LOCAL ANAESTHESIA FOR MINOR PROCEDURES

Introduction

Research consistently shows that children receive less analgesia for similar conditions than adults. Remember: children cannot verbalise their pain like adults— if you think it would hurt an older patient (or you!) it will hurt a baby. Anaesthetic and analgesic agents can be used safely in children and infants.

Local anaesthetic should be used wherever possible for painful procedures such as venepuncture, cannula insertion, lumbar puncture and laceration repair.

It has been traditional to use local anaesthesia (LA) much less frequently for lumbar puncture than venepuncture – this is illogical.

Infiltration of lignocaine is painful but there are simple ways to diminish this (see below).

Always consider tissue adhesive / steristrips as an alternative to suturing for simple lacerations.

All local anaesthetics (including topical preparations) can cause serious toxicity – know the safe maximum doses for any preparations you prescribe.

Topical anaesthetics

These can provide effective anaesthesia for venepuncture and cannula insertion, and reduce the pain of lumbar puncture/bladder aspiration.

Apply to intact skin under an occlusive plastic film dressing (e.g OpSite/Tegaderm). Ametop probably provides superior pain reduction for IV insertion compared with EMLA, but IV insertion success rate is equivalent.

EMLA

Emulsified eutectic mixture of 2.5% lignocaine and 2.5% prilocaine. Leave in place for 90 minutes prior to the procedure. Provides anaesthesia down to 3-5mm tissue depth and for up to 2 hours. Methaemaglobinaemia is a rare life threatening complication of EMLA use (haem Fe^{2+} is oxidised to Fe^{3+}) caused principally by excess prilocaine absorption. Hence application to areas where absorption will be more rapid e.g. broken skin (burns, lacerations), mucous membranes or diseased skin (eczema/dermatitis) should be avoided. The thinner skin of infants can also result in higher absorption – note safe age and dose recommendations. EMLA can be applied safely to small, superficial lacerations to aid cleaning / gluing.
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Recommended maximum daily doses of EMLA\(^1\) (1 tube = 5 grams)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Maximum dose (g)</th>
<th>Maximum skin area (cm(^2))</th>
<th>Period of application (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 – 11 months</td>
<td>2</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>1 – 5 years</td>
<td>10</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>6 – 11 years</td>
<td>20</td>
<td>200</td>
<td>4</td>
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EMLA can cause local oedema or vasoconstriction making the procedure harder, removing dressing 10 minutes prior will allow this to resolve.

**Ametop**

Amethocaine hydrochloride.

Requires refrigeration.

Suitable for use above 1 month of age.

Leave on for 30 to 45 minutes. Anaesthesia will last for up to 4 hours after removal.

Often causes erythema but this does not necessitate removal or indicate allergy.

**Little tips**

Good idea to apply the cream at two sites in case the first attempt at venous access fails (!) and on the back if an LP is likely to be performed. EMLA can cause local oedema or vasoconstriction making the procedure harder, removing dressing 10 minutes prior will allow this to resolve.

**ALA**

Available in CED as “Topicaine” - liquid preparation of 4% lignocaine, 0.5% amethocaine and 0.18% adrenaline.

Used as a topical local anaesthetic specifically for application to open wounds or mucous membranes.

Can allow cleaning of wounds that don’t require suturing, suturing of small wounds without injected LA or to reduce the discomfort of injected LA in larger wounds. It can be used in any age of child.

Prior to application warm the ALA to room temperature to reduce stinging (warn patient that it can sting) and gently irrigate the wound to remove excess clot so the ALA is able to contact the wound edges.

Soak a cotton-wool ball and place in the wound if there is a cavity or on the wound if not. Cover with an occlusive plastic film dressing (e.g. Opsite/Tegaderm) and leave for 20 minutes prior to the procedure. Blanching of the area will confirm adequate effect.

**Maximum dose is 0.1ml/kg** (hence impractical for wounds larger than ~ 5cm).

Contraindicated on distal extremities (e.g. finger, toe) as with all adrenaline containing anaesthetics.

As with EMLA systemic absorption can occur (see lignocaine side effects below) so prolonged or repeated applications should be avoided.
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Infiltration of Lignocaine

Local infiltration is more appropriate when the procedure involves deeper or larger cuts, topical anaesthesia has had only a partial effect or it is not possible to wait before performing the procedure.

Lignocaine without adrenaline is the standard agent and is available in 0.5% and 1% strengths. Bupivicaine 0.5% is used in special situations where a prolonged action is desired (e.g. nerve blocks: see below) but must be used with care as it is markedly cardiotoxic compared with lignocaine.

Use of adrenaline

The addition of adrenaline to local anaesthetic has two useful effects:
- Increases the duration of effect by 50 – 100%
- Helps provide haemostasis

It is contraindicated for perivascular infiltration at peripheral end arteries e.g. fingers, toes, ears, nose, penis, wrist or ankle.
It should be viewed as something to add when required, rather than omit when contraindicated

The pain of local infiltration is greatly diminished by:

- Using a fine needle and minimum number of injections (25G in 2.5cm length standard or 29G on 1ml 'tuberculin' syringes when only a small area of infiltration required).
- Infiltrating slowly, with gentle pressure.
- Warming the lignocaine solution to near body temperature.
- Buffering lignocaine with NaHCO₃ (1 part neat 8.4% NaHCO₃ to 9 parts lignocaine)
- Injecting through exposed subcutaneous tissue in lacerations
- Use of adjuncts e.g. topical local anaesthetics prior to or Entonox during injection
- Anxiety heightens the perception of painful stimuli. Environmental/behavioural methods to reduce distress are very effective, safe, and work for the parents as well as the child. CED Nursing Staff and our Play Therapist are able to assist considerably with the use of distraction and other techniques

Onset of local anaesthesia after local infiltration or for block of small nerves (e.g. digital n.) is rapid, however it is best to wait 3-5 minutes before starting the procedure for full effect. Reliable duration of action is 30-40 minutes for plain lignocaine, and 2-3 hours for bupivicaine. For large nerves (e.g. femoral n.) time to maximal effect is slower (5-10 mins for lignocaine, 10-15 for bupivicaine) and duration longer (1-2 hours for lignocaine, 4-6 hours for bupivicaine)

It is important to be aware of the maximum safe dose of local anaesthetics, since it is possible to exceed this in small children with local infiltration. It is equally important to avoid direct injection into blood vessels (aspirate before and during infiltration).

<table>
<thead>
<tr>
<th>Anaesthetic</th>
<th>Maximum volume/kg</th>
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<tbody>
<tr>
<td>Lignocaine 0.5%</td>
<td>0.8ml/kg (4mg/kg)</td>
</tr>
<tr>
<td>Lignocaine 1.0%</td>
<td>0.4ml/kg (4mg/kg)</td>
</tr>
<tr>
<td>Bupivicaine 0.5%</td>
<td>0.4ml/kg (2mg/kg)</td>
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*Maximum safe dose can be increased by 50% when used with adrenaline
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Signs of local anaesthetic toxicity
Local anaesthetics are neurotoxic and cardiotoxic.

Early symptoms: Perioral tingling, perioral/tongue numbness, tinnitus, agitation/anxiety, dizziness, flushing

Progresses to: Muscle twitches, nystagmus, hypertonia, seizures, CNS depression, coma, bradycardia, hypotension, widened QRS preceding arrhythmias (VT with bupivicaine)

Nerve Blocks in Children’s Emergency Dept
Local anaesthetic blocks are a valuable part of the procedural repertoire for pain relief and wound management. The use of these simple and effective techniques in CED is encouraged, however unless you are familiar with the process guidance of senior staff should be sought. These techniques can be used independently or, in younger children, in conjunction with sedation allowing lighter sedation

Advantages over local infiltration
- Less painful injection due to site or volume of LA used e.g. sole, palm, finger tip, large cuts
- Doesn’t distort wound e.g. vermillion border of lip
- Safer as smaller doses of LA may be used
- Regional anaesthesia e.g. femur fractures, fingertip crush injuries (more effective than opiates for these injuries)

Disadvantages
- Operator dependant – not always successful. Consider the volume and concentration of agent used, anatomical variation (the area supplied by a nerve can vary, often an adjacent nerve may also need blocking e.g. median and ulnar for palm lacerations)

General practical issues
- Equipment is generally the same as for local infiltration.
- Bupivicaine is preferred unless the period of analgesia required is short.
- Skin preparation prior to procedure is as for cannula placement
- Anatomy – knowledge of landmarks and nerve distribution is needed as the anaesthetic agent needs to be placed close to an appropriate nerve.
- After infiltration gently massage the site, this encourages dispersal of the agent and increases success
- Patience – wait 5 minutes for small nerves, up to 10-15 for big nerves
- In the context of fractures and lacerations ALWAYS document limb neurological status before placing a nerve block
- Acute pain or parasthesias during the procedure suggest the nerve is being touched, withdraw 1-2 mm
Digital Nerve Blocks

This is a very safe and simple technique. It is the 1st line analgesic for all painful finger or toe injuries/procedures.

Technique: Use the smallest needle that will reach the palmar subcutaneous tissue from the dorsal side of the finger.
Approach from the dorsum (back) of the hand as close to the MCP joint (knuckle) as possible. Inject as you slowly pass the needle down BOTH sides of the proximal phalanx (2 injections only required).
The volume injected should produce obvious swelling, which will rapidly dissipate with gentle massage. ~ 0.05 mls/kg (max 2mls) each side of 1% lignocaine or 0.5% bupivicaine.
Note: big toes (and to a lesser extent thumbs) may require a complete ring block, with additional infiltration along dorsal and palmar/plantar surface of proximal phalanx.

Femoral Nerve Blocks

Supplies femur, anterior and medial thigh and majority of knee joint.
Indicated as 1st line analgesia for femoral shaft fractures. Often useful for fractures of femoral neck and condyles.

The femoral nerve emerges beneath the inguinal ligament lateral to the femoral artery. It lies in a pyramidal shaped potential space which has 2 implications: 1) the nerve does not need to be closely approximated as the LA can spread widely 2) a major reason for failure is inadequate volume injected as dissipation is too wide. With a good volume the obturator and lateral cutaneous nerve of the thigh are also often involved giving effective analgesia to the hip and knee (3-in-1 block).
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Technique: Establish IV access and cardiac monitoring. Monitor for 30mins post injection. Use a 2.5cm 25G needle with a 10 or 20 ml syringe. The nerve lies 1-2 cm lateral to the femoral pulse depending on size. Mentally note landmarks. Starting just lateral to where the nerve lies enter the skin at ~25° from perpendicular and aim as if toward the umbilicus. Inject and aspirate slowly as you advance. 2 distinct ‘pops’ should be felt, first the fascia lata then the iliopectineal fascia. After the second ‘pop’ there should be a loss of resistance to injection. Fix the needle at this point and inject the entire volume aspirating every few mls. If there is resistance or swelling the needle is likely to superficial. Stop injecting and advance as before. 0.5% bupivicaine is preferred for its long duration of action. Dilution may be required to make an adequate volume. Aim to inject a volume of 0.4 mls/kg (max 25mls) for one femoral nerve block.

Wrist Blocks

Particularly useful for exploration and repair of palm lacerations.

Anatomical variations - block both nerves when lesion is near territory boundaries. Standard Equipment: 25G or 26G needle with 3-5 ml syringe. Aim to infiltrate ~0.05mls/kg (max 2.5mls) for median and ulnar blocks and ~0.1ml/kg (max 5mls) for radial.
**Median Nerve**

Identify flexor carpi radialis (flex wrist against resistance) and palmaris longus (clench fist). Inject between these two, approximately 1-2 cm proximal to main wrist crease and advancing needle perpendicularly. Nerve is superficial, maximum of 0.5-1 cm deep depending on patient size.

**Ulnar Nerve**

The tendon of flexor carpi ulnaris can be easily felt on a gently flexed wrist. The ‘lateral’ approach is easiest, starting 1-2 cm proximal to the main wrist crease advance the needle under the tendon aiming to infiltrate just medial to the ulnar artery pulse.
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Radial Nerve

![Radial Nerve Diagram]

The radial nerve is branching and superficial at the level of the wrist. Using the base of the anatomical snuff box as a landmark fan 2 bands of subcutaneous LA such that they cover the lateral side of the wrist at the level of the main wrist crease. Massage to diffuse the LA helps success.

Ankle Blocks

Excellent for exploration and repair of sole lacerations. The sural nerve supplies a variable part of the heel and lateral border of the sole, the tibial nerve the rest. Three other nerves supply the dorsum of the foot.

Tibial Nerve

The landmark is the midpoint between the most prominent point of the medial malleolus and the Achilles tendon. The tibial artery pulse may be felt and the nerve wraps around this. Advance the needle such that it feels it would just slide behind the tibia ~0.5-2 cm depending on patient size. If you hit bone you are too anterior or too deep. Infiltrate ~0.1mls/kg (max 5mls) of LA and massage. Entering the artery is not a disaster, simply withdraw until negative aspiration then infiltrate as above.
Sural Nerve
Superficial subcutaneous nerve running between the lateral malleolus and Achilles tendon. Fanning ~0.05-0.1 mls/kg (max 5mls) of LA subcutaneously between these points should catch it.

Facial Nerve blocks
Vital for accurate repairs of the vermillion border of the lip. In younger children used in conjunction with sedative agent. Blocking nerves bilaterally is necessary for central lacerations. Standard technique is ~0.05 mls/kg (max 2.5mls) 1% lignocaine using 25G needle and 3 ml syringe for both.

Infraorbital Nerve
Supplies medial cheek and upper lip. Does not cover gums, teeth or nose. Exits through the infraorbital foramen. This is a large foramen that can be located medial to the zygomatic arch in a line between the pupil and upper canine. It is most easily accessed from the intraoral route. One hand lifts lip then insert needle at reflection of the oral mucosa above canine. Advance ~0.5-1cm towards foramen, do not attempt to enter foramen as retrograde spread of LA can produce very extensive facial blocks. Infiltrate gently and massage as with usual technique.
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Mental Nerve

Supplies chin and lower lip (not gums or teeth). Exits mandible through the mental foramen, a small foramen located in the middle of the mandible just posterior to the lower canine. The intraoral route is again easier. Evert the lip, insert the needle ~0.5–1cm at the reflection of the oral mucosa just posterior to the canine. Inject gently and massage.

References


Jankovic D, Wells C. Regional nerve blocks, 2nd edn. Blackwell Science 2000; Ch 3

The excellent anatomical diagrams are from the series of articles by Dr Scott Simpson published in Australian Family Physician referenced above (used with permission of the author).