Pro-Con Debate
Single shot regional technique preferred

Lisa Mouzi, MD
Assistant Professor Anesthesiology
Ben Taub General Hospital
Baylor College of Medicine
Why perform peripheral nerve blocks?

• Reduced postop pain
• Reduced opioid requirements
• Reduced postop n/v
• Decreased time to functional recovery
• Facilitate discharge from PACU
• Alternative to GETA
Benefits of SS over continuous PNB

- Faster and easier to perform
- Less infection
- Less complications
- Ability to examine pt sooner
- Less expensive
- No pain service required
- Adjuncts allow longer duration

Catheters require additional time, cost, skill
Are continuous nerve blocks really worth it?

They do increase the duration of the PNB, but...

- Difficult catheter insertion
- Kinked catheter
- Inadvertent removal
- Catheter migration
- Nerve injury
- Infection
- Pain service
TKA: FNB SS vs catheter

- Prospective randomized study
- No difference in resting VAS at 12 hours
- POD1-3, pain scores higher in SS group
- Higher narcotic consumption in SS group
- No difference in anti-emetics
- No differences in hospital LOS, 6-wk knee flexion, and 12-wk knee flexion

The effect of single-injection femoral nerve block versus continuous femoral nerve block after total knee arthroplasty on hospital length of stay and long-term functional recovery within an established clinical pathway.
Salinas FV1, Liu SS, Mulroy MF.
TKA: SS ACB vs continuous FNC

- Opioid and epidural analgesia
- Femoral nerve catheters:
  - Reduced quadriceps muscle strength
  - Increased risk of perioperative falls
  - Catheter site infections
  - Limited ambulation
- Goal: adequate pain control and early rehab
- Retrospective study: ACB single shot vs FN catheter
  - No difference in mean perioperative opioid usage
  - No difference in median self-rated pain scores
  - ACB ambulated further on POD1
  - Postsurgical knee flexion better in ACB group
  - Shorter LOS in ACB group

*A Comparison of Single Shot Adductor Canal Block Versus Femoral Nerve Catheter for Total Knee Arthroplasty.*
Ludwigson JL1, Tillmans SD1, Galgon RE2, Chambers TA2, Heiner JP3, Schroeder KM2.
Complications and adverse effects of continuous peripheral nerve blocks

- Prospective study of consecutive ortho patients
- 1398 CPNBs in 849 patients
- 221 interscalene, 628 femoral, 549 sciatic

### Table 2. Complications and Minor Adverse Effects Associated with CPNBs

<table>
<thead>
<tr>
<th>Complication/adverse event</th>
<th>Overall n (%)</th>
<th>Interscalene n (%)</th>
<th>Femoral n (%)</th>
<th>Sciatic n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local inflammation</td>
<td>9 (0.6)</td>
<td>1 (0.5)</td>
<td>4 (0.6)</td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Local infection</td>
<td>3 (0.2)</td>
<td>0</td>
<td>3 (0.5)</td>
<td>0</td>
</tr>
<tr>
<td>Positive culture</td>
<td>2 (0.1)</td>
<td>0</td>
<td>2 (0.3)</td>
<td>0</td>
</tr>
<tr>
<td>Neurological deficit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transient</td>
<td>12 (0.9)</td>
<td>3 (1.4)</td>
<td>3 (0.5)</td>
<td>6 (1.0)</td>
</tr>
<tr>
<td>Permanent</td>
<td>1 (0.1)</td>
<td>0</td>
<td>1 (0.2)</td>
<td>0</td>
</tr>
<tr>
<td>Methemoglobinemia</td>
<td>1 (0.1)</td>
<td>1 (0.5)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hoarseness</td>
<td>32 (2.3)</td>
<td>32 (14.5)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Horner’s syndrome</td>
<td>25 (1.8)</td>
<td>25 (11.3)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vascular puncture</td>
<td>72 (5.2)</td>
<td>0</td>
<td>36 (5.7)</td>
<td>36 (6.6)</td>
</tr>
<tr>
<td>Catheter breakage</td>
<td>1 (0.1)</td>
<td>0</td>
<td>0</td>
<td>1 (0.2)</td>
</tr>
</tbody>
</table>

CPNB—continuous peripheral nerve block; interscalene—interscalene brachial plexus CPNB; femoral—femoral CPNB; sciatic—anterior sciatic CPNB; positive culture—culture of the catheter tip.

Complications and adverse effects associated with continuous peripheral nerve blocks in orthopedic patients.
Wiegel M1, Gottschaldt U, Hennebach R, Hirschberg T, Reske A.
Bacterial colonization and infection risk

- 211 patients with femoral nerve catheter
- 208 patients underwent bacterial analysis
  - 120 catheters had positive cultures (57%)
  - No abscesses
  - 3 cases of transient bacteremia
  - No long-term complications


The continuous femoral nerve block catheter for postoperative analgesia: bacterial colonization, infectious rate and adverse effects.

Cuvillon P1, Ripart J, Lalourcey L, Veyrat E, L’Hermite J, Boisson C, Thouabtia E, Eledjam JJ.
Inflammation and infection complications of 2285 perineural catheters: a prospective study

### Table 2

<table>
<thead>
<tr>
<th>Localization</th>
<th>ALL</th>
<th>AXC</th>
<th>ISC</th>
<th>ICC</th>
<th>PSOAS</th>
<th>FC</th>
<th>LABAT</th>
<th>ASC</th>
<th>PPC</th>
<th>LPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perineural catheters (n)</td>
<td>2285</td>
<td>600</td>
<td>303</td>
<td>92</td>
<td>65</td>
<td>574</td>
<td>57</td>
<td>239</td>
<td>255</td>
<td>100</td>
</tr>
<tr>
<td>Local inflammation (n/%)</td>
<td>96/4.2</td>
<td>30/5.0</td>
<td>16/5.3</td>
<td>7/7.6</td>
<td>4/6.2</td>
<td>23/4.0</td>
<td>3/5.3</td>
<td>4/1.7*</td>
<td>7/2.8</td>
<td>2/2.0</td>
</tr>
<tr>
<td>Infection (n/%)</td>
<td>73/3.2</td>
<td>23/3.8</td>
<td>16/5.3†</td>
<td>1/1.1</td>
<td>3/4.6</td>
<td>19/3.3</td>
<td>1/1.8</td>
<td>2/0.8*</td>
<td>7/2.8</td>
<td>1/1.0</td>
</tr>
<tr>
<td>Infection requiring surgical drainage (n/%)</td>
<td>20/0.9</td>
<td>6/1.0</td>
<td>3/1.0</td>
<td>0</td>
<td>0</td>
<td>8/1.4</td>
<td>0</td>
<td>1/0.4</td>
<td>1/0.4</td>
<td>1/1.0</td>
</tr>
</tbody>
</table>

- 4.2% – local inflammation
- 3.2% – infection
- 0.9% - required surgical intervention
- Catheter tip cultures: 42% Staph. epidermidis and 58% Staph. aureus
- Duration of PNC is a risk factor
Infectious complications of PNCs

- Localized inflammation - up to 13.7%
- Local infection – up to 3.2%
- Abscess formation – up to 0.9%
- Sepsis extremely rare
- Bacterial rates of colonization range from 7.5% to 57% depending on the location of the
- Femoral and axillary catheters have highest rates of colonization, whereas the rates for popliteal catheters are low. It is speculated that the higher density of sebaceous glands (which have been shown to decrease the efficacy of skin disinfectants) in the groin and axilla make colonization more likely. The skin flora are usually the source of colonizing bacteria; the most common organism is Staphylococcus epidermidis.
- Factors increasing incidence of infection:
  - Catheter site
  - Intensive care unit admission
  - Trauma
  - Immune compromise including DM
    - Nerve catheter indwelling >48 h
    - Male sex
    - Absence of antibiotics

Increased incidence of falls with catheters

- Meta-analysis of 5 studies
- Continuous lumbar plexus block (631 pts) vs non-continuous block or no block (964 pts)
  - 14 falls in continuous block group
  - 5 falls in non-continuous/no block group

Continuous lumbar plexus blockade was associated with a statistically significant increase in the risk for falls $P=0.005$

*Falls and major orthopaedic surgery with peripheral nerve blockade: a systematic review and meta-analysis.*
*Johnson RL1, Kopp SL, Hebl JR, Erwin PJ, Mantilla CB.*
Threading catheter can be difficult

- 96% success rate with nerve stimulator for both upper and lower extremity PNCs in 433 patients
  - 87% placed on the first attempt
  - 10% placed on the second attempt
  - 3% placed with greater than two attempts
- Success rate of first attempts improved during study, highlighting importance of **operator skill** in limiting the number of needle punctures.

- Even with a high success of nerve localization (98.6%), difficulty threading the catheter can occur (9.5%).
- Insertion site plays a role, with popliteal and femoral catheters easier to thread than interscalene catheters.

Block failure with catheter

• Secondary failure rate of PNCs ranges from 10% to 40%.

• An observational study found the ability to elicit a motor response with the stimulating catheter correlated with successful postoperative analgesia in 124 of 130 cases for a secondary failure rate of 5%.

Inadvertent catheter removal and damage

- Inadvertent catheter removal complicated 1% of cases where a popliteal catheter was secured by tunnelling.
- Accidental premature catheter removal occurred in 1.4% of femoral catheters secured with adhesive strips or transparent dressings alone.
- Adverse events associated with tunnelling and suturing:
  - Catheter cut during suture removal.
  - Inadvertent cutting of an indwelling catheter while moving the tunnelling needle through the skin. Surgical exploration unsuccessful in retrieving the catheter.

Despond O, Kohut GN. Anesth Analg 2010; 110: 643–4
Catheter kinking, knotting, and looping


Accidental vascular puncture and hematoma formation

- Vascular puncture during PNC placement is not uncommon.
  - 5.7% for femoral catheters
  - 6.6% for sciatic catheters
- Intravascular catheter migration
- Case reports:
The ASRA Third Consensus Conference on Regional Anesthesia and Anticoagulation recommends that patients undergoing deep plexus or peripheral nerve block be treated with the same guidelines as those pertaining to neuraxial techniques.

- Weller RS, Gerancher JC, Crews JC, Wade KL. Extensive retroperitoneal hematoma without neurologic deficit in two patients who underwent lumbar plexus block and were later anticoagulated. Anesthesiology 2003; 98: 581–5

Adjuncts to local anesthetics

- Epinephrine
- Tramadol
- Buprenorphine
- Dexamethasone
- Midazolam
- Clonidine
- Magnesium
- Dexmedetomidine
- Ketamine
Liposomal bupivacaine

- Extended release bupivacaine formulation
- Bupivacaine is encapsulated by lipid based particles
- Slow release over 96 hours
- 1.3% 20ml single use vial (266mg)
- Approved for local infiltration only in bunionectomy and hemorrhoidectomy
- FNB dose response study
Conclusions

• Single shot blocks are quick and easy to perform, need little follow up, and are cost effective
• Adjuncts and liposomal bupivacaine can extend the duration of the SS block
• Continuous catheters can be time consuming to perform, require greater expertise to place, cost more, and are associated with more complications
Pro-Con Debate
Single shot regional technique preferred

Lisa Mouzi, MD
Assistant Professor Anesthesiology
Ben Taub General Hospital
Baylor College of Medicine
References

References

- Salinas FV. Location, location, location: continuous peripheral nerve blocks and stimulating catheters. Reg Anesth Pain Med 2003; 28: 79–82
- Weller RS, Gerachner JC, Crews JC, Wade KL. Extensive retroperi- toneal hematoma without neurologic deficit in two patients who underwent lumbar plexus block and were later anticoagulated. Anesthesiology 2003; 98: 581–5