New Kids on the Block: Advances in Regional Anesthesia Practice

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“Precision” Acute Care Medicine

**One-size fits-all medicine**

**Stratified medicine**

- Stratification
  - Patients are grouped by: Disease, Subtypes, Demographics, Clinical features, Biomarkers

**Precision medicine**

- Personalisation
  - Patient individual: Preferences, Clinical features, Medication history, Environment, Behaviours & habits, Biomarker
### Table 1. Estimated Incidence of Chronic Postoperative Pain by Type of Surgery

<table>
<thead>
<tr>
<th>Surgery</th>
<th>Incidence of Chronic Pain (%)</th>
<th>Incidence of Disabling Pain (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amputation</td>
<td>30-50</td>
<td>5-10</td>
</tr>
<tr>
<td>CABG Surgery</td>
<td>30-50</td>
<td>5-10</td>
</tr>
<tr>
<td>Thoracotomy</td>
<td>30-40</td>
<td>10</td>
</tr>
<tr>
<td>Breast Surgery</td>
<td>20-30</td>
<td>5-10</td>
</tr>
<tr>
<td>Inguinal Hernia</td>
<td>10</td>
<td>2-4</td>
</tr>
<tr>
<td>Cesarean Section</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>

CABG, coronary artery bypass graft
“Nurse, get on the internet, go to NYSORA.COM, scroll down and click on the ‘Are you totally lost?’ icon.”
Roadmap for Discussion

Fascial Plane Blocks

Lower Extremity Blocks

Novel Local Anesthetics

Take Home Points
Overview

• *Who can do it?*
• *What do you need?*
• *Where should you place them?*
• *Why bother?*
Who Can Do It?
What Do You Need?

- **Catheters / Needles**
  - Single- or multi-orifice catheters
  - Stimulating or non-stimulating
  - Flexible springwound or rigid plastic
  - Through or over the needle
Overview

• *Who can do it?*
• *What do you need?*
• *Where should you place them?*
• *Why bother?*
Truncal Fascial Plane Blocks

- Tactile “pops” and “clicks” + ultrasound → fascial plane blocks
- Fastest growing subset of blocks

“If we can see it, we can now block it.”
(Elsharkawy et al., RAPM 2018)
The Rise of the Fascial Plane Block

El-Boghdady & Pawa (Anaesthesia, 2017)
TAP Blocks…Why Bother?

- Recent meta-analysis of US-guided TAP blocks
  - *Baeriswyl et al, Anesth Analg 2015*
  - Statistically significant but clinically modest analgesic benefit in adult patient undergoing abdominal laparotomy, laparoscopy or cesarean delivery
  - 6 and 11 mg IV morphine at 6 and 24 hours, respectively
Beneficial

- **Upper Abdominal Surgery**: Subcostal TAP block is a useful alternative when epidural analgesia is contraindicated with fewer side effects such as hypotension.
- **Colorectal Surgery**: Open and laparoscopic.
- Open appendectomy
- Abdominoplasty
The Data is Out…

- Major open gynecological surgery including total abdominal hysterectomy
- Laparoscopic total hysterectomy
- Open inguinal hernia surgery
- Laparoscopic donor nephrectomy
- Cesarean delivery
No Benefit

• Laparoscopic cholecystectomy
• Laparoscopic Roux-en-Y bypass surgery
• Laparoscopic appendectomy
• Open radical retropubic prostatectomy
• Reconstructive abdominal surgery
• Renal transplantation
Quadratus Lumborum (QL)
Quadratus Lumborum (QL)
QL Block – Why Bother?

- Sparse literature; most only case reports

doi: 10.1093/jhps/hny024
Advance Access Publication 25 October 2018
Research article

Quadratus lumborum block provides improved immediate postoperative analgesia and decreased opioid use compared with a multimodal pain regimen following hip arthroscopy

Christopher L. McCrum¹, Bruce Ben-David², Jason J. Shin³ and Vonda J. Wright⁴*
PECs Blocks
PECS Blocks – PECS I

- Lateral and medial pectoral nerves blocked
- Suitable for surgeries involving pecs major muscle (e.g., breast expanders, traumatic chest injuries, Portocath, pacemaker insertion)
PECS Blocks – PECS II

- T2-4 spinal nerves (including intercostobrachial) and long thoracic nerve may be blocked
- Suitable for more extensive excisions (e.g., tumor resections, mastectomy, axillary clearance, sentinel node excision, tissue expanders)
PECS Blocks – Why Bother?

- RCTs for mastectomy
  - Decreased opioid consumption and pain scores in first 24 hours compared to paravertebral (PVB) blocks (Wahba and Kamal, 2014)
  - Lower pain scores and opioid use (Bashandy and Abbas, 2015)
  - Increased duration of analgesia compared to PVB (Kulhari, 2016)
PECS Blocks – Why Bother?

• Case Reports
  – Insertion of cardiac resynchronization device with block and dexmedetomidine
  – Mastectomy under PECS II with supplemental infiltration
  – Alternative to brachial plexus blockade for axilla, proximal median upper arm and posterior shoulder
Serratus Anterior

- Thoracodorsal, thoracic intercostal nerves may be blocked
- Suitable for latissimus dorsi flap reconstruction
Serratus Anterior – Why Bother?

• Early data
  – Duration of paresthesia in intercostal nerve distribution T2-9 was 752 minutes

• Case reports
  – Rib fracture: enabled RT and ambulation
  – Thoracotomy: pain and ventilation improvement

• RCTs
  – Increased opioid consumption during radical mastectomy compared to PVB
  – Less hemodynamic change compared to thoracic epidural in thoracotomy
Erector Spinae (ESP) Blocks
Is this a paravertebral block by proxy???
ESP – Why Bother?

- Early data
  - Case reports/series
    - Rib fractures (single shot and catheters employed)
    - Pleuroscopy: minimized procedural sedation (T5 level)
    - Bariatric surgery
    - Thoracotomy (as rescue analgesic)
  - Pilot study
    - Laparoscopic ventral hernia repair (T7 level)
Adductor Canal

- Indications: saphenous vein stripping, supplementation for medial foot/ankle surgery, analgesia for knee surgery
Adductor Canal – Why Bother?

- TKA
  - Similar pain scores to femoral nerve block
  - **Quad strength preserved and ambulation retained** (several studies) compared to FNB
  - Analgesic and opioid-sparing benefits in TKA
  - **KEY COMPONENT OF MULTIMODAL ANALGESIC PLAN**
Adductor Canal – Why Bother?

- Minor knee arthroscopies
  - Little benefit (i.e., multimodal with NSAIDs + APAP = ACB)
  - ACL reconstruction → mixed data
iPACK Blocks

- iPACK = interspace between the popliteal artery and capsule of the posterior knee
iPACK – Why Bother?

• Early data
  – iPACK + ACB \(\rightarrow\) equivalent analgesia + improved PT + earlier hospital discharge post-TKA (Thobhani et al, Ochsner Journal 2017)
  – iPACK + ACB \(\rightarrow\) better analgesia + improved ROM and number of steps walked post-TKA than ACB alone (Reddy et al, Int J Orthop Sci 2017)
Roadmap for Discussion

- Fascial Plane Blocks
- Lower Extremity Blocks
- Novel Local Anesthetics
- Take Home Points
Liposomal Bupivacaine (Exparel®)

DepoFoam® (non-concentric) 10–30μm

EXPAREL®
(bupivacaine liposome injectable suspension)

OPIOID FREE
Liposomal Bupivacaine – Why Bother?

- Many efficacy studies in surgical infiltration but compare only to placebo
  - Hemorrhoidectomy
  - Mammoplasty
  - Bunionectomy
  - Forefoot surgery
  - TKA
Liposomal Bupivacaine – Why Bother?

• Single-injection PNB
  – NOTE: only FDA-approved for interscalene & TAP blocks
    • High degree of intersubject variability
    • Peak effect at 24 hours in 75% of subjects
    • MUCH less than predicted 72 hours by manufacturer
Liposomal Bupivacaine – Why Bother?

• Robotic-assisted hysterectomy
  – Decrease in LOS with TAP blocks
  – Potentially long-term opioid-sparing benefit
• Laparoscopic prostatectomy
  – No difference in median time to opioid use, pain scores comparing 20 mL vs 40 mL
  – No placebo group included
• Open abdominal umbilical hernia repair
  – Pain severity, opioid-related adverse events recorded
  – No placebo group included
Liposomal Bupivacaine Does Not Reduce Inpatient Opioid Prescription or Related Complications after Knee Arthroplasty

A Database Analysis

Lukas Pichler, M.D., Jashvant Poeran, M.D., Ph.D., Nicole Zubizarreta, M.P.H., Crispiana Cozowicz, M.D., Eric C. Sun, M.D., Ph.D., Madhu Mazumdar, Ph.D., Stavros G. Memtsoudis, M.D., Ph.D., F.C.C.P.

In conclusion, we failed to show a clinically meaningful reduction in either inpatient opioid prescription, opioid-related complications, or resource utilization outcomes among patients receiving liposomal bupivacaine as part of their total knee arthroplasty. Given the number of recent publications that suggest a lack of benefit of the addition of liposomal bupivacaine to a multimodal regimen including a regional analgesic technique, its routine use should be carefully examined, especially given its relatively high cost. Future studies will need to evaluate the effectiveness of liposomal bupivacaine separately for the different routes of administration.

(Anesthesiology 2018; 129:689-99)
Liposomal Bupivacaine – Why Bother?

“...use of liposomal bupivacaine was not associated with a change in billing patterns for opioids... [or] decreased use of naloxone or incidence of opioid-related... complications...”
# Liposomal Bupivacaine Infiltration for Knee Arthroplasty

**Significant Analgesic Benefits or Just a Bunch of Fat?**

Brian M. Ilfeld, M.D., M.S., Rodney A. Gabriel, M.D., M.A.S., James C. Eisenach, M.D.

## Table 1. Published Randomized, Controlled Clinical Trials Comparing Periarticular Infiltration of Lipo, Bupiv, or Ropiv

<table>
<thead>
<tr>
<th>Reference</th>
<th>Experimental Group (mg)*</th>
<th>Control Group (mg)*</th>
<th>Primary Pain Endpoint</th>
<th>Opioid Consumption</th>
<th>Manufacturer Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alljanipour⁶</td>
<td>Lipo 266</td>
<td>Bupiv 50</td>
<td>Negative</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>Amundson⁷</td>
<td>Lipo 266 + Bupiv 125</td>
<td>Ropiv 200–400‡</td>
<td>Negative</td>
<td>Negative total; Lipo needed more rescue</td>
<td>None‡</td>
</tr>
<tr>
<td>Barrington⁸</td>
<td>Lipo 266 + Bupiv 125</td>
<td>Ropiv 250†</td>
<td>Negative</td>
<td>Negative</td>
<td>Funding‡</td>
</tr>
<tr>
<td>Bergese²⁷</td>
<td>Lipo 532</td>
<td>Bupiv 200</td>
<td>Negative</td>
<td>Not provided</td>
<td>Funding§</td>
</tr>
<tr>
<td>Bramlett²⁸</td>
<td>Lipo 133–532</td>
<td>Bupiv 150</td>
<td>Negative</td>
<td>Negative</td>
<td>Funding‡, §</td>
</tr>
<tr>
<td>Collis⁹</td>
<td>Lipo 266</td>
<td>Ropiv 246</td>
<td>Negative</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>DeClaire¹⁰</td>
<td>Lipo 266</td>
<td>Ropiv ?</td>
<td>Negative</td>
<td>Lipo used more total oral opioid</td>
<td>Unclear</td>
</tr>
<tr>
<td>Jain¹¹</td>
<td>Lipo ?</td>
<td>Bupiv 75†</td>
<td>Negative</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>Schroe¹²</td>
<td>Lipo 266 + Bupiv 75</td>
<td>Bupiv 150</td>
<td>Negative</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>Schwarzkopf¹³</td>
<td>Lipo 266 + Bupiv 50</td>
<td>Ropiv 246</td>
<td>Negative</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>Smith¹⁴</td>
<td>Lipo 266 + Bupiv ?</td>
<td>Bupiv ? + intraarticular Bupiv infusion</td>
<td>Negative</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>Positive studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mont²⁵</td>
<td>Lipo 266 + Bupiv 100</td>
<td>Bupiv 100 mg</td>
<td>Positive</td>
<td>Positive</td>
<td>Manufacturer provided funding and “participated in the study conception and design; collection, analysis, and interpretation of the data; and review of the manuscript”‡</td>
</tr>
<tr>
<td>Snyder²⁹</td>
<td>Lipo 266</td>
<td>Ropiv 400</td>
<td>Positive</td>
<td>Positive</td>
<td>None‡</td>
</tr>
</tbody>
</table>

*Indicates only local anesthetics listed (e.g., additives such as epinephrine not listed). †A third treatment group not involving infiltration excluded from chart (e.g., continuous peripheral nerve block). ‡At least one author was a paid consultant to the manufacturer during enrollment year(s). §One author was an employee of the manufacturer during enrollment.

Bupiv, standard bupivacaine; Lipo, liposomal bupivacaine; ?, dosage unknown; Ropiv, ropivacaine.
Final Words on Liposomal Bupivacaine…

Caveat emptor
POSIMIR® (bupivacaine extended-release solution)

Overview

POSIMIR is an investigational nonopioid analgesic being evaluated for its ability to provide 3 days of continuous local pain relief after surgery. Intended for administration just once at the close of surgery, POSIMIR may be instilled directly into the surgical incision(s) with a blunt-tipped applicator or injected into targeted anatomic spaces under endoscopic guidance. Once placed, clinical and nonclinical studies have shown it to form a biodegradable depot that releases bupivacaine directly to the surgical site at a stable rate for 72 hours.
SABER – Why Bother?

• Laparoscopic cholecystectomy
  – Did not meet its primary efficacy for Phase 3 trial with 380 patients
  – No statistical difference in pain reduction with movement over first 48 hours post surgery compared to bupivacaine HCl

• Open hernia repair
  – Significantly lower AUC for mean pain intensity from 1-72 hours compared to placebo

• Abdominal surgery
  – Decreased pain for 3 days
Roadmap for Discussion

- Fascial Plane Blocks
- Lower Extremity Blocks
- Novel Local Anesthetics
- Take Home Points
Take Home Points

- Continued emphasis on precision acute care medicine and avoiding persistent postoperative pain
- Multiple newer fascial plane blocks can be employed in the perioperative period
- Research regarding outcomes demands further investigation
- Novel long-acting formulations may provide additional benefit
References

References

KIDS

LOTS OF KIDS EVERYWHERE