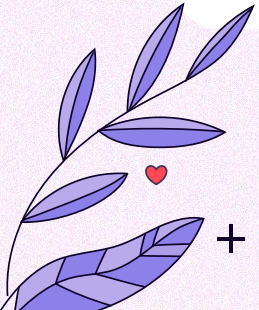
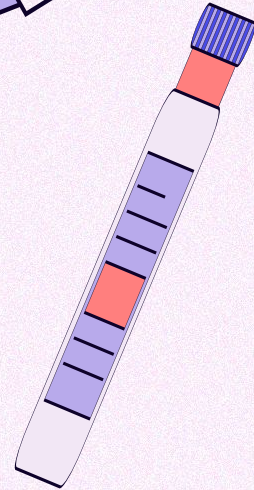


LOCAL ANAESTHETIC GIL

BDS2

GEORGIA, ALEX, BRENDAN



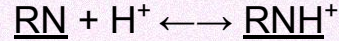


Royal Australasian College
of Dental Surgeons
Let knowledge conquer disease



Chemistry

- LA molecules exist in an equilibrium between two forms:



RN is the basic form - it diffuses through the nerve sheath

RNH⁺ is the cationic form - it inhibits the action of sodium channels

This is the mechanism by which LA works.

- Both forms are required for LA to be effective

The ratio of each form at equilibrium is determined by:

The pH of the LA

The pKa of the LA (what does a pKa closer to 7.4 mean for a LA?)

The pH of the injection site

Question: You are planning to anaesthetise a tooth which has been diagnosed with irreversible pulpitis. You inject the LA and begin treatment, but as soon as your bur reaches the dentine your patient claims they can feel sharp pain. Explain the reason why the LA may not have worked in this situation.

Chemistry

There are two types of LAs - **amide** and **ester**:

Amide LAs are metabolised in the liver

Ester LAs are hydrolyzed by pseudocholinesterase in the plasma membrane

All the LAs used in the ADH are the amide type. *Why?*

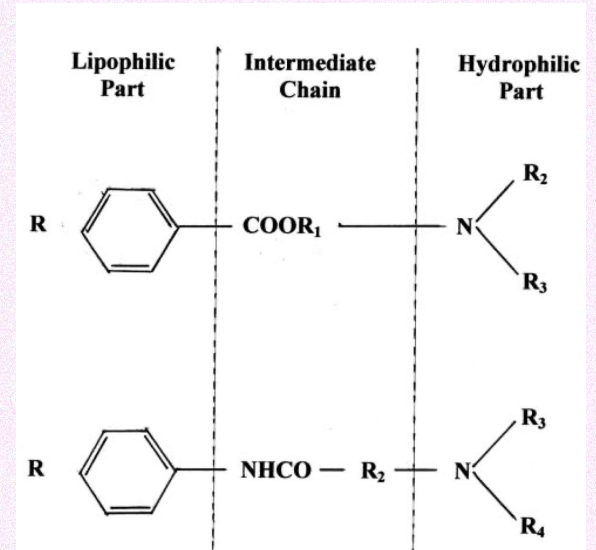
LAs are divided into three portions:

Lipophilic portion - binds to fatty tissues

Hydrophilic portion - binds to water

Intermediate Chain - binds the two ends

Alteration of the lipophilic and hydrophilic portions will alter the solubility, binding and anaesthetic activity of the LA agent.



LA Types – What's the difference?

- Beyond the LA itself, there are specific ingredients that are added to LAs for different purposes:

Ingredient	Purpose
Vasoconstrictor	Increase the local concentration of LA to increase duration of effect
Methylparabens	Antibacterial preservative
Bisulfites	Prevent oxidation of the vasoconstrictive agent
Sodium chloride	Keep the solution isotonic to minimise pain during injection
Sodium hydroxide	Alter the pH of the solution
Distilled water	Alter the volume of the solution
Nitrogen gas	Fill the remainder of the carpule (as opposed to oxygen)

Question: Some LAs have no ingredients beyond the anaesthetic agent itself. Why might this be?

+ LA Types – Indications and

○ Contraindications

There are 3 types of LA available in the ADH:

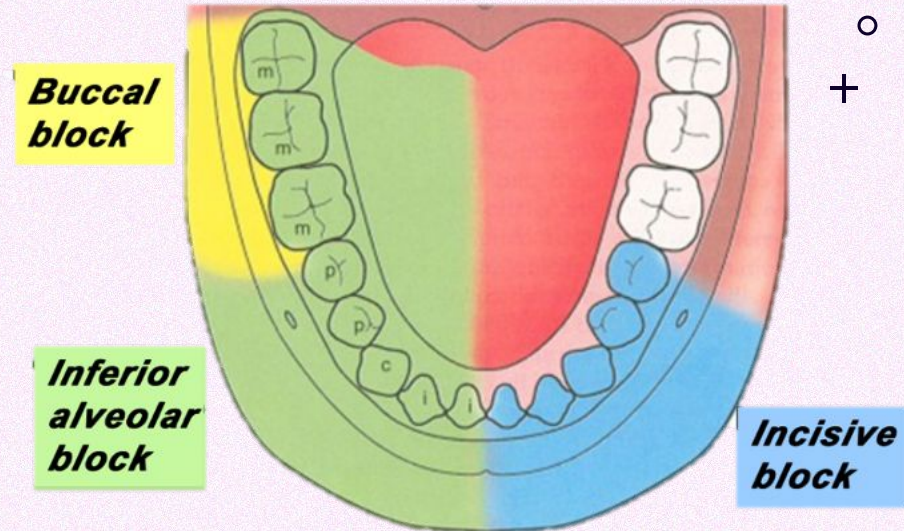
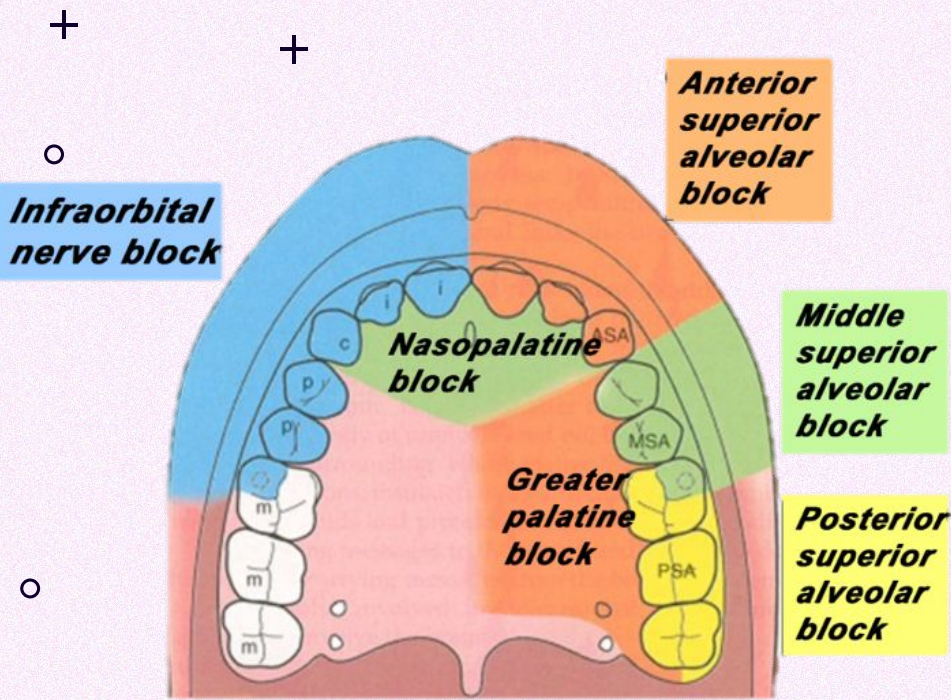
- 1) **Lignospan special** - 2% xylocaine with 1 : 80 000 adrenalin
- 2) **Scandonest Plain** - 3% mepivacaine with no vasoconstrictor
- 3) **Septanest** - 4% articaine with 1 : 100 000 adrenalin

○ The LA agent itself is very rarely the reason why a patient is unable to have a specific solution. Often it comes from the other ingredients:

- Asthmatics may have a sensitivity to bisulphites
- Uncontrolled hyperthyroidism and patients using non-selective beta blockers are contraindicated for catecholamine vasoconstrictors (*Why?*)
- Articaine is contraindicated for IANBs

LA Types – Additional LA Techniques

- Mental block
- Maxillary block
- Nasopalatine block
- Intra-periodontal
- Intra papillary
- Intra pulpal
- Intra osseous



Question: You want to perform a subgingivally extending mesiobuccal restoration on the 47. Which nerves do you want to anaesthetise? And why?

COMPONENTS



- Needle, Carpule and syringe

Needle used most likely is 27 gauge (thickness).

Length:

- Shorter for infiltration → 25
- Longer for IANB → 40

Carpule in ADH contains 2.2ml solution.



IANB

IANB: is a technique involving the insertion of the needle through the pterygotemporal depression and into the pterygomandibular space, by piercing through the buccinator muscle (adjacent to the pterygomandibular raphe). The aim of this is to deposit the LA solution superior to the lingula and produce anaesthesia of the IAN before it enters the mandibular foramen.

The key anatomical area that needs to be considered during an IANB block is the **pterygomandibular space**. The pterygomandibular space has the following **borders** and **contents**:

BORDERS:

Medial and inferior: Medial pterygoid muscle

Lateral: Medial surface of the mandibular ramus

Superior: lateral pterygoid muscle

Posterior: parotid gland

Anterior: Buccinator and superior constrictor muscle (which together form the fibrous junction, the pterygomandibular raphe).

CONTENTS:

1. *Inferior Alveolar Nerve (IAN), Inferior alveolar artery and Inferior alveolar vein*
1. *Lingual Nerve*
2. *Nerve to Mylohyoid (which branches off the IAN before it enters the mandibular foramen; which is located on medial aspect of mandibular ramus)*
3. *Sphenomandibular ligament + Fascia (sheet of CT)*

IANB- TECHNIQUE

The **level of needle insertion** should be superior to the lingula; near the **coronoid notch** (Area of maximum concavity of ramus). This should be approximately 1cm above the mandibular occlusal plane - when the mouth is positioned at maximum mandibular opening.

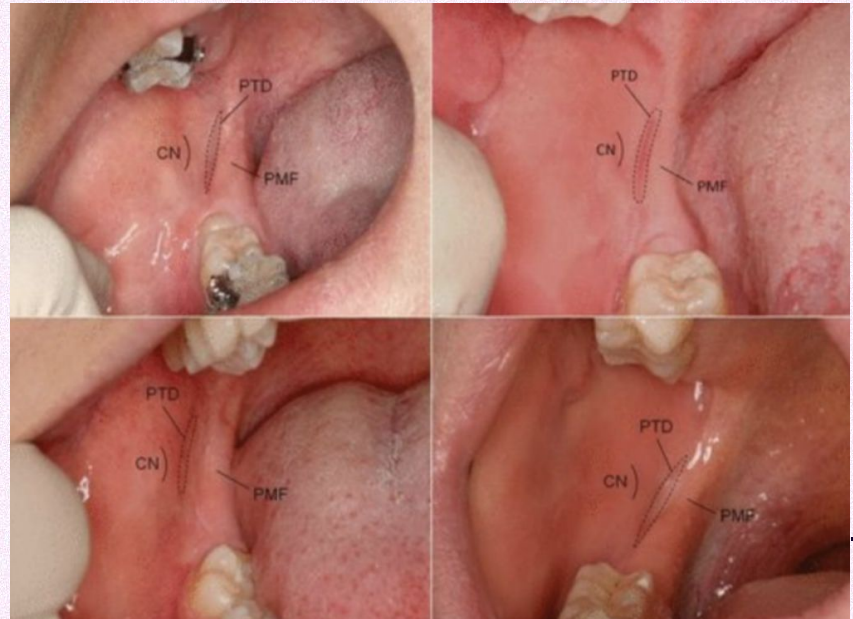
PTD: Pterygomandibular depression

CN: Coronoid Notch

PMF: Pterygomandibular fold

Other considerations: Ensure to remain parallel to occlusal plane → otherwise may not be injecting superior to lingula and thus will not anaesthetise IAN before it enters mandibular foramen. Hold syringe barrel over opposing premolars.

In obese pts → palpate coronoid notch and slide finger medially until a sharp piece of bone is felt (internal oblique ridge). Inject behind this.



LINGUAL & LONG BUCCAL BLOCK

The **lingual nerve** (posterior branch of the mandibular division of the trigeminal nerve- V3) lies anterior and medial to the IAN & can also be anaesthetised during an IANB.

***To do this: swing barrel of syringe toward the midline; and withdraw approximately 1/3rd of the needle.

Re-aspirate and deposit a portion of the remaining solution.

The **long buccal** block may be placed for further anaesthetisation of the soft tissues along the buccal surface. →



INFILTRATIONS



The process (clinically)

1. Imagine and identify your insertion point (infiltration = fornix, IANB= pterygotemporal depression).
2. Application of topical anesthetic gel into area of insertion; wait for one minute or until numbness is felt.
3. Put together the syringe/needle/carpule out of sight of your patient.
4. Uncap the needle, and use non-dominant fingers to retract the soft tissues. Ensure good lighting and visualisation of injection site.
5. Seat the needle near insertion point. Wait for tutor OK to insert.
6. Insert needle (IANB= 2/3rds needle, Infiltration= 2-3mm). For IANB, be sure to aspirate before injection.
7. Inject appropriate amount of carpule; at an appropriate speed. If see blanching or swelling of soft tissues- slow down to avoid trauma to the area.
8. Upon completion, retract and dispose of needle safely.

When writing notes in **Titanium**:

- Specify use of topical (e.g. use of 5% lidocaine zigel)
- Specify which site and which technique (e.g. 11 infiltration within fornix)
- Specify which LA solution you used (e.g. Xylocaine 1 80000 adrenaline)
- Specify how much you used (e.g. full carpule 2.2ml)
- Specify that adequate anesthesia was achieved (or wasn't → and what you did after that)
- Write in full the POI you provided:

“Patient aware to take care with soft tissues (lips and cheek) while the numbness wears off; and patient aware to take caution/ avoid hot or very cold foods until sensation returns. Patient aware to report to the clinic if any prolonged anesthesia (24 hours+) or if they have any concerns.”

FAILURE (IANB)

- Could be due to **poor operator technique** or **anatomical variation**.
- If the **ipsilateral (same side as injection)** chin/lip is not anaesthetised → indicative of incorrect IANB technique
- If there is soft tissue anaesthesia of the chin/ lips, but **not the teeth** → indicative of anatomical variation

PATIENT FACTORS

Accessory Innervation	<ul style="list-style-type: none">- Nerve to mylohyoid often has motor function; but may also provide sensory function in some cases.- If this nerve separates higher (than usual), it may be beyond the area of diffusion of a conventional md block.
Accessory Foramina	<ul style="list-style-type: none">- May be a crossover of nerves between the L/R side; seen within the anterior teeth
Bifid Mandibular nerve	<ul style="list-style-type: none">- Presence of a secondary branch of the inferior alveolar nerve, which may bifurcate before it enters the foramen normal IANB technique may be insufficient in blocking conduction from both branches.
Landmarks	<ul style="list-style-type: none">- May be anatomical variation in shape/ width/ length of the mandible.

- **Anxiety:** Patients are more likely to experience pain due to a lowered pain threshold.
- Other patient related factors include **pathology**.
 - o **Inflammation:** If there is inflammation or pathology within the area, there will be a decreased pH of the tissues within the surrounding area. This may alter the chemical equilibrium of the LA in solution and will shift the equation to produce more RNH^+ ; which cannot diffuse properly as it cannot cross into the nerve membrane.
 - o **Increased blood supply** to the area may increase the rate of absorption and clearance
 - o **Inflammatory mediators** (prostaglandins) lower the threshold of activation of sensory neurons and make them more sensitive lowering LA effectivity.

OPERATOR FACTORS

<p>Poor technique</p>	<ol style="list-style-type: none"> 1. <i>Height too low</i>: Pt not opening wide enough; or jaw closes during the administration of anaesthesia. 2. <i>Lack of stretching cheek</i>: leads to not being able to locate the pterygotemporal depression 3. <i>Injection too posteriorly</i>: injection does not hit bone (+ thus redirect the needle) 4. <i>Injection too medially</i>: will be met with fibrous resistance from the medial pterygoid muscle 5. <i>Electric shock</i>: touched the inferior alveolar nerve
<p>Insufficient Volume</p>	<ul style="list-style-type: none"> - Entire cartridge should be deposited (Adults), ensuring toxicity is not reached.
<p>Timing</p>	<ul style="list-style-type: none"> - Inserting too quickly will result in ballooning of the tissues. Should aim to inject at 1-2mL/min. Allow time for the LA to diffuse. - Not waiting long enough for the LA to set in: can sometimes take >5-10min. Pulpal anaesthesia may take longer due to dense covering of apex of tooth (and thus impaired diffusion). <ul style="list-style-type: none"> o 2-3min onset: infiltration o 4-5min onset: IANB
<p>Intravenous injection</p>	<ul style="list-style-type: none"> - Ensure a negative aspiration before injecting the contents of a LA carpule. - Intravenous injection may cause haematoma.

COMPLICATIONS

Complication	Cause	Signs + Symptoms	Management
Facial Paralysis	<ul style="list-style-type: none"> - Needle positioned too far posteriorly, and LA administered instead into the body of the parotid gland 	<ul style="list-style-type: none"> - Facial paralysis may exist unilaterally (face lopsided, inability to close one eye) or through the drooping of eyelid and upper lip/corner of mouth 	<ul style="list-style-type: none"> - Reassure pt that it is temporary - Advise pt to not rub eyes - Cover the affected eye with eye patch - Keep under observation until better - No driving back home - If not recovered after 12hrs -> med review (Therapeutic Guidelines Fig. 13.54)
Trismus	<ul style="list-style-type: none"> - Trauma to the muscles or blood vessels, often caused by withdrawing the needle or through tissue distension 	<ul style="list-style-type: none"> - May present as a prolonged spasm of the jaw muscles with limited or complete inability to open the mouth, or pain associated with mouth opening 	<ul style="list-style-type: none"> - Usual improvement (self) within 48-72 hours with up to 6-weeks for complete recovery - Pt may seek heat therapy, warm saline rinse, soft diet and jaw exercises
Soft tissue damage	<ul style="list-style-type: none"> - Usually a self-inflicted injury by the patient themselves; includes trauma (pt bites the anaesthetised area) or burn (pt eats hot and burns mucosa) 	<ul style="list-style-type: none"> - May present as a soft tissue lesion, accompanied by localised pain and swelling. - More noticeable once the LA has worn off 	<ul style="list-style-type: none"> - Provide appropriate post-operative instructions - If severe, antibiotics may be prescribed to avoid infection - Warm saline rinses

Complication	Cause	Signs + Symptoms	Management
Temporary blindness	<ul style="list-style-type: none"> - Intravascular administration - IAN -> middle meningeal artery (orbital branches) -> ophthalmic artery -> loss of vision 	<ul style="list-style-type: none"> - Loss of vision a few mins post-IANB administration 	<ul style="list-style-type: none"> - Stop Dx Tx - Call 000 - Pt must be taken to an emergency department urgently - If the Pt is unconscious -> basic CPR (Therapeutic Guidelines Fig. 13.58)
Persistent anaesthesia	<ul style="list-style-type: none"> - Direct sensory nerve damage caused by the needle - Injecting too much LA at high conc. - Haemorrhage from around/ near the neural sheath pressure on the nerve 	<ul style="list-style-type: none"> - Paraesthesia will vary depending on structures involved -> usually drooling, numbness, pins and needles. If damage to lingual nerve altered taste sensation. 	<ul style="list-style-type: none"> - Paraesthesia: resolves within approximately 8 wks (if >8wks, refer to oral surgeon) - Reassure pt and reassess
Heart palpitations	<ul style="list-style-type: none"> - Intravascular injection may cause an excitation of the cardiovascular system - Possibly normal physiological response to adrenaline 	<ul style="list-style-type: none"> - Tachycardia, palpitations and headache 	<ul style="list-style-type: none"> - Typically, only short in duration - Ensure to stop procedure and monitor the patient
Oedema	<ul style="list-style-type: none"> - May be caused by physical trauma, an allergic response, haemorrhage or irritation 	<ul style="list-style-type: none"> - Present as a swelling of tissues on the medial side of the ramus, after deposition of LA. 	<ul style="list-style-type: none"> - Pressure and cold compress applied to the area for 3-5 minutes, accompanied by warm saline rinse

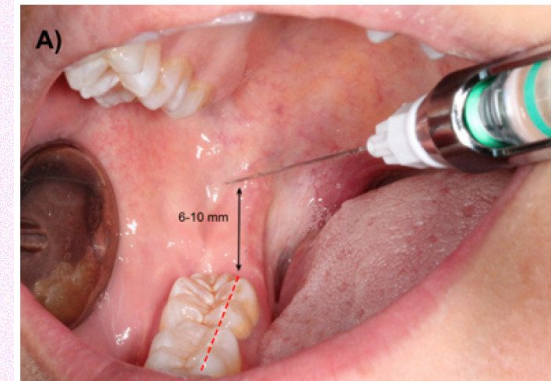
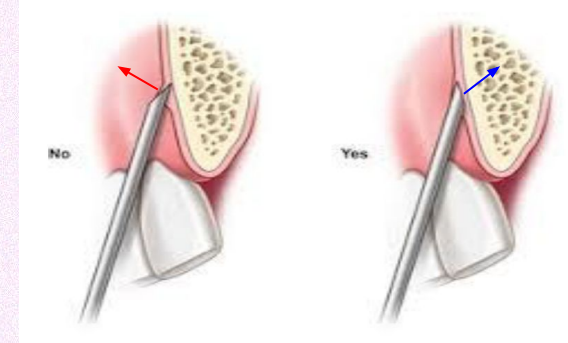
Disclaimer:

The next few slides contain some tips + tricks which you might find helpful in clinic when doing LA. Every clinician has their own way of doing things so take with a grain of salt and listen to what your tutor says

Clinical Tips + Tricks (Part 1/3)

Technical

- Bevel (ie. small black triangle on the needle hub) should face towards the bone
 - More comfortable for the Pt
 - Facilitates more effective anaesthesia
- 25-30mm in and still no bone contact for IANB?
 - Reassess your technique and position of needle barrel
 - Reassess your insertion point
 - Consider the use of an OPG (more relevant in BDS3 clinics) to check:
 - Width of the Pt's ramus -> this may warrant >30mm of needle insertion to achieve bone contact if Pt has a wide ramus
 - Course of the IANB canal -> may need to have a higher insertion pt
- Hover the needle over the insertion site -> place 1-2 droplets of LA and wait a few seconds before inserting the needle into site
 - Similar function to topical Ziagel
- Slower injection = more comfortable for the Pt



Clinical Tips + Tricks (Part 2/3)

Patient management strategies:

- When Pt is in the chair, ensure that your bracket tray is away from the Pt's eyes
- When asking DA for needles -> ask for "shorts" and "longs"
- When your needle has touched bone -> mention to your tutor that you have "made contact" rather than "hit bone"
- Give words of encouragement whilst administering LA (eg. you are doing really well, we are almost halfway there, etc.)

Safety considerations:

- Uncapping the needle with one hand (ie. thumb + side of index finger) is safer than using two hands
 - When uncapping, ensure that the syringe barrel/needle points downwards -> let gravity do the rest
- Ensure needle does not make contact with the bracket tray once uncapped -> infection control
- Do NOT recap the needle
- If Pt experiences excruciating pain or makes a loud noise that signifies discomfort -> stop procedure, uncap needle and check with Pt

Clinical Tips + Tricks (Part 3/3)

How to minimise your chances of getting Failed LA

- Ask Pt if they have had past failures with LA in previous dental procedures
- Ask Pt if they required extra carpules of LA for dental procedures which were done in the past
- Ask Pt if they have ever been referred off to another practitioner due to previous Hx of failed LA
- If site contains lots of inflammation -> consider a higher order nerve block instead (refer back to RN + H+ concepts)
- Ensure that there is sufficient quantity of LA being deposited at the region

Link to the Therapeutic Guidelines

<https://tqldcdp-tg-org-au.eu1.proxy.openathens.net/topicTeaser?guidelinePage=Oral+and+Dental&etgAccess=true>

- Login under the institution: The University of Adelaide (Open Athens)