Paraspinal Blocks: Should they be a Core Competency for all Anesthesiologists?

Ioana Costache MD FRCPC
Department of Anesthesiology and Pain Medicine,
The Ottawa Hospital
Disclosures

♦ No financial disclosures

♦ MTP block
Competency

- What defines competency

- How many blocks are enough?

- Topic worthy of entire talk!
Paraspinal blocks

- Definition

- Potential uses

- Ultrasound-guided block techniques

- Evidence
Paraspinal Blocks

- Rely on indirect spread to the TPVS

  *Cur Anesthesiol Rep (2017) 7:212–219*
  DOI 10.1007/s40140-017-0212-y

**Regional Techniques for Thoracic Wall Surgery**

Kim Wild¹ · Ki Jinn Chin¹

- Indirect paravertebral

- Paravertebral by proxy

- Paravertebral “lite”
Paravertebral and Paraspinal blocks

- Applications: thoracic/breast/rib #/ VATS/other
- Paravertebral
  - Landmark
  - Ultrasound-guided
- Retrolaminar (RLB)
- Intercostal/paraspinal
- Erector spinae plane (ESP)
- Mid-point transverse process to pleura (MTP)
Paraspinal blocks

Costache, Pawa, Abdallah, PVB by proxy, Anaesthesia, In press
Paravertebral – the good

- Decreased narcotic consumption
- Decreased pain scores
- Less PONV
- Faster PACU discharge
- Reduction in persistent postop pain
- Possible decreased cancer recurrence
- GA free anesthetic
Paravertebral – the bad

- Pneumothorax
- Vascular injury
- Nerve injury
- Epidural or intrathecal injection, hematoma
- Hypotension
Paravertebral risks

- Until recently, based on landmark technique

- No pneumothorax in recent retrospective study 856 patients (1427) US-guided blocks

Boundaries of the thoracic paravertebral space: potential risks and benefits of the thoracic paravertebral block from an anatomical perspective. Bouman et al, *Surg Radiol Anat* 2017
Paravertebral-landmark

- Contact transverse-process (2.5 cm lateral to spinous process), redirect needle and advance 1-
  - 1.5 cm cephalad or caudad

- Caudad re-orientation preferable as less likely hit lung if initial contact is actually rib and not TP

- Multiple injections required

- Only 28% landmark PVB placed needle tip in PVS in high fidelity simulation model

- Samee, Grant, Gadsden, abstract #1299, ASRA 2016
Paravertebral-ultrasound-guided

- “Beyond scope of this text”
- First described 2010
- 9 different approaches with parasagittal or transverse scan currently described

**Different Approaches to Ultrasound-guiled Thoracic Paravertebral Block**

*An Illustrated Review*

Annelot C. Krediet, M.D., Nizar Moayeri, M.D., Ph.D., Geert-Jan van Geffen, M.D., Ph.D.,
Jörgen Bruhn, M.D., Ph.D., Steven Renes, M.D., Ph.D., Paul E. Bigeleisen, M.D.,
Gerbrand J. Groen, M.D., Ph.D.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transversal</td>
<td>Rib (lat)</td>
<td>lat → med IP</td>
<td>Ben-Ari²⁰;</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paraskepoulos¹⁵</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tip of TP (lat)</td>
<td>lat → med IP</td>
<td>Shibata²²; Renes¹³; Cowie¹⁶; Bouzinac¹⁷</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>IAP (med)</td>
<td>caudal → cranial OOP</td>
<td>Marhofer¹⁴</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lat → med IP</td>
<td>Gautier †</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>med → lat OOP</td>
<td>Luyet¹⁹ †</td>
<td>5</td>
</tr>
<tr>
<td>Sagittal</td>
<td>Rib (lat)</td>
<td>caudal → cranial IP</td>
<td>Paraskepoulos¹⁵</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>caudolat → craniomed IP</td>
<td>Luyet¹²</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>TP (med)</td>
<td>caudal → cranial IP</td>
<td>O’Riain¹¹; Abdallah¹⁸</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>caudal → cranial OOP</td>
<td>Hara¹⁰; Vandepitte</td>
<td>9</td>
</tr>
</tbody>
</table>
Paravertebral-ultrasound-guided

♦ Multiple injections NOT required to achieve multilevel spread:
  
  
  
  ♦ Marhofer D, Magnetic resonance imaging analysis of the spread of local anesthetic solution after ultrasound-guided lateral thoracic paravertebral blockade: A volunteer study, *Anesthesiology* 2013
Paravertebral: ultrasound-guided (parasagittal scan)
Retrolaminar PVB

- First described in 2005, ultrasound approach 2013 by Zeballos
- Contact lamina and inject in plane between posterior surface of thoracic lamina and erector spinae muscle
- Higher volumes required than direct PVB
- Case reports, small RCT RLB vs PVB breast surgery
Ultrasound-guided Retrolaminar PVB
Zeballos JL et al, Anaesthesia 2013
Intercostal/ Paraspinal

- First described in 2015 by Roue (2010 by Truitt)
- Injection posterior to ribs, same interfascial plane as ESP, RLB, rhomboid intercostal, sub-serratus plane
- Case reports: rib fractures, thoracic surgery
Intercostal/ Paraspinal

Roue, *Anaesthesia* 2016
Erector Spinae Plane Block

- First described by Forero et al 2016 in treatment thoracic neuropathic pain
- Extensive cranial caudad spread with 1 injection (T5 for thoracic, T7 for abdominal surgery)
- Injection between TP and erector spinae muscle
- Mechanism of action not definitively described
The Erector Spinae Plane Block A Novel Analgesic Technique in Thoracic Neuropathic Pain
Mauricio Forero, MD, FIPP,* Sanjib D. Adhikary, MD,† Hector Lopez, MD,‡ Calvin Tsui, BMSc,§ and Ki Jinn Chin, MBBS (Hons), MMed, FRCPC
ESP block
Erector Spinae Plane Block

- Less risk than PVB or epidural
- ESP catheter preferable to single shot (variable duration with single shot)
- Analgesic rather than anesthetic block
- Risk of LAST
- Case reports for: breast surgery/ rib # / VATS/ ventral hernia/ other
- No RCTs (yet)
Mid-point transverse process to pleura (MTP) block

♦ Clinical observations during transition from landmark to ultrasound-guided PVB

♦ Pleural displacement noted with needle tip and injection clearly posterior to SCTL
Does paravertebral block require access to the paravertebral space?


Original Article

The mid-point transverse process to pleura (MTP) block: a new end-point for thoracic paravertebral block*

L Cmte:he! L de Nemmapp a C. J. BemD”’”D.s S. L Goodwa! A. Pawa,’P. W. Ahd•11•Fr aad
C . J . L
The mid-point transverse process to pleura (MTP) block: a new end-point for thoracic paravertebral block, *Anaesthesia* 2017
MTP block
MTP block

- No need to visualize superior costotransverse ligament
- Further distant from pleura than traditionally described PVB
- Mechanism of action: PVB spread
- Multiple injection technique BUT may spread to adjacent levels
- Case reports, anecdotal experience Ottawa & UK
Comparisons?

- No literature comparing paraspinal blocks:
  - Retrolaminar
  - Intercostal/Paraspinal
  - ESP
  - MTP

- Possibly doing combinations of these with landmark for many years
PVB with different initial contact points on transverse process

Costache, Pawa, Abdallah, PVB by Proxy, Anaesthesia, In press
Landmark PVB: MRI correlation
ESP catheters
Jadon, *Anaesthesia* 2017

PVB catheter

**-5:** X-ray after contrast injection through catheters, arrows show contrast spread with paravertebral encroachment.
Other options

- PECS I
  - Medial and lateral pectoral nerves

- PECS II
  - PECS I plus injection b/w pec minor & serratus
    - Covers long thoracic/thoracodorsal/multiple intercostal levels

- Serratus plane block

- Rhomboid intercostal
Serratus plane block

- First described in 2013 by Blanco et al.
- Case reports: breast surgery, thoracoscopy, rib fracture analgesia, shoulder surgery
- Injection superficial or deep to serratus anterior muscle
- Blocks lateral cutaneous branches of intercostal nerves

- Anatomically not comparable to PVB
- Same interfascial plane intercostal/ paraspinal, rhomboid intercostal, ESP, RLB
Paraspinal blocks

Costache, Pawa, Abdallah, PVB by proxy, Anaesthesia, In press
How do we apply the paraspinal blocks?

- Desire to do PVB
- Fear the complications
- Options when imaging poor
- Teaching/learning PVB
  - Stepwise approach: ESP/M TP, PVB once comfortable with skills
Which block to choose?
Thoracic Paraspinal Blocks:

A) are useful for surgery involving the thoracic wall

B) their ultrasound-guided techniques are technically less challenging than a paravertebral block

C) potentially carry less risk than thoracic epidural or paravertebral

D) have a risk of local anesthetic systemic toxicity (LAST)

E) all of the above
Conclusion

♦ Multiple options for traditionally defined PVB

♦ May have been doing the “new” blocks with landmark

♦ PVB trusted, old technique, good evidence
  ♦ If new techniques similar action, we already have evidence for use
Conclusion

- Paraspinal blocks should be a core competency for all anesthesiologists
  - Easy to do
  - Easy to teach
  - Less risk than paravertebral or epidural
  - The evidence is coming!