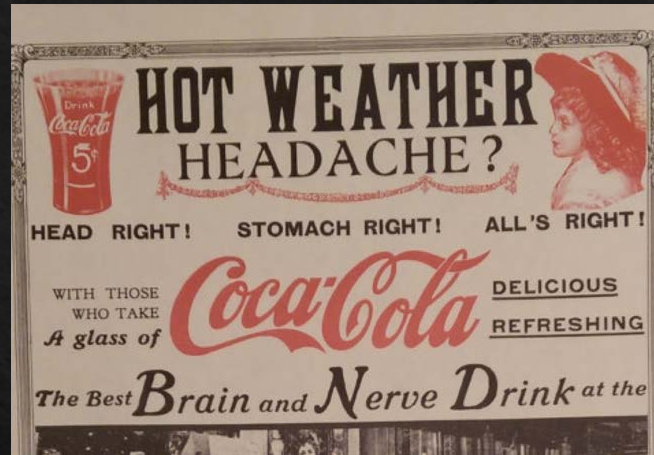
32,656

Deaths attributed to overdosing on synthetic opioids other than methadone (in 12-month period ending February 2019)²

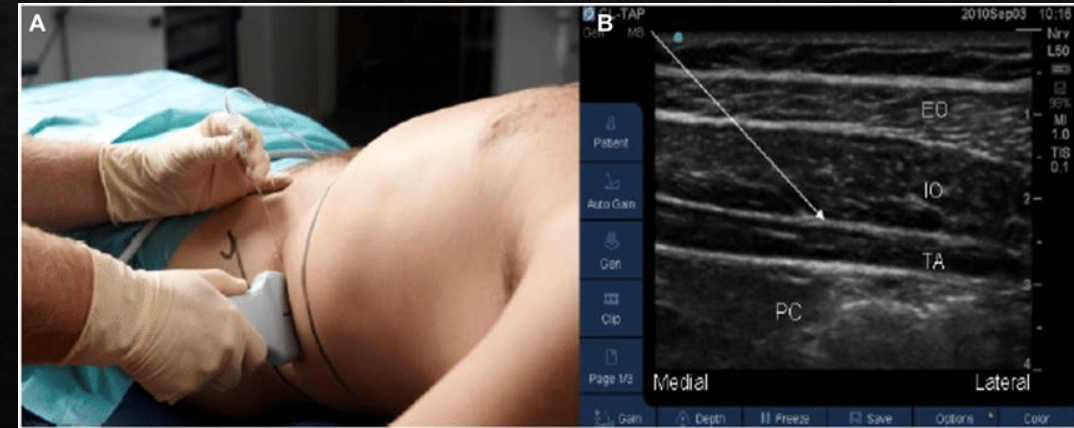
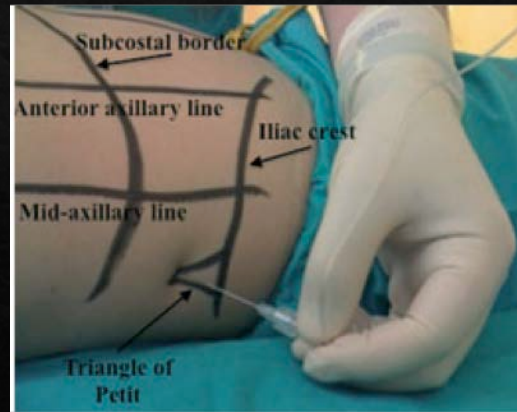
SOURCES

1. 2019 National Survey on Drug Use and Health, Mortality in the United States, 2018
2. NCHS Data Brief No. 329, November 2018
3. NCHS, National Vital Statistics System. Estimates for 2018 and 2019 are based on provisional data.

THEN



NOW



Epidural vs Fascial Plane Blocks

Epidural

Hypotension

Urinary Retention

Headache

Anticoagulation

Neurologic complication

Failure rate

Cost

****ULTRASOUND****

Fascial Plane Blocks

Technically easier to perform

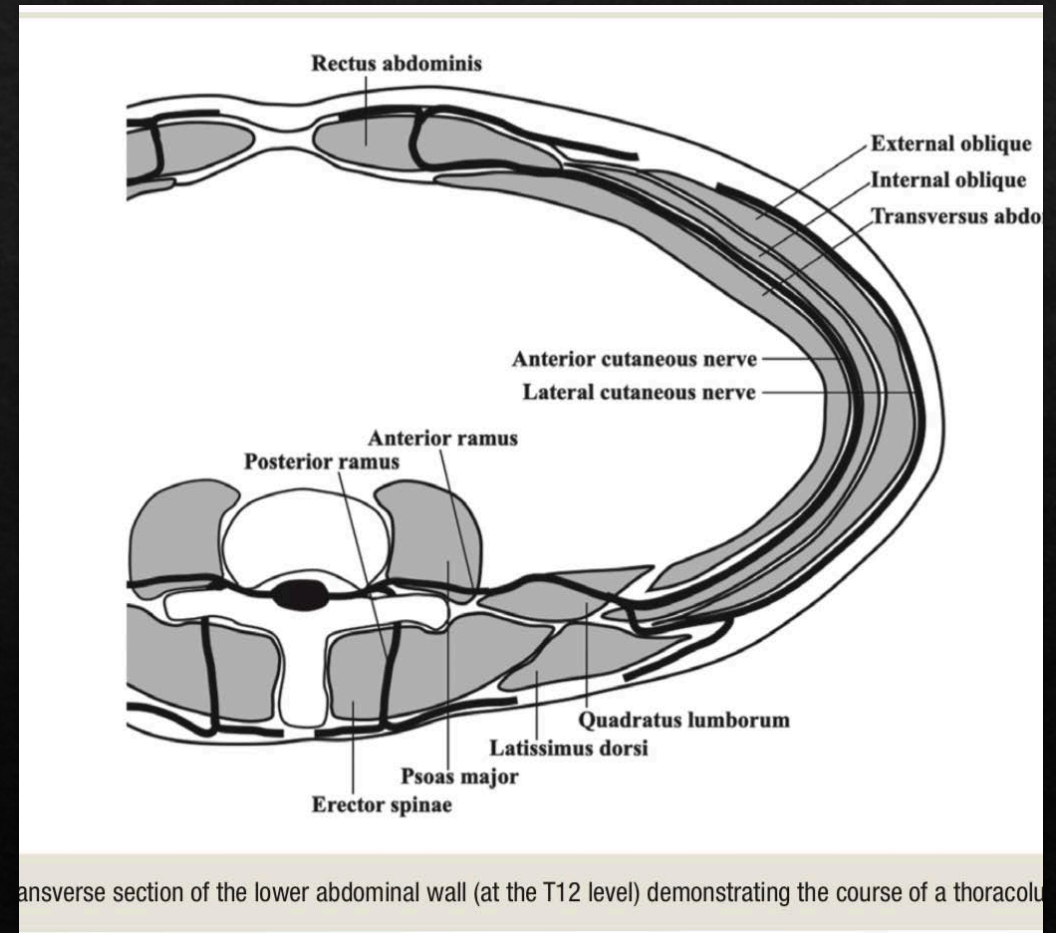
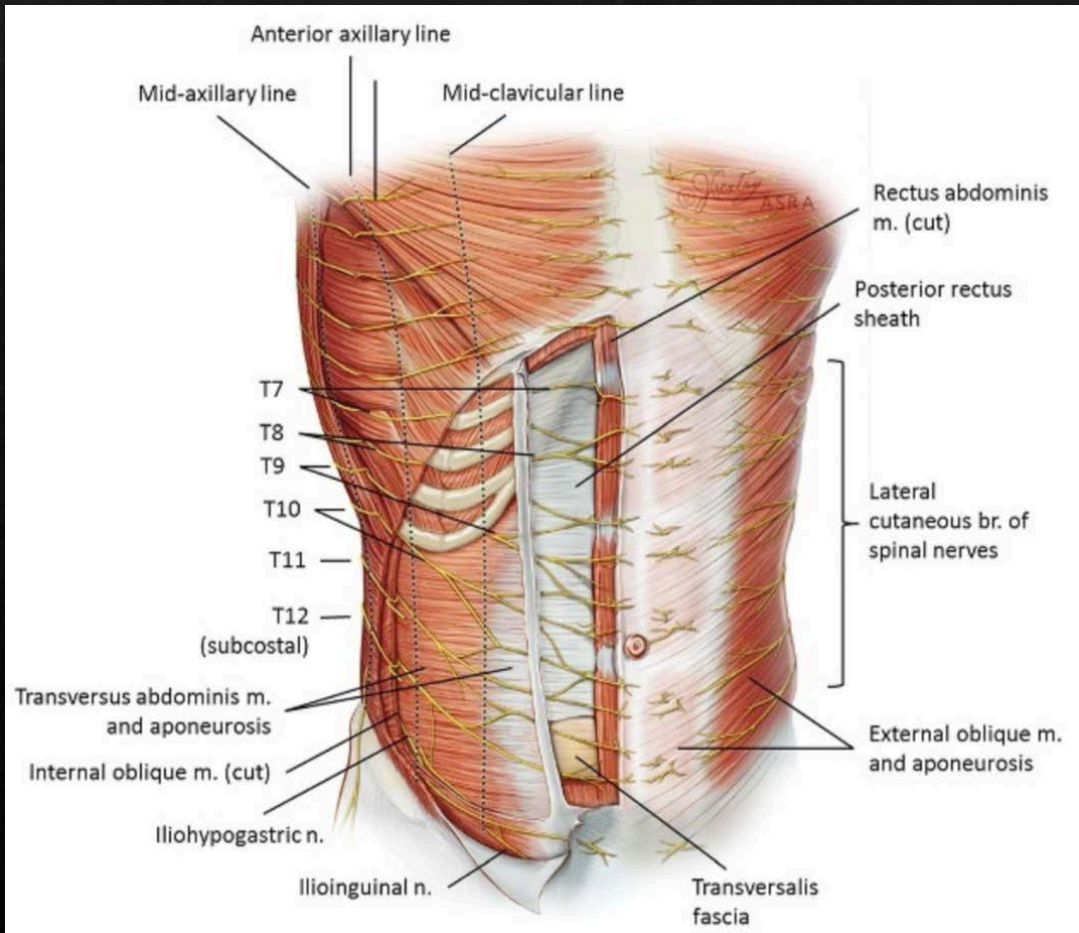
Less risk

Decreased side effects

Multimodal analgesia

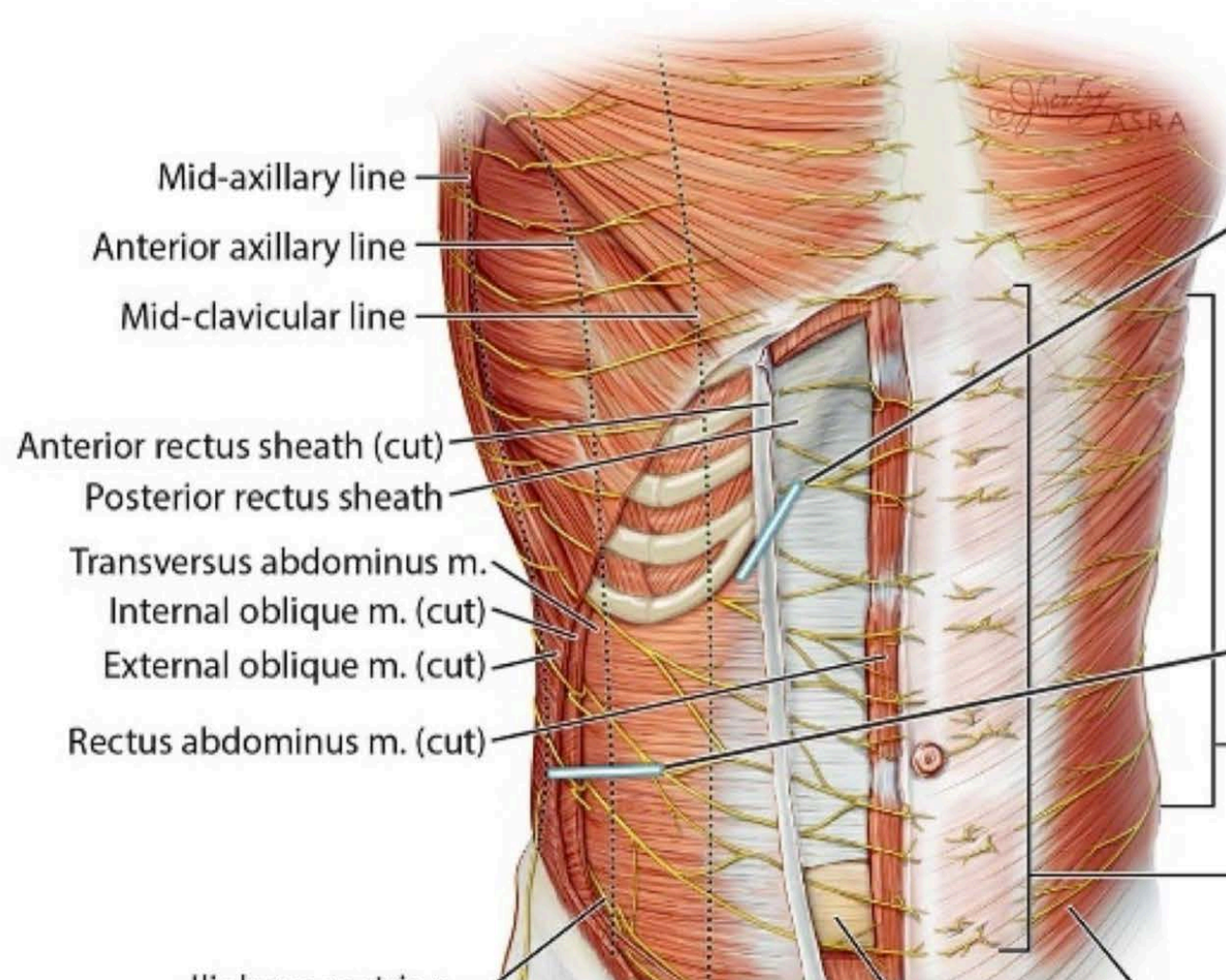
? Evidence

Innervation of the Abdominal Wall

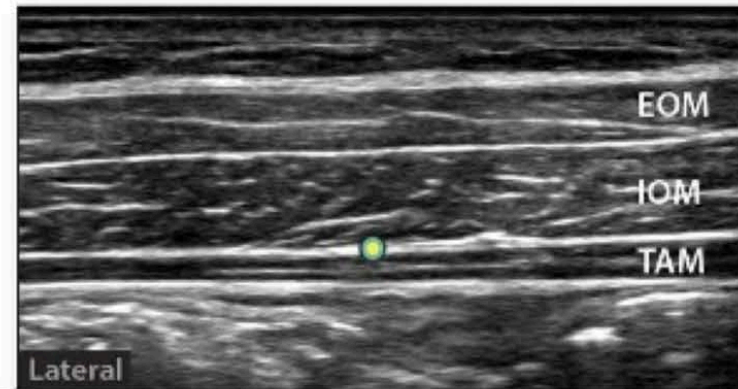


Transverse section of the lower abdominal wall (at the T12 level) demonstrating the course of a thoracolumbar nerve.

Transversus Abdominis Plane Blocks



USG subcostal TAP block



USG lateral TAP block

Lateral cutaneous branches of thoracoabdominal nn. (T6-T12)

Anterior cutaneous branches of thoracoabdominal nn. (T6-T12)

Posterior TAP

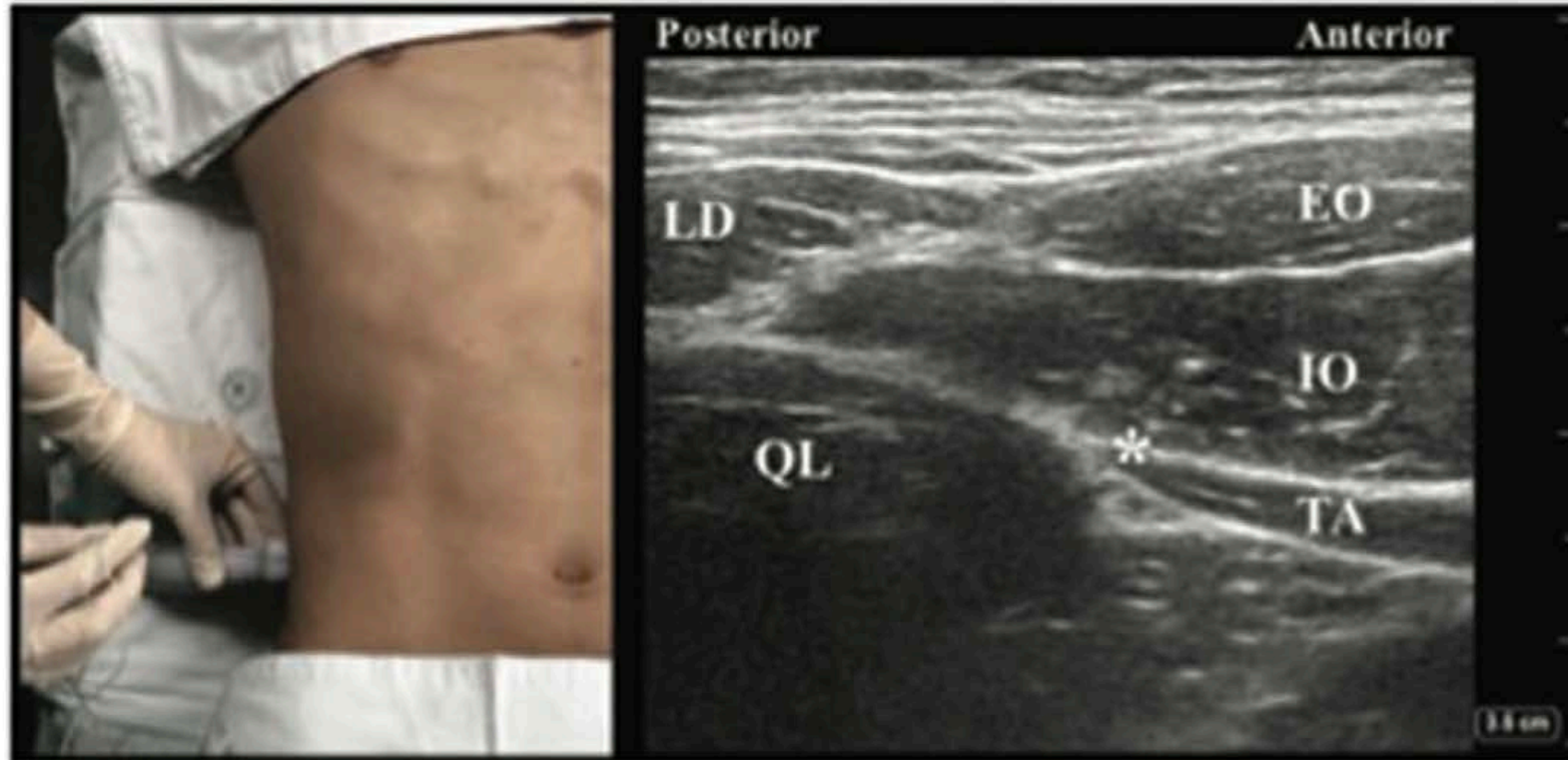
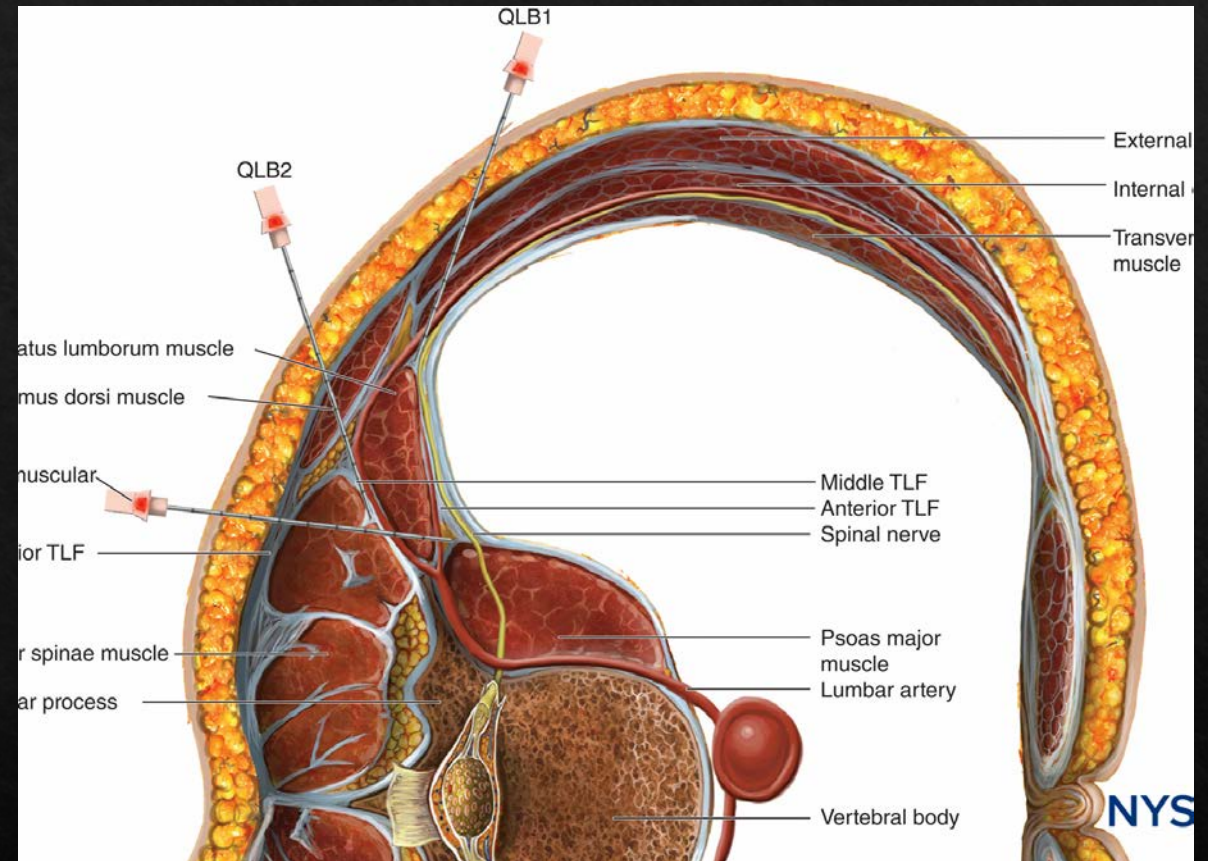
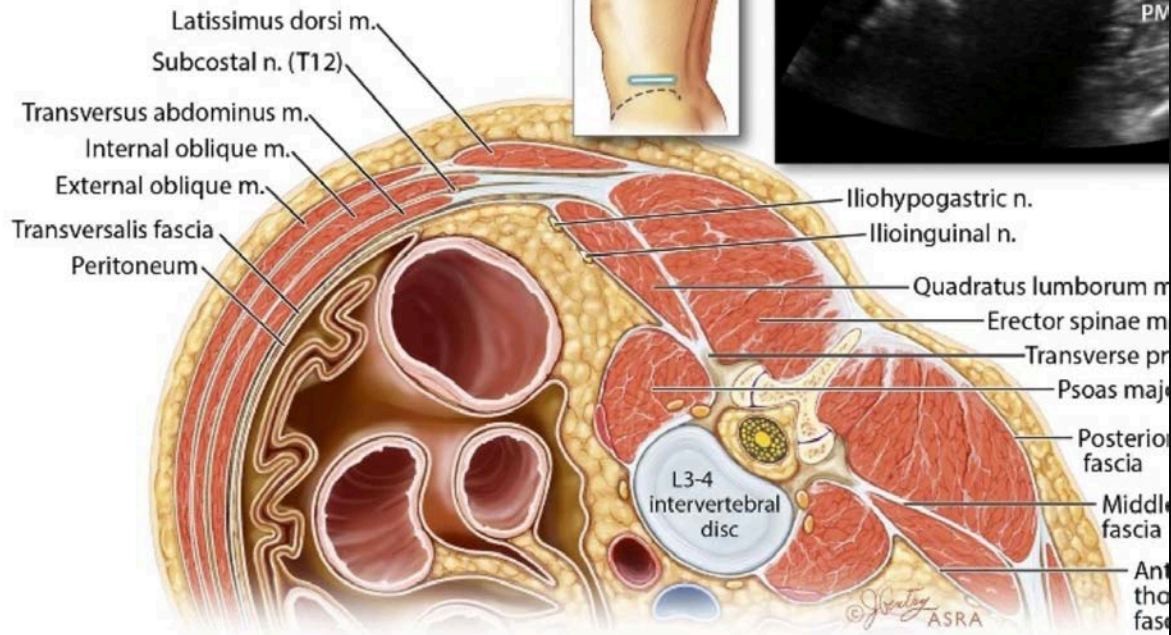
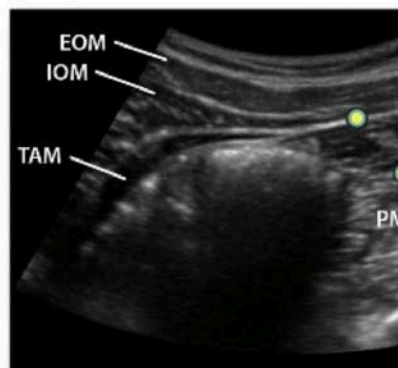


Fig. 4. Ultrasound probe position, needle puncture site, and sonographic image of the posterior transversus abdominis plane block. Asterisk indicates needle target; EO, external oblique muscle; IO, internal oblique muscle; LD, latissimus dorsi muscle; QL, quadratus lumborum muscle; TA, transversus abdominis muscle.

Quadratus Lumborum Block



Quadratus Lumborum Blocks

	Target	Landmarks	Indications	Limitations
Subcostal TAP	Anterior cutaneous branches of T6-T10	Subcostal Margin, Rectus and TA	Unilateral, midline upper abdominal incision: open cholecystectomy	No visceral coverage
Lateral TAP	Anterior division of intercostal nerves T10-L1	Internal Oblique and External Oblique, Triangle of Petit	Unilateral/midline incision on lower abdominal wall: Hernia ostomy , C-section	Limited spread, No visceral coverage
Posterior TAP	Anterior cutaneous branches of T7-L1	Posterior axillary line, above iliac crest and below costal margin, intersection of TA and QL	Abdominal surgery above or below umbilicus	Possible visceral coverage, ? Same as lateral QL
Quadratus Lumborum	T4-L1 anterior and lateral cutaneous branches Lateral, Posterior and Anterior Approaches	Posterior axillary line, above iliac crest and below costal margin	Abdominal surgery above or below umbilicus	Limited data, potential for spread to PVS /lumbar plexus with anterior approach (quad weakness)

- ◇ Based on systematic reviews or meta-analysis published in 2018-2019 or cumulative RCTs if no review available
- ◇ PubMed
- ◇ 18 years of data - many limitations

ANESTHESIOLOGY



Transversus Abdominis Plane Block

A Narrative Review

De Q. Tran, M.D., F.R.C.P.C., Daniela Bravo, M.D.,
Prangmalee Leurcharusmee, M.D., Joseph M. Neal, M.D.

ANESTHESIOLOGY 2019; 131:1166–90

What We Know

Optimal Dosing

- No difference in concentration (low vs high)
- Volume is required (>15mls per side)
- Dosing based on Lean Body Weight to avoid LAST
- PIB vs Continuous
- Rapid first phase absorption kinetics; Mean time to maximum serum concentration 10-35 min
- Epinephrine (5mcg/ml): 35% decrease in max plasma concentration

Optimal Local Anesthetic

- Ropivacaine vs Bupivacaine = No difference
- Bupivacaine vs Liposomal Bupivacaine – Not enough evidence
- Catheters: PIB vs continuous? 4 catheters? Vs liposomal?

Liposomal Bupivacaine vs Bupivacaine

- ◇ Cochrane Review 2016: 7 RCTS, 4 with data
- ◇ 2 RCTs looked at subcostal TAP
- ◇ Quality of Evidence: **LOW**



- ◇ Hysterectomy: TAP with liposomal vs port infiltration with bupivacaine
 - ◇ LB reduced opioids consumption in the first 72 hours, PONV and pain scores
- ◇ Nephrectomy: TAP Liposomal bup vs Bup with epi
 - ◇ No difference in opioid or pain scores in PACU or at 24 hours
 - ◇ Pain scores 5 vs 6 at 24-48 hours, 3 vs 5 at 48-72 hours, decreased opioid between 48-72 hours 100 mcg vs 180mcg
 - ◇ Multimodal was PRN at discretion of nurse

Liposomal Bupivacaine vs Epidural

Conventional Epidural vs Transversus Abdominis Plane Block with Liposomal Bupivacaine: A Randomized Trial in Colorectal Surgery



Journal of the
American College
of Surgeons

Matthew Torgeson, DO, Joel Kileny, MD, Christopher Pfeifer, DO, FACOS,
Lawrence Narkiewicz, MD, FACS, Shawn Obi, DO, FACS

- n=83; Standardized Multimodal/ERAS
- Primary Outcome: 0.5-day reduction in LOS
- No difference in time to flatus
- Increased PONV in TAP group
- Increased urinary retention in epidural group

Liposomal Bupivacaine Transversus Abdominis Plane Block Versus Epidural Analgesia in a Colon and Rectal Surgery Enhanced Recovery Pathway: A Randomized Clinical Trial

Felling, Daniel R. M.D., M.S.¹; Jackson, Miles W. M.D.¹; Ferraro, Jane B.S.N., M.P.P., R.N.²; Battaglia, Michael A. M.S.³; Albright, Jeremy J. Ph.D.³; Wu, Juan Sc.D.²; Genord, Cheryl K. B.S. Pharm., R.Ph.⁴; Brockhaus, Kara K. Pharm.D.⁴; Bhavre, Rohit A. M.D.⁵; McClure, Amanda M. M.D.⁶; Shanker, Beth-Ann M.D., M.Sc.⁶; Cleary, Robert K. M.D.⁶

Diseases of the Colon & Rectum: October 2018 - Volume 61 - Issue 10 - p 1196-1204

- ◇ n=183 Primary Outcome: Pain scores: higher in TAP first 24 hours, then lower. Overall no significant difference.
- ◇ Opioid higher in epidural when counting infusion dose but significantly lower if excluded
- ◇ No difference in GI recovery, LOS, complications; Epidural=increased cost

Evidence for Clinical Indications

Laparoscopic Cholecystectomy

Recommendation: Subcostal TAP

- 7 RCTs
- Subcostal approach outperforms standard analgesic regimen (no block or periportal infiltration)
- None of the studies employed multimodal analgesia.

Bariatric Surgery

Recommendation: evidence does not support block

- 3 RCTs, 2 studies reported statistically significant decrease in pain scores (<2 pts), opioid consumption (3mg in 24 hrs), time to ambulation (1.7hrs) and PO intake (2.4hrs) in TAP group. (Clinical relevance?)
- One study that employed multimodal (acetaminophen, ketorolac, LA infiltration) reported NO Difference with subcostal TAP

Evidence for Clinical Indications

Appendectomy

Recommendation:
Open - Lateral or
post TAP

- OPEN: 3 RCTs. Both lateral and posterior TAP showed reduction in pain scores and opioid consumption
- Laparoscopic: 2 RCTs. Does not support lateral TAP

Inguinal Hernia Repair

Recommendation:
None

- OPEN: Both lateral and posterior TAP showed reduction in pain scores and opioid consumption
- Laparoscopic: 2 RCTs. Lateral TAP decreased pain scores and opioid consumption compared to port infiltration/no block
- Bilateral: 1 RCT. Preperitoneal LA outperformed TAP block
- Only one study used multimodal

Colorectal Surgery

Laparoscopic

Recommendation:
None

- 2018 Systematic Review and Meta Analysis
 - Lateral TAP: statistically significant difference in early (2 hours) and late (24 hours) pain scores with movement only. (? clinical sig of 0.2 to 0.7)
 - Similar pain at rest, breakthrough opioid consumption

Open

Recommendation:
Thoracic epidural

- TAP vs placebo: (2 RCTs) TAP decreased pain scores and morphine consumption
- Epidural vs single shot: Epidural superior but side effects
- Continuous TAP vs epidural: Mixed
 - 1 favored epidural, 2 showed similar analgesia with TAP but increased need for breakthrough analgesia

USGRA vs Lap-Assisted/Surgeon-administered TAP

- ◇ Definition of surgically placed TAP
 - ◇ Many more permutations than percutaneous approach
- ◇ 4 RCTs: Non-Inferior with Equal Analgesia
 - ◇ **Performance time: Surgical approach *DECREASED* time by 60-80%**
 - ◇ Zaghiyan, et al showed decreased morphine consumption at 48 hours



Potential Complications

Accidental Peritoneal Puncture

Intravascular Injection

LAST

Failure

QLB: retroperitoneal hematoma, psoas weakness, femoral nerve block

Catheters: infection, dislodgment, leaking, migration

Conclusions

- ◇ Posterior and subcostal approach provide more reliable analgesia.
- ◇ Posterior TAP approach could cover visceral pain (=QLB?)
- ◇ Surgical approach to block placement promising with shorter performance time and equal analgesia but no trial to date has determined optimal technique
- ◇ Need for quality RCTs:
 - ◇ Comparing posterior TAP vs QLB
 - ◇ Determine an optimal multimodal analgesia regimen
 - ◇ Liposomal vs catheter

Chest Wall Blocks



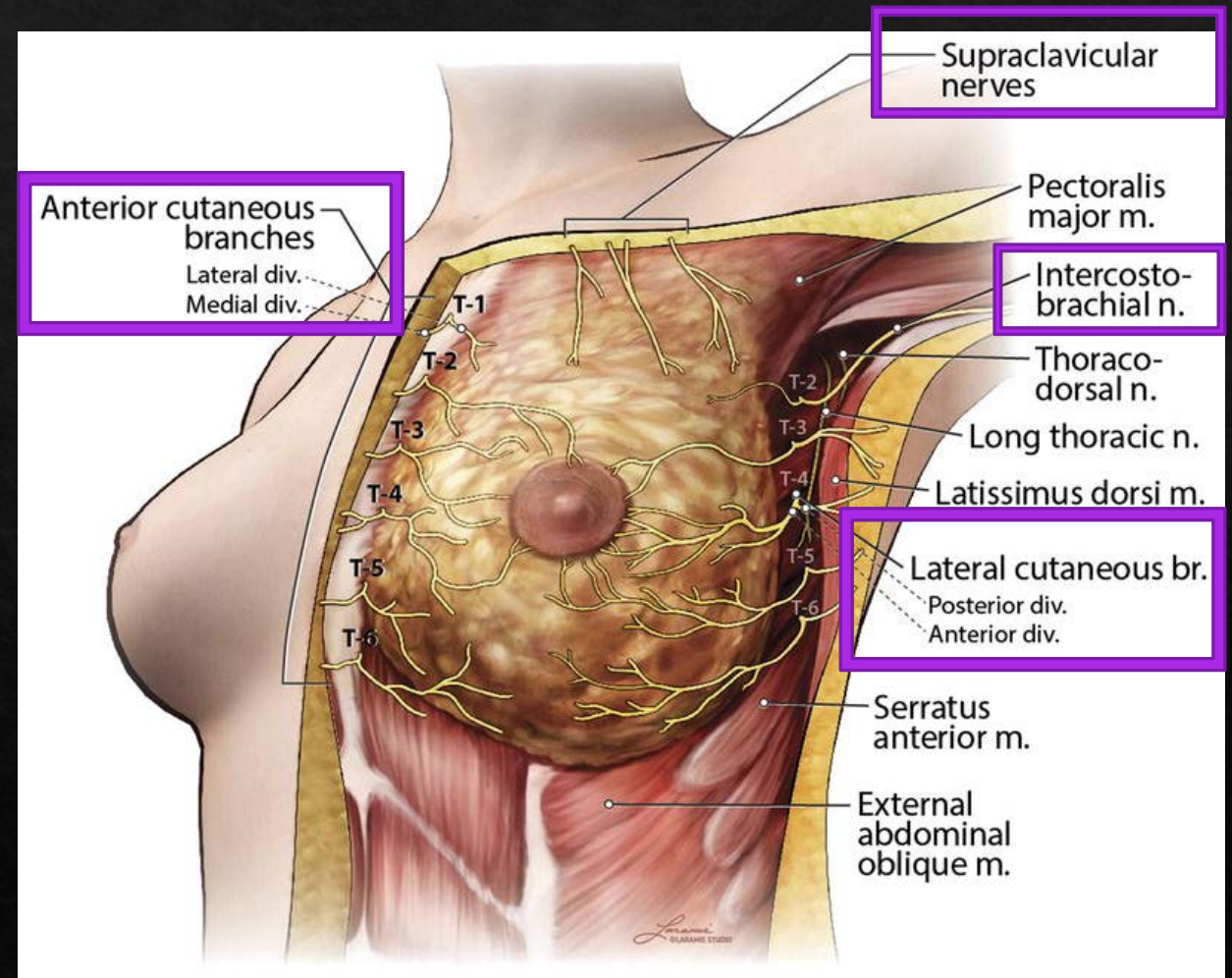
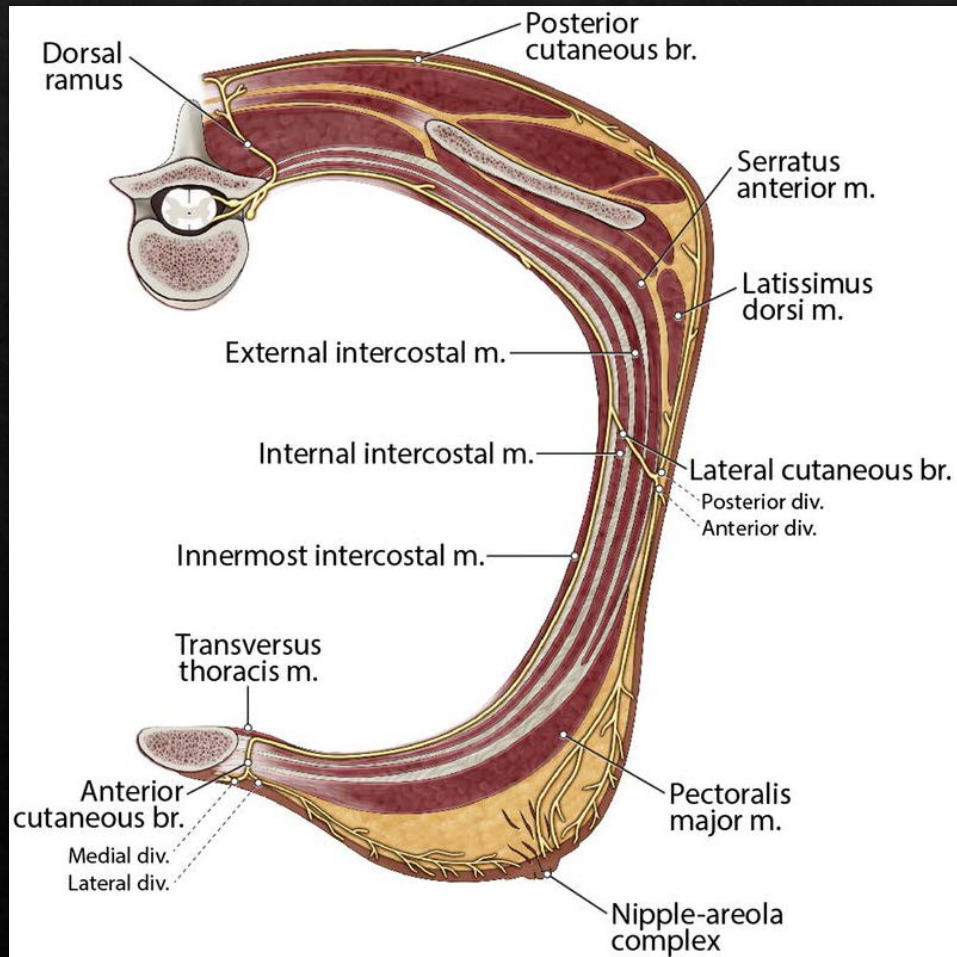
NYSORA. <https://www.nysora.com/pectoralis-serratus-plane-block>

PECS I

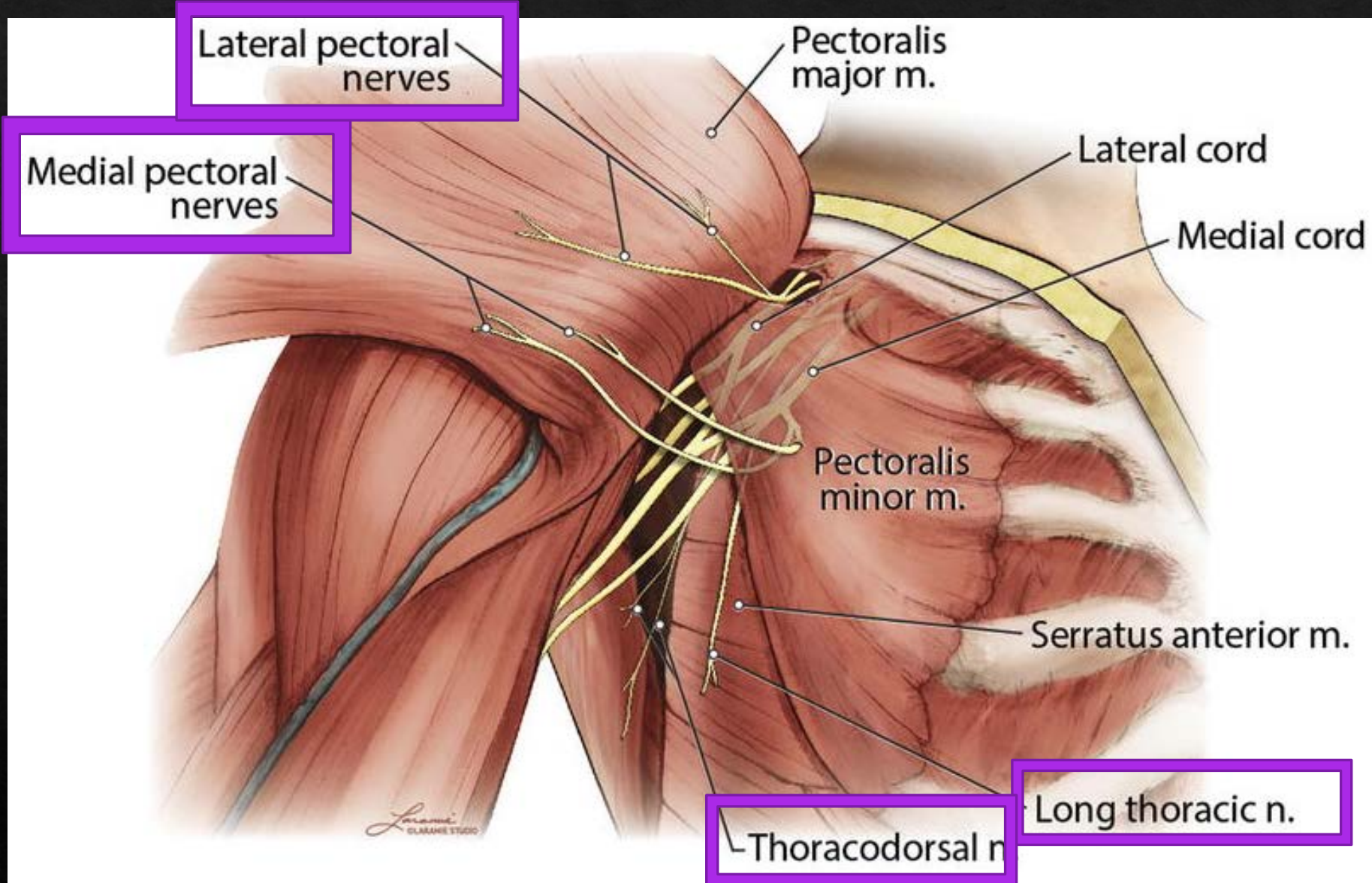
PECS II

SERRATUS PLANE

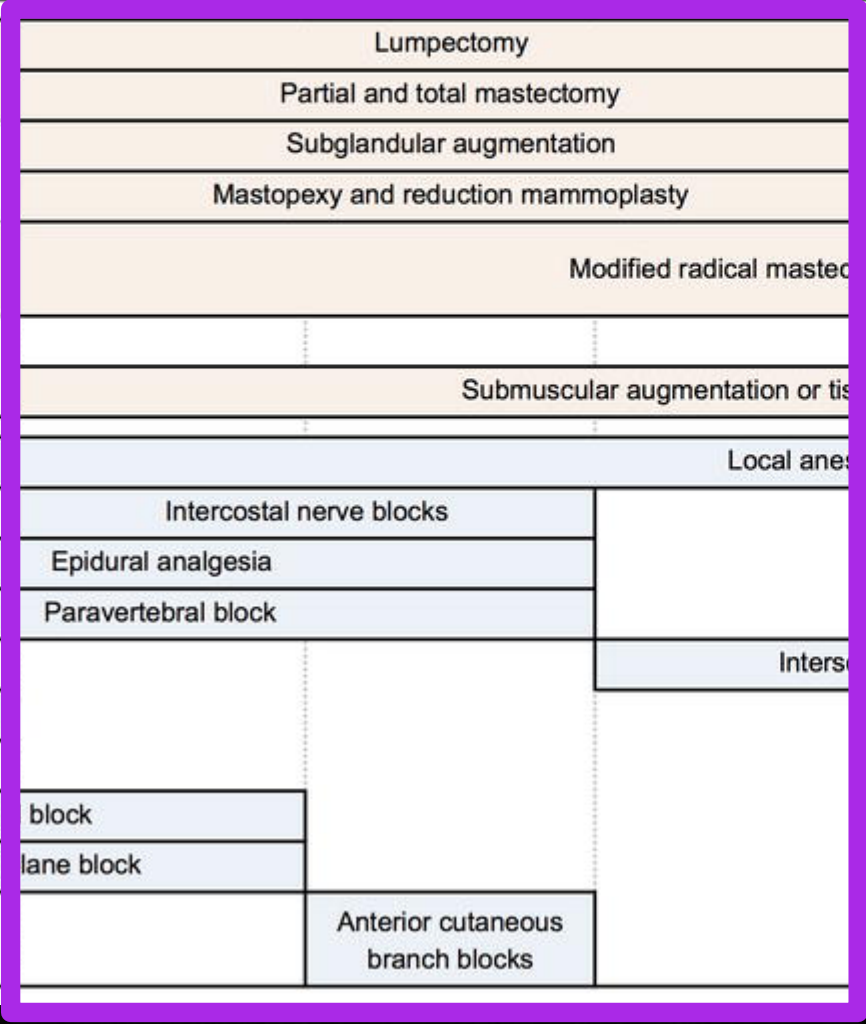
Cutaneous Innervation



Innervation of Muscles



		Cutaneous and Subcutaneous Innervation			Muscle Innervation (Myofascial Pain)			
Nerves	Intercostal nerves			Cervical plexus	Brachial plexus			
	Intercostobrachial nerve (T2)	Lateral cutaneous branches	Anterior cutaneous branches	Supraclavicular nerves	Lateral pectoral nerve (C5-7)	Medial pectoral nerve (C7-T1)	Thoracodorsal nerve (C6-8)	Long thoracic nerve (C5-7)
Supply	Axilla & Medial upper arm	Lateral half of breast	Medial half of breast	Cranial portion of the breast	Pectoralis major	Pectoralis minor & major (caudal portion)	Latissimus dorsi	Serratus anterior
Surgical Procedures	if sentinel lymph node biopsy		Lumpectomy					
			Partial and total mastectomy					
			Subglandular augmentation					
			Mastopexy and reduction mammoplasty					
	if axillary lymph node dissection		Modified radical mastectomy					if axillary lymph node dissection
								Latissimus dorsi flap
Analgesic Procedures	Local anesthetic infiltration							
	Intercostal nerve blocks							
	Epidural analgesia							
	Paravertebral block							
				Interscalene block	partial block			Interscalene block
	Infraclavicular block			Infraclavicular block ^a				
				Pecs I block				
	Pecs block			Pecs II block ^b				
	Serratus plane block			Serratus plane block				
				Anterior cutaneous branch blocks				



PVB vs PECS II

Paravertebral

Pneumothorax

High uptake -
LAST

Epidural Spread

Sympathectomy

Vagal response

Technically
challenging

Anticoagulation

Prone or sitting
position



PECS II

Technically easy to
perform

Cutaneous and
Myofascial Coverage

High volume block -
LAST

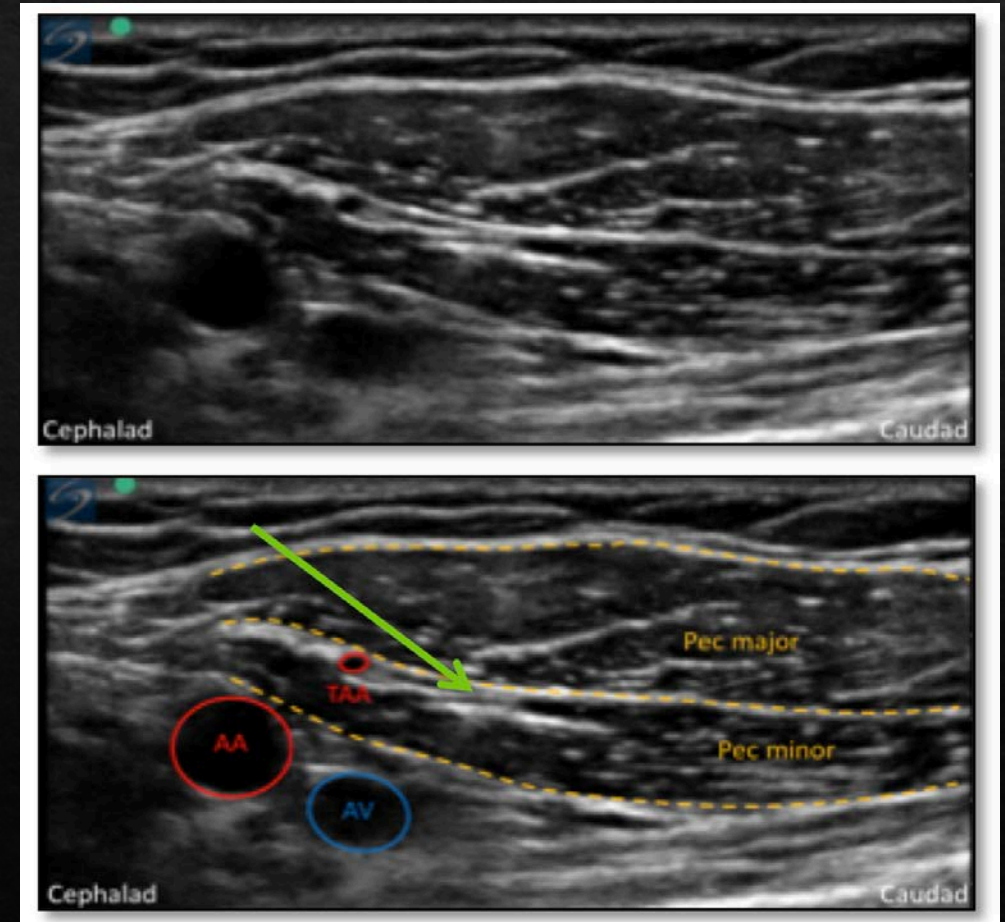
Disruption of tissue
planes

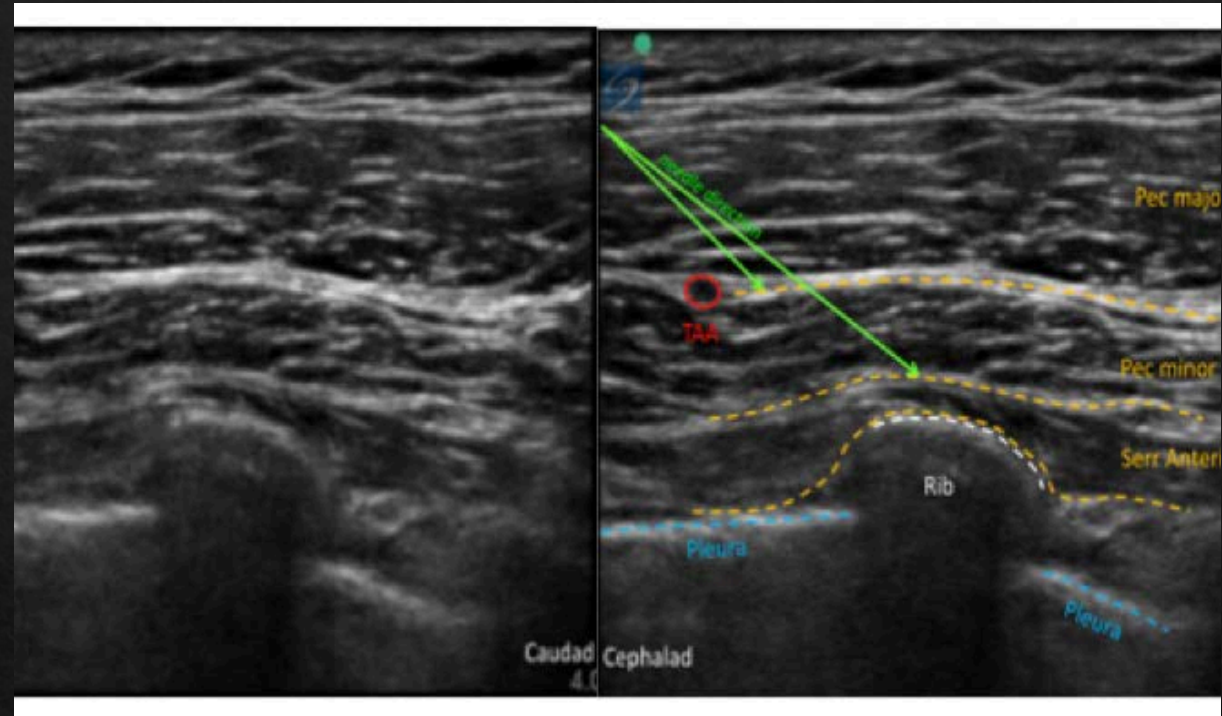
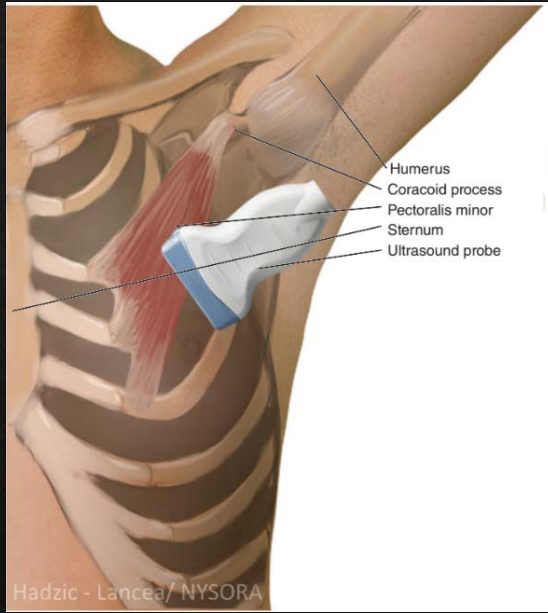
Lack coverage for
medial breast

Supine position

Pecs I Block

- Blocks the Lateral and Medial Pectoral Nerves
- Provides Myofascial Analgesia
 - Breast expanders, Radical Mastectomy/Reconstructive Surgery
- Does not cover medial chest and axilla





Pecs II Block

- Targets: T2-4 intercostal branches, thoracodorsal, long thoracic → lateral breast and axillary coverage
- Spares medial chest (anterior cutaneous branches)
- Caution: Axillary dissection (LTN)

- ◇ Published 2019
- ◇ 14 RCTs (2012-2018)
 - ◇ CoPrimary Outcomes:
 - ◇ Pain scores
 - ◇ Cumulative postoperative opioid consumption during the first 24-h.
 - ◇ Secondary outcomes:
 - ◇ Opioid side effects, Pain severity, Time to discharge, Quality of recovery

ANESTHESIOLOGY

Pectoralis-II Myofascial Block and Analgesia in Breast Cancer Surgery

A Systematic Review and
Meta-analysis

Nasir Hussain, M.Sc., M.D., Richard Brull, M.D., F.R.C.P.C.,
Colin J. L. McCartney, M.B.Ch.B., Ph.D., F.R.C.A., F.R.C.P.C.,
Patrick Wong, M.D., F.R.C.P.C., Nicolas Kumar, B.Sc.,
Michael Essandoh, M.D., F.A.S.E., Tamara Sawyer, M.L.I.S.,
Timothy Sullivan, M.B., F.A.N.Z.C.A.,
Faraj W. Abdallah, M.Sc., M.D.

ANESTHESIOLOGY 2019; 131:630–48

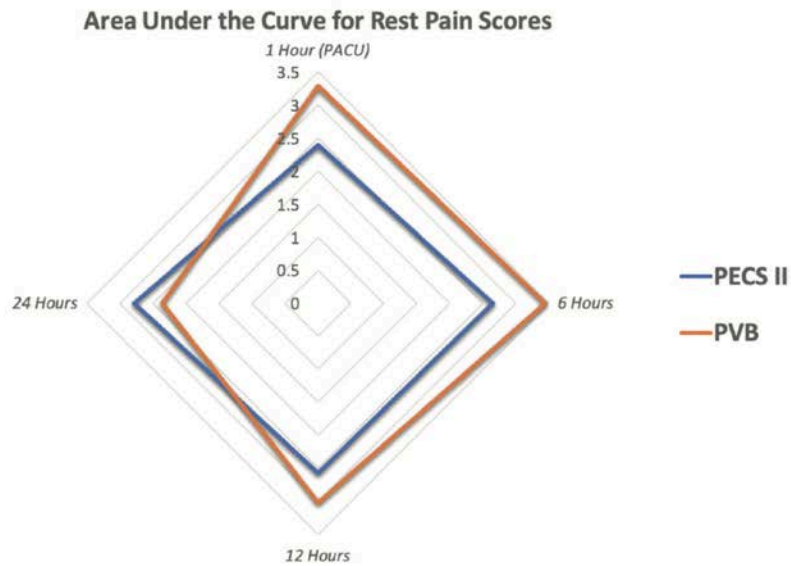


Fig. 4. Graphical representation (star plot) of the area under the curve of the pooled weighted mean pain scores at rest as measured by the visual analog scale (0–10 cm) over time (four time points) for each of Pectoralis-II (PECS II) and paravertebral block (PVB). The axes depict pain scores at different time points. PACU, postanesthesia care unit.

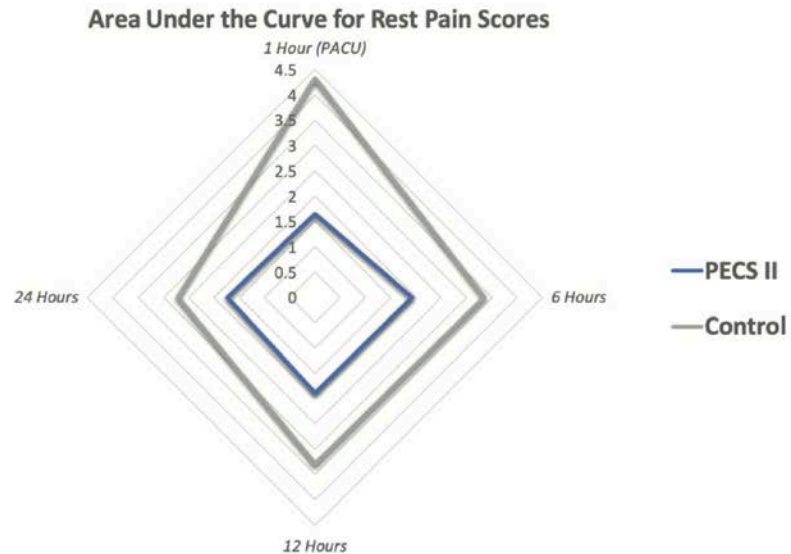


Fig. 3. Graphical representation (star plot) of the area under the curve of the pooled weighted mean pain scores at rest as measured by the visual analog scale (0–10 cm) over time (four time points) for each of Pectoralis II (PECS II) and Control (systemic analgesia). The axes depict pain scores at different time points. PACU, postanesthesia care unit.

Pain Scores at Rest:

- ❖ Clinically superior to control
- ❖ Non-inferior to PVB during the first 24h

Morphine Consumption at 24h

- ❖ No difference first time to analgesic rescue, in PACU or at 24-48 hours.

Secondary Outcomes:

- ❖ Opioid side effects: No Difference between PECS II and control or PECS and PVB
- ❖ Quality of recovery: Not assessed by any study
- ❖ Incidence of Chronic Post Surgical Pain: Limited to one study, no qualitative diff

*Conclusion:
PECS II is a valid
multimodal pain control
strategy and an
acceptable alternative to
PVB following breast
tumor resection.*

Summary

- ◆ Fascial Plane Blocks are promising alternatives to the traditional regional techniques (Epidural and PVB) with a safer risk profile.
- ◆ Techniques continue to evolve and well defined studies are needed to identify optimal approach.
- ◆ Multimodal analgesia should be utilized regardless of regional technique
- ◆ USGRA has proven to be a positive force in an opioid sparing approach to pain management

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