Objectives

- Utility of regional anaesthesia in the upper and lower limb
- Regional anaesthesia safety
- PoCUS identification of nerves
- Principles of PoCUS needle guidance
- PoCUS / Anatomy of the wrist / hand block
- PoCUS / Anatomy of the ankle / foot block
Utility of Peripheral Nerve Blocks in ED

- Procedural anaesthesia
  - Wound care
  - FB removal
  - Abscess drainage
  - Fracture management
- Pain control
Safety

• Cardiac monitor
• IV access
• Emergency Airway equipment available
• Intralipid
Safety

• Dose of local anaesthetic

<table>
<thead>
<tr>
<th>Anesthetic</th>
<th>Duration without Epi (min)</th>
<th>Duration with Epi (min)</th>
<th>Maximum Dose without Epi, mg/kg</th>
<th>Maximum Dose with epi, mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine (1%)</td>
<td>30 – 120</td>
<td>60 – 400</td>
<td>4.5</td>
<td>7</td>
</tr>
<tr>
<td>Mepivicaine (1%)</td>
<td>30 – 120</td>
<td>30 – 120</td>
<td>4.5</td>
<td>7</td>
</tr>
<tr>
<td>Bupivicaine (0.5%)</td>
<td>120-240</td>
<td>240-480</td>
<td>2.5</td>
<td>3.3</td>
</tr>
</tbody>
</table>

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PoCUS Nerves

- Best identified in short axis plane
- Proximal trunks are hypoechoic (*bunch of grapes*)
- Distal nerves are more hyperchoic (*honeycomb*)

Interscalene Brachial Plexus - *bunch of grapes*
PoCUS Nerves

- Best identified in short axis plane
- Proximal trunks are hypoechoic (bunch of grapes)
- Distal nerves are more hyperchoic (honeycomb)

Median nerve - honeycomb,
Note with probe angulation anisotropy of the tendons (*) highlights the nerve
PoCUS Nerves

Median nerve at wrist (1) and proximal forearm (2)
PoCUS Needle Guidance

- Sterile technique
- Aseptic vs non-touch
- Risk of infection vs hindrance to procedure

- In-plane vs Out-of-plane
- What are the advantages and disadvantages of each?
In-Plane

- Correct alignment required
- Technically more challenging
- Both needle shaft and tip can be seen
- Skin surface / bony contours can hinder access
PoCUS Needle Guidance

Transverse upper arm, in-line approach - from sonoguide.com
Note how the needle is relocated to surround the nerve with local anaesthetic

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PoCUS Needle Guidance

Transverse upper arm, in-line approach - from sonoguide.com
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Out-Of-Plane

- Alignment easier
- Only needle shaft **OR** tip can be seen
- Access when skin surface / bony contours are present may be easier
- Reverb artifact can hinder visualisation of the tip
Out-Of-Plane Walk Down Method

• This technique allows needle tip to be safely guided in short axis

• The needle tip is advanced into the plane of the beam (some angulation helps visualisation)

• As soon as the needle tip is seen, NO further advancement is made

• The transducer is moved a small distance away from the needle

• The needle tip is once again advanced into the plane of the beam

• The process is repeated

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- As soon as the needle tip is seen, NO further advancement is made.
- The transducer is moved a small distance away from the needle.
- The needle tip is once again advanced into the plane of the beam.
- The process is repeated.
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Out-Of-Plane
Walk Down Method
Out-Of-Plane
Walk Down Method
Practical Tips

- Large gauge needles are better visualised than small needles
- Expel air from needle by filling with fluid
- Injecting small amounts of fluid can help to localise the tip (can even use colour flow)
- In-plane
  - Insert needle with bevel up - enhances tip visualisation
  - Short needle movements “in-out or side-to-side” enhance visualisation
Hand Block

- Distal wrist / hand anaesthesia
  - Median, Radial and Ulnar nerves
  - Location of desired anaesthesia determines which nerves are blocked
  - Can block at wrist or mid forearm
- Note - to block the proximal wrist / forearm requires a brachial plexus block
Median Nerve
Median nerve - short axis at wrist, note the anisotropic effect of tendons becoming anechoic when transducer is angled.
Median nerve - short axis at wrist, note the anisotropic effect of tendons becoming anechoic when transducer is angled.
Radial Nerve

Midshaft Radius

Radial nerve

Radial artery

Midshaft Radius
Radial Nerve
Radial Nerve

Radial Artery
Ulnar Nerve
Ulnar Nerve
Femoral Nerve Fascia Iliaca Block

- Neck of Femur # / Femur # analgesia
- Large volume (20-30ml) dilute LA (e.g. 0.5% Lidocaine)
- Distal compression encourages proximal spread beneath Fascia Iliaca resulting in anaesthesia of:
  - Lateral Cutaneus Nerve to Thigh
  - Femoral Nerve
  - (+/- Obturator Nerve)

Fig. 2 Cross sectional anatomy of the inguinal region (right side). Trajectory of blockade is indicated by the red arrow.
Femoral Nerve Fascia Iliaca Block

- Neck of Femur # / Femur # analgesia
- Large volume (20-30ml) dilute LA (e.g. 0.5% Lidocaine)
- Distal compression encourages proximal spread beneath Fascia Iliaca resulting in anaesthesia of:
  - Lateral Cutaneous Nerve to Thigh
  - Femoral Nerve
  - (+/- Obturator Nerve)
Femoral Nerve
Fascia Iliaca Block

- Neck of Femur # / Femur # analgesia
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  - Lateral Cutaneous Nerve to Thigh
  - Femoral Nerve
  - (+/- Obturator Nerve)
Popliteal Nerve

- Ankle block
- Includes Tibial n. and Common Peroneal n.
- Will also need to block Saphenous n. for medial ankle anaesthesia
Saphenous Nerve
Posterior Tibial Nerves

- Sole of foot
Other Blocks

- The same principles can be applied to any regional block

- Requirements
  - Knowledge of sensory nerve distribution and regional anatomy
  - Use a recognised *safe approach* to avoid complications
  - e.g. Interscalene brachial plexus block, axillary nerve block, etc
Questions?