Paravertebral Block and Thoracotomy: Review Article
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ABSTRACT
Background: First described paravertebral block (PVB) to provide abdominal analgesia in 1905. This technique has been modified for rib fracturing, flail chest, hepatic-biliary operations, open cholecystectomy, inguinal hernia repair, breast tumors operations and thoracotomies. PVB was shown to be as successful as thoracic epidural analgesia with less minimal complications in recent systematic reviews and meta-analyses.

Objective: To evaluate the effect of paravertebral block and Thoracotomy to the other technique in issues analgesia, complications.

Conclusion: Paravertebral block is a very useful regional anaesthetic technique for surgeries, Paravertebral block was shown to be as successful as thoracic epidural analgesia with less minimal complications.

Keywords: Paravertebral block, Thoracotomy.

INTRODUCTION
Hugo Sellheim first described paravertebral block (PVB) to provide abdominal analgesia in 1905. Along with Arthur Lawen, Hugo Sellheim are merited as being the first to administer local anesthetic (LA) into the paravertebral (PV) space in order to identify the intra-thoracic and intra-abdominal organs’ innervation (1).

Indications: Indications for TPVBs are illustrated in table 1 (2).

Table (1): Common indications for TPV (2)

<table>
<thead>
<tr>
<th>Surgical</th>
<th>Abdomen area</th>
<th>Non-surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute:</td>
<td></td>
<td></td>
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<tr>
<td>Breast</td>
<td>Ingual</td>
<td>Rib</td>
</tr>
<tr>
<td>Lung</td>
<td>hernia repair</td>
<td>fractures</td>
</tr>
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<td>Cardiovascular</td>
<td>Renal</td>
<td></td>
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<tr>
<td>Esophagus</td>
<td>Cholecystectomy</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td>Gynecological</td>
<td></td>
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<tr>
<td></td>
<td>(open)</td>
<td></td>
</tr>
<tr>
<td>Chronic</td>
<td></td>
<td></td>
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<tr>
<td>Post-operative pain</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Post-herpetic neuralgia</td>
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</tbody>
</table>

Role in Thoracotomy:
PVB was shown to be as successful as thoracic epidural analgesia (TEA), which is the traditional local technique, in recent systematic reviews and meta-analyses with less minimal complications (3-5).

Techniques:
- Conventional Technique:
  To access the PV region, traditional strategies represented a loss-of-resistance. A small-gauge Tuouhy needle is placed 2.5 cm lateral to the upper edge of the spinous process perpendicular to all planes and progressed until it came into contact with the transverse process (TP) planes.

  After that, a needle is retracted to the skin, rotated 15 degrees, and progressed without resistance to the upper costotransverse ligament. To stop pleural puncture, the needle is progressed one centimeter (maximum 1.5 centimeters) beyond the point where the TP was touched.

  To reduce the chance of local anaesthetic injection through a dural sleeve, the anesthetist should prevent medial angulation of the needle. It's also a good idea to stop lateral angulation because the PV area is smaller laterally, putting the anesthetist at risk of pleural puncture (6, 7).

  - Ultrasound Guidance Technique:
    The application of ultrasound (US) guidelines in the thoracic PVB has made it easier to determine the needle injection locations, needle tip position, and depth to the TP and pleura. The traditional loss-of-resistance approach is used when the TP has been reached under US guidance.

    The US probe is positioned 2.5 cm from the midline in a longitudinal parasagittal plane to visualize the TP. The US probe is positioned 2.5 cm from the midline in a longitudinal parasagittal plane to visualize the TP. A "thumbprint symbol" is what this is known as. The parietal pleura can be seen as a sharp hyperechoic line about 1 cm extending to the TP on either side (Figure (1) (7).
maximum alished reports, the risk of needle is cautiously
ance of. The TP process is touched and after
that diverted caudad 1 cm (maximum 1.5 cm) beyond
the TP using an out-of-plane needle procedure (7).

Loss of saline resistance is verified, and an
assistant administers a LA injection with occasional
aspiration while retaining US visualization. It's essential
to mention that resistance reduction can be gradual and
doesn't always happen. On ultrasound, the downward
displacement of the parietal pleura can be observed,
confirming proper LA placement. When a Tuohy needle
was used, a catheter could be inserted while keeping the
needle tip oriented lateral or cephalad. Passing the
catheter should be met with some resistance. It's likely
that the needle tip is in the intrapleural space if there's
no resistance. Another method uses an in-plane or out-
of-plane solution to the PV space, which is a minor
modification of the first (8).

Within the same longitudinal parasagittal plane,
the probe is positioned as previously mentioned, and the
PV space is reached before even engaging the TP
process. It's crucial to visualize the needle tip precisely
while using this method. Saline or LA can be injected
incrementally to detect needle tip progress by
hydrodissection if the tip tracking is difficult. Whenever
the posterior costotransverse ligament is traversed, a
"pop" can be sensed along with a lack of resistance.
Another method is to photograph the TP with a
longitudinal parasagittal view, then rotate the probe
obliquely to provide the better view of the posterior
costotransverse ligament and the PV wedge. Using an
in-plane needle technique, the needle is cautiously
advanced (Figure 2) (9).

When the needle has met up with the TP, the
depth is measured, and a Tuohy needle or blunt-bevel
block needle is inserted. A closed needle-syringe device
and a needle with centimeter labeling compared to
ambient pressure are helpful in reducing the chance of
pleural puncture. The TP process is touched and after
that diverted caudad 1 cm (maximum 1.5 cm) beyond
the TP using an out-of-plane needle procedure (7).

The last injection site is usually at the
intersection of the intercostal and PV spaces, instantly
ventrolateral to the tip of the adjacent TP. Since it is
more lateral and more superficial than the parasagittal
technique, this approach allows for perfect needle
depiction. (10).

- **Nerve stimulation:**
  Nerve stimulation may help LAs be placed
  more precisely in the PV space, which is located
  anterior to the endothoracic fascia (11).

**Dosing:**

In single-dose thoracic paravertebral block
(TPVB), injection of 20–25 mL of LA is used in
aliquots, while injection of 4–5 mL of local anaesthetic
is used at each stage expected in multiple-injection
TPVB. In old, malnourished, and frail cases, the
maximum dosage of LA should be regulated (12).

Anesthesia lasts 3–4 hours after TPVB, but
analgesia continues for 8–18 hours. In cases such as
thoracotomy or constant pain ease for broken ribs,
continuous TPVB infusion can be initiated. Levobupivacaine 0.25% or bupivacaine or ropivacaine
0.2% at the rate of 0.1–0.2 mL/kg/h after the initial
bolus injection and extended for 3–4 days or as
specifed (12).

**Complications:**

According to published reports, the risk of
complications following TPVB is mild, ranging from
2.6% to 5%. These might include pneumothorax,
pleural puncture, hypotension and vascular puncture.
Since the sympathetic blockade is unilateral, contrasting
TEA, hypotension in normovolemic patients is
uncommon following TPVB. TPVB, on the other hand,
might unmask hypovolemia and cause hypotension. As
a result, TPVB should be used rationally in
hypovolemic or hemodynamically unstable patients.
Even with bilateral TPVB, rare incidence of
hypotension is attributed to the segmental nature of the bilateral sympathetic blockade\(^{(12)}\). Bolus dosing, which may unintentionally be inserted into a blood vessel, or into the epidural or intrathecal space, results in life-threatening problems from PV blocks \(^{(13)}\).

REFERENCES