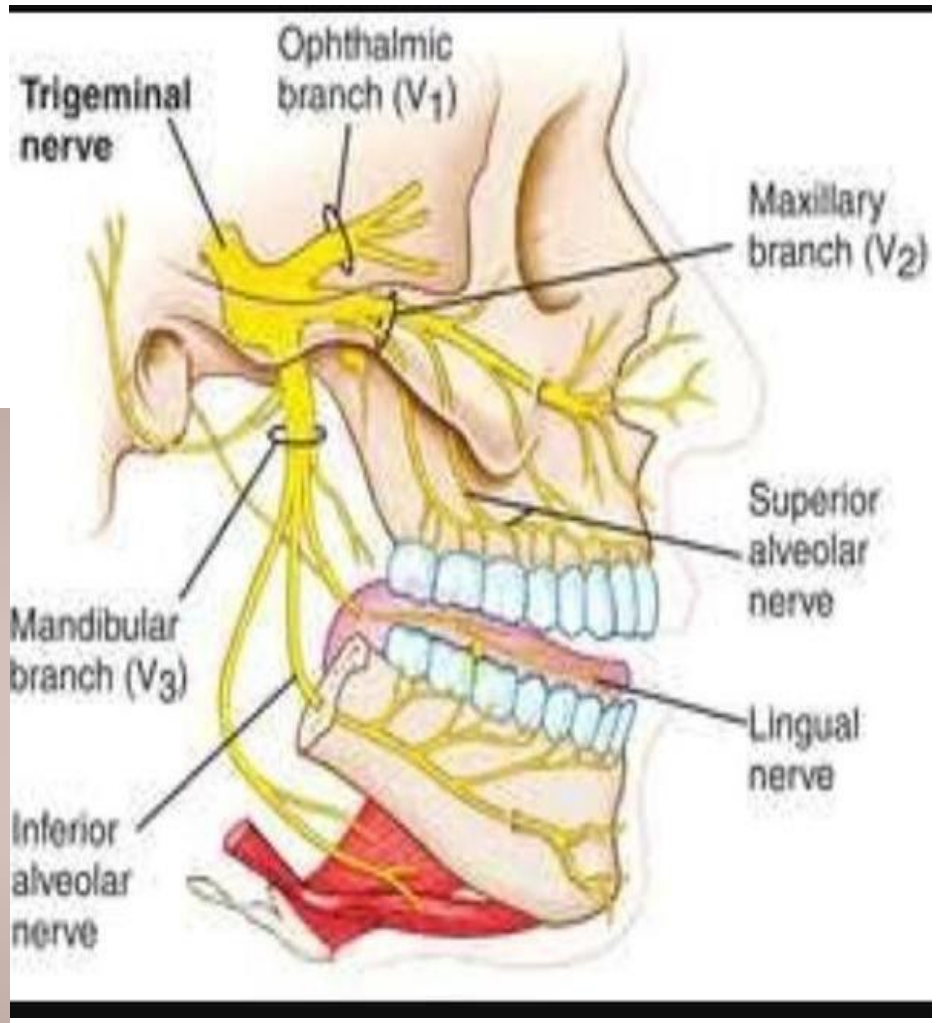
Dental Local Anesthesia Techniques



PROF.ABBAS AY TAHER

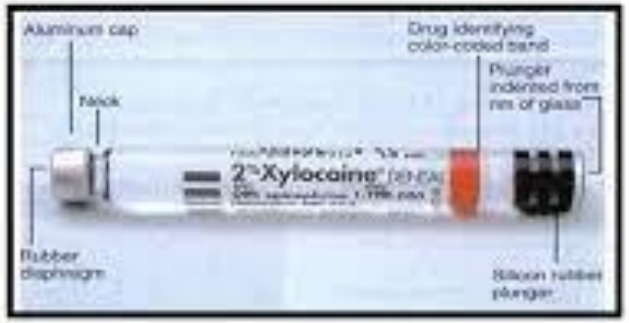
The dental cartridge:

Is a **glass cylinder containing** the local anesthetic drug, among other ingredients. the glass cylinder itself can hold 1.8, 2 ,2.2 mL of solution; however, as prepared today, the dental cartridge contains approximately 1.8 mL of local anesthetic solution. Local anesthetic cartridges list their volume
The dental local anesthetic cartridge is, by common usage, referred to by dental professionals as a ***carpule***.
The following is a brief history of the dental anesthetic "carpule." Local anesthesia was introduced in 1905 with
the synthesis of procaine hydrochloride by Alfred Einhorn (1856–1917) in Germany. The drug was supplied in powder form, so dentists had to mix up a new solution each time they needed it.

Plastic cartridges have several negative features, **primarily leakage of solution** during injection, the requirement for **considerable force to be applied** to the plunger of the syringe (e.g., periodontal ligament [PDL], nasopalatine), and the fact that the plunger does not "glide" down the plastic cartridge as smoothly **as it does down the glass cartridge**, leading to sudden **spurts of administration of local anesthetic** under increased pressure, which can produce pain in the patient.

Another problem with plastic cartridges is that they are permeable to air. Exposure to oxygen leads to more rapid degradation of the vasoconstrictor in the cartridge and to a shorter shelf life.

The Cartridge



Components

The prefilled 1.8-mL dental cartridge consists of four parts
1. cylindrical glass tube
2. stopper (plunger, bung)
3. aluminum cap
4. diaphragm

The stopper (plunger, bung) is located at the end of the cartridge that receives the harpoc of the aspirating syringe. The sharp harpoon is embedded into the silicone (non–latex-containing) rubber plunger with gentle finger pressure applied to the thumb ring of the syringe. The plunger occupies a little less than 0.2 mL of the volume of the entire cartridge. Today, local anesthetic stoppers are treated with **silicone**, **eliminating both the paraffin** and **the glycerin that were used in years past**. “Sticky stoppers” (stoppers that do not move smoothly down the glass cartridge) are rare today. Recent years have seen a move toward the use of a uniform black rubber stopper in all local anesthetic drug combinations. Virtually gone are the color-coded red, green, and blue stoppers that aided in identification of the drug.

Composition of Local Anesthetic agent

1) Local anaesthetic agent : eg Lignocaine HCL – 2% (20 mg/ml)
2) Vasoconstrictor : Adrenaline – 1:80,000 (0.012 mg) or Epinephrine
3) Reducing Agent: Sodium Metabisulphite – 0.5 mg
4) Preservative: Methylparaben – 0.1% (1mg)
5) Isotonic Solution: Sodium Chloride – 6 mg
6) Fungicide: Thymol
7) Vehicle: Ringer's Solution
8) Diluting Agent: Distilled water
9) To adjust pH: Sodium Hydroxide
10) Nitrogen Bubble: 1-2mm in diameter and is present to prevent Oxygen from being trapped in the cartridge and potentially destroying the Vasopressor or vasoconstrictor.

Actions of each component of Local Anesthetic agent:

Vasoconstrictor function:

Decrease blood flow to the site of injection, absorption of local anesthetic into the cardiovascular system is solved, **decrease the risk of local toxicity**, **higher volume of local anesthetic agent remain in and around the nerve for longer period**, **thereby increasing the duration of action**, **vasoconstrictor decreases bleeding at the site of their administration**.

Preservative :

Stability of **modern local anesthetic solution** is maintained by adding c**aprylhydro-cuprienotoxin** which includes **xylotox** and **methyl paraben.**

Reducing agent :

These act as preservatives for vasoconstrictor agents. Vasoconstrictors are unstable in solution and may **oxidize,** especially on a **prolonged exposure to sunlight**. **Sodium metabisulphite** which competes for the available oxygen is added in the concentration **between 0.05% and 0.1%**

Vehicle :

All the above solutions and local anesthetic agent are **dissolved in a modified ringer solution**. This isotonic vehicle minimizes **discomfort during inje**ction

Function of Nitrogen bubble in LA cartridge

The bubble size 1-2mmin diameter and is present to prevent .Oxygen from being trapped in the cartridge and potentially destroying the **Vasopressor** or **vasoconstrictor,** so this is the function of Nitrogen Bubble in the LA cartridge.

We see many patients who ask "**what do dentists** use to **numb teeth or mouth**" before performing a procedure and the answer is dental anesthetics which help in making dental procedures painless be it related to the tooth or the gums and other soft tissue in the mouth or oral cavity. Having proper knowledge about the Allergic Reactions to LA and also we should have good knowledge about the amount of LA to be given to avoid

Dental Local Anesthesia Techniques

The most important skill required of all dental practitioners is the ability to **provide safe** and **effective local anesthesia** (LA).
The injection of local anesthetic is perhaps the **greatest source of patient fear and inability to obtain adequate pain control with minimal discomfort remains a significant concern of dental practitioners**.

The achievement of good local anesthesia requires knowledge of the agents being used, the neuroanatomy involved, and best techniques and devices available.

The agents and anesthetic delivery equipments available today provide the practitioner an array of options to effectively manage the pain associated with dental procedures.

Local anesthesia forms the backbone of pain control techniques in the dental profession.
Local anesthetics represent the safest and most effective method for managing pain associated with dental treatment. They are the only drugs that prevent the nociceptive impulse from reaching the patient's brain.

Local anesthetics need to be deposited as close to the nerve as possible so that optimal diffusion of the drug may occur, providing profound anesthesia and a pain-free dental experience.

The importance of this is demonstrated by the fact that **when patients** are asked to list the most important factors used when selecting a dentist, the **2 most important are:**
(1)A dentist who does not hurt
(2)A painless injection.

Unfortunately, for painless dentistry to be accomplished, local anesthetics need to be injected using a cartridge, syringe, and needle. This leads to the major problem of fear of needles **(trypanophobia)** and its consequences, ie, the occurrence of syncope or other medical emergencies during injection of the local anesthetic.
More than 50% of medical emergencies occurring in dental offices happen during or immediately following administration of a local anesthetic.

Several highly efficacious and practical techniques can be used to achieve anesthesia of the dentition and surrounding the hard and soft tissues of the maxilla and mandible.
The type of procedure to be performed as well as the location of the procedure determine the technique of anesthesia to be used are:

Topical , Local infiltration, Field block, Nerve block., and supplement technique

Topical anesthesia:

Topical anesthetics act on the peripheral nerves and reduce the sensation of pain at the site of application. In dentistry, they are **used to control local pain caused by needling, placement of orthodontic bands, the vomiting reflex, oral mucositis, and rubber-dam clamp placemen**

Topical anesthetic reduces the slight discomfort associated with **insertion of the needle**.
It is affective to a depth of 2-3mm. Although its application is beneficial for reducing patient discomfort during the **initial phase of local anesthetic administration**, it may be a **disadvantage in children** if the **taste is disagreeable to the patient**.
Also, **excessive length of application** time may **increase apprehension of the approaching procedure**.
It is available in **gel**, **liquid**, **ointment**, **patch** and **pressurized spray forms**.

The most **common topical anesthetics used in dent**istry are those **containing benzocaine** or **lidocaine.**

Benzocaine (ethyl aminobenzoate) is an ester local anesthetic. It is available in up to **20% concentrations**. **It is not known to produce systemic toxicity** but can produce **local allergic reactions** especially **after prolonged** or

It exhibits **poor solubility in water** and **poor absorption into the cardiovascular system**, thus it **remains at the site of application longer**, providing a **prolonged duration of action**.

Systemic toxic (overdose) reactions are **virtually unknown**. Benzocaine is reported to **inhibit the antibacterial action** of **sulfonamides.**

Lidocaine is available as a **solution** or **ointment up to 5% concentration** and as a **spray up to 10% concentration**.
It has a **low incidence of allergic reactions** but is **absorbed systemically** and application of **excessive amounts of topical lidocaine may absorb rapidly into the cardiovascular system leading to higher local anesthetic blood levels with an increased risk, especially in the pediatric patient**, of **overdose reaction**. Thus, **a minimal amount of topical gel should be applied to the tissue** and a **metered spray** is suggested if an **aerosol preparation is selecte**

Tetracaine is also used for **endoscopic procedures** and **gag control** [

Topical anesthesia will not cause a completely painless injection and that depends more on the needle gauge and duration of the injection.

Topical anesthesia will be helpful for **periodontal examinations** and **very conservative** treatments.

Preparation of Patient

Preparation of the patient prior to injection consists of **two components**, **mental** and **physical**.
Mental preparation begins with explaining to the child, in terminology they can understand, the anesthesia administration process. **Example:**
Today I'm going to put ***your tooth asle****ep, wash some* ***germs out of your teeth*** *and* ***place a white star****. When your tooth falls asleep your* ***lip*** *and* ***tongue will feel fat and funny for a little while****.*

First, you're going to ***sit in my special chair*** *and then* ***I'm going to place some (goofy, cherry****,* ***bubble gum)*** *tooth* ***jelly next to your tooth****. Then I'll wash it away with the* ***sleepy water****. I'm going to show you everything I do so you can see* ***how easy this is***."

Administration protocol of topical LA

1-Positioning the Patient in the Dental Chair

The patient is positioned with the head and heart parallel to the floor and the feet slightly elevated. Positioning the patient in this manner **reduces the incidence of syncope** that can occur because of **increased anxiety**

2-Drying the Tissue

Use a 2 X 2 gauze to dry the tissue and remove any gross debris around the site of needle penetration. **Retract the lip to obtain adequate visibility during the injection**. Wipe and dry the lip to make retraction easier

3-Apply Topical Anesthetic

Topical anesthetic reduces the slight discomfort associated with insertion of the needle. It is effective to a depth of 2-3mm. It is applied only at the site of preparation. The clinician should avoid excessive amounts that can anesthetize the soft palate and pharynx. The topical anesthetic should remain in contact with the soft tissue 1-2 minutes.

4-Administration of the Anesthetic

There are **two important goals 1-** must accomplish during anesthetic administration; **control** and **limit movement of the patient's head and body** and 2-**communicate with the patient to draw their attention away from the minor discomfort that may be felt during the injection process**.

Most clinicians prefer to keep the **uncapped needle out of the patient's line of sight**. Do not ask the child to close his/her eyes as that is usually a sign to the child that something bad or painful is about to occur.

Instead, the assistant passes the **uncapped syringe behind the patient's head**

5-Stabilization

Before placement of the syringe in the mouth, the patient's head, hands and body should be stabilized. There are two basic positions for stabilizing the patient's head.

A behind the patient position is assumed for injecting the **contralateral quadrants to the clinician's favored hand** and the anterior regions, i.e., right-handed clinicians injecting the left side, left-handed clinicians injecting the right side.

The clinician stabilizes the **patient's head** by supporting the head against the clinician's body with the less favored hand and arm. The clinician stabilizes the jaw by resting the fingers against the mandible for support and retraction of lips and cheek.

For injections on the same side as the clinician's favored hand, i.e., right side for right-handed clinicians, left side for left-handed clinicians, the clinician assumes a more forward position, 8 o'clock for right-handed clinicians, 4 o'clock for left-handed clinicians.

The clinician stabilizes the patient's head and retracts the soft tissues with the fingers of the weaker hand resting on the bones of the maxilla and mandible.

To prevent **unexpected movements** of the child's hands during the injection, the assistant restrains the hands by asking the child to place them on their belly button and placing her hands over them.

6-Communication

The clinician initiates communication with the patient by speaking in a reassuring manner during anesthesia administration. The subject matter can range from describing the process in child friendly terminology, to praise, to storytelling, to singing, or, if the clinician is totally unimaginative, counting. **Avoid words like shot, pain, hurt and injection and substitute words like cold, warm, weird, fat and funny**

Basic Injection Technique

The anesthetic injection begins by stretching the tissue taut at the administration site. Insert the needle 1-2mm into the mucosa with the bevel oriented toward bone. Inject several drops of anesthetic before advancing the needle. Slowly advance the needle toward the target while injecting up to ¼ cartridge of anesthetic to anesthetize the soft tissue ahead of the advancing needle. **Aspirate**.

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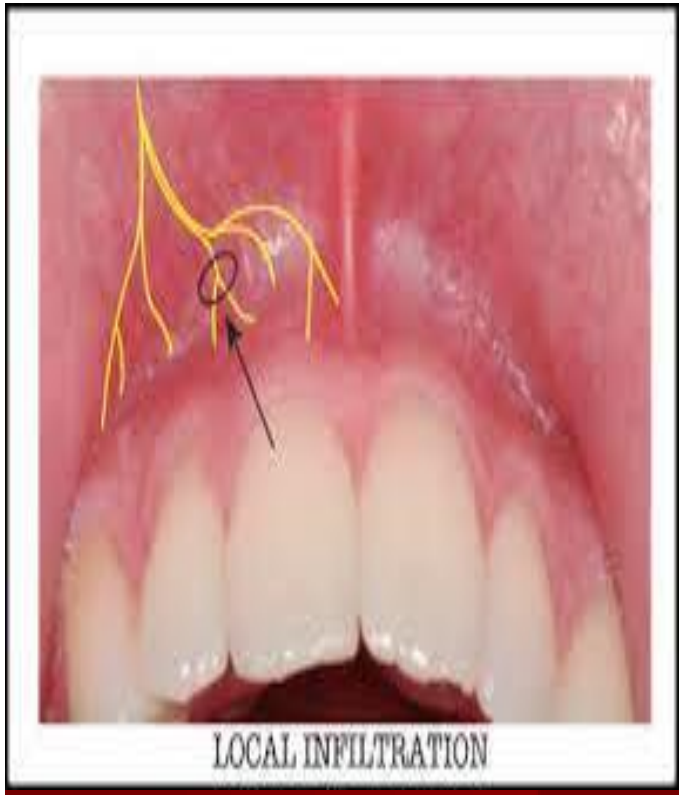
The depth of insertion will vary with the type of injection; however, one should never insert a needle in its entirety **to the hub**. Although a rare occurrence, **retrieving a broken needle fully embedded in soft tissue is extremely difficult.**

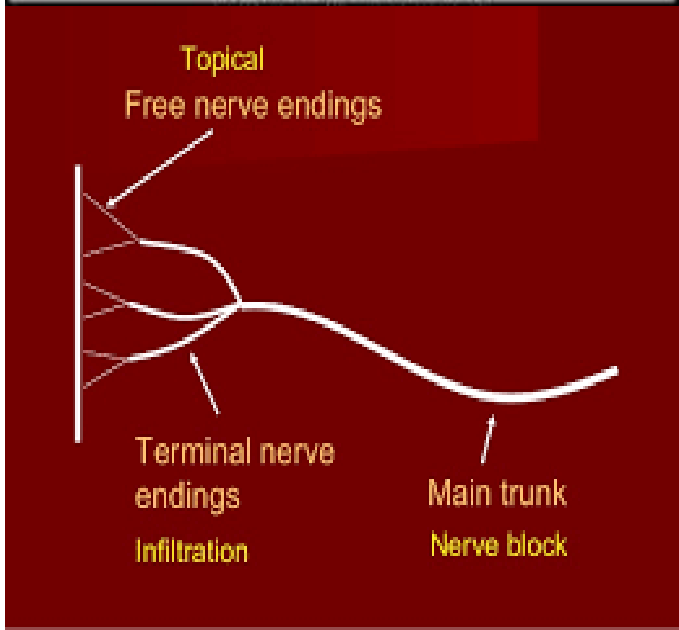
Infiltration Anaesthesia:

Small terminal nerve endings in the area of the dental treatment are flooded with local anesthetic solution.

Incision (or treatment) is then made into the same area in which the local anesthetic has been deposited.

An example of local infiltration is the administration of a local anesthetic into an **interproximal papilla before root planing**



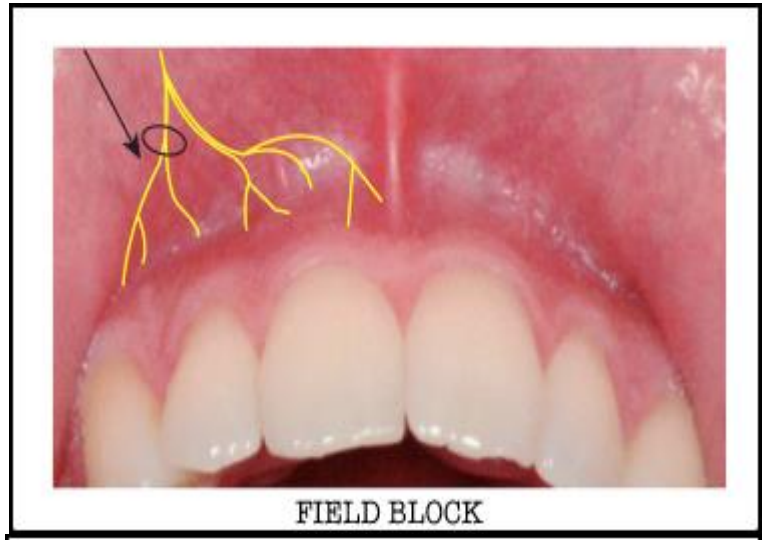


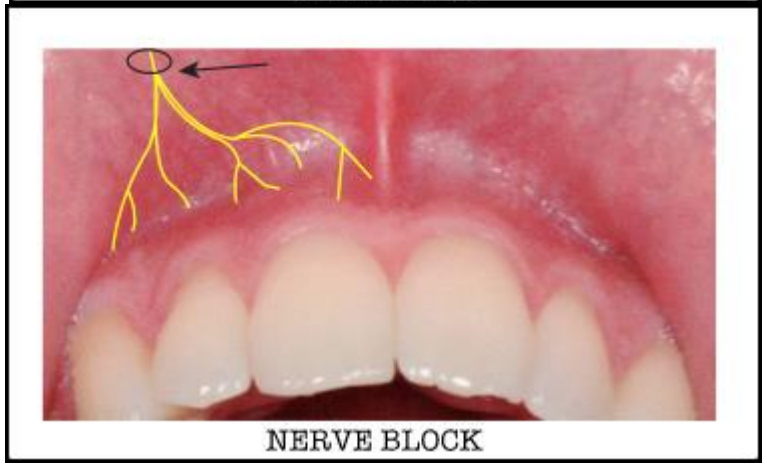
FIELD BLOCK

Local anesthetic solution is deposited near the **larger terminal nerve branches** so the anesthetized area will be circumscribed, **preventing the passage of impulses from the tooth to the central nervous system (CNS)**. Incision (or treatment) is then made into an area away from the site of injection of the anesthetic. Maxillary injections administered above the apex of the tooth to be treated are properly termed field blocks **(although common usage identifies them as infiltration or supraperiosteal).**

NERVE BLOCK

Local anesthetic is **deposited close to a main nerve trunk**, usually at a distance from the site of operative intervention. **Posterior superior alveolar**, **inferior alveolar**, and **nasopalatine injections** are **examples of nerve blocks.**

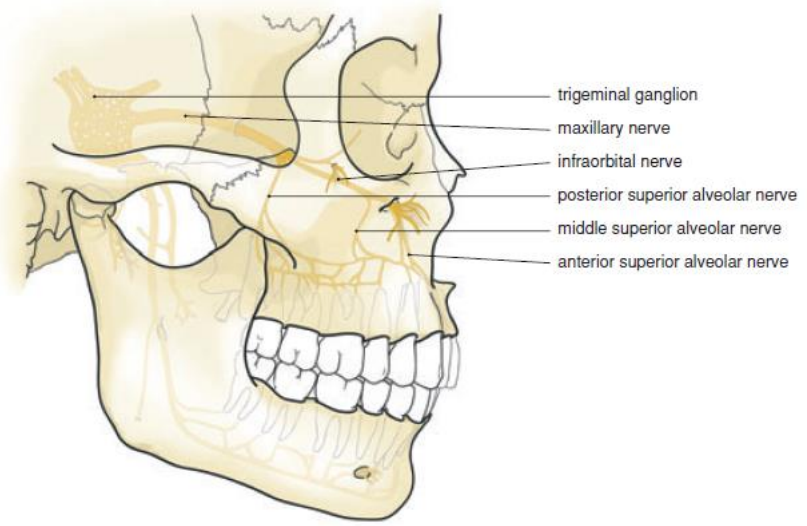

FIELD BLOCK


NERVE BLOCK

The type of injection administered for a given treatment is determined by the extent of the **operative area**. For management of **small,** isolated areas, infiltration **anesthesia may suffice**. When two or three teeth are being restored, **field block is indicated**, whereas for pain control in **quadrant dentistry, regional block anesthesia is recommended**

Techniques of local anaesthesia

- Basic injection techniques
- Techniques of maxillary anesthesia
- Local infiltration.
- Posterior superior alveolar nerve block
- Middle superior alveolar nerve block
- Anterior superior alveolar nerve block (infraorbital nerve block)
- Greater palatine nerve block
- Nasopalatine nerve block
- Maxillary nerve block



Sensory innervation of the upper jaw arises from the **second trunk of the trigeminal nerve**, the maxillary nerve. This main branch of the trigeminal nerve leaves the neurocranium via the foramen rotundum, reaches the pterygopalatine fossa and runs straight through as the infraorbital nerve, branching off many times along its course.

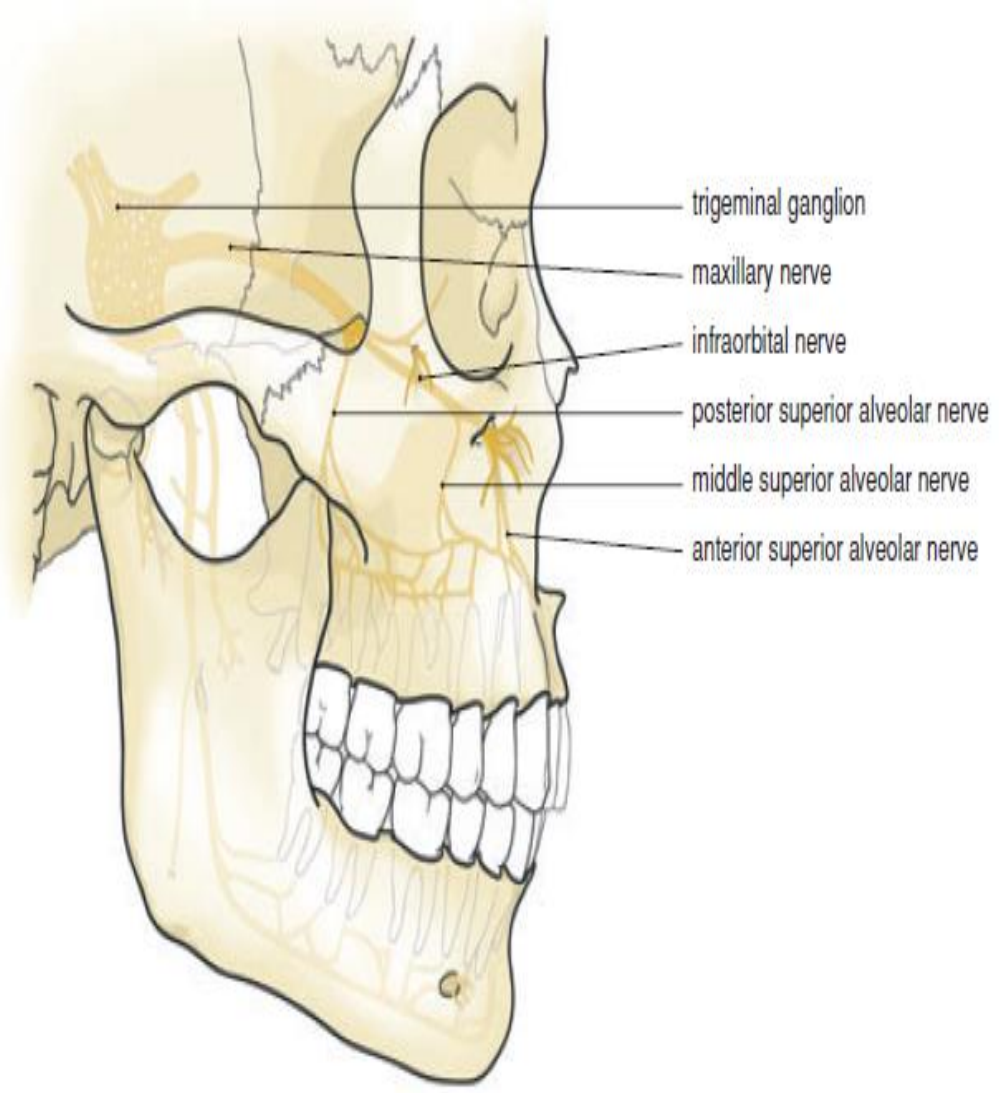
With regard to local anaesthesia in the upper jaw, the following branches are of importance:

- the greater and lesser palatine nerves;
- the posterior, middle and anterior superior alveolar nerves;
- the infraorbital nerve (Thus the main trunk of the maxillary nerve can be reached via the greater palatine foramen, via the infraorbital foramen as well as from high behind the maxillary tuberosity. In practice, high tuberosity anaesthesia is the only practical regional block anaesthesia for almost the entire maxillary nerve. Therefore this regional block anaesthesia technique is used for surgical procedures.

For everyday dental procedures in the upper jaw, infiltration anaesthesia is commonly used. The cortical bone of the outer surface of the upper jaw is **relatively thin**, which facilitates the diffusion of local anaesthetic fluid. All (buccal) roots of the upper teeth can be reached in this way.
The palatine roots of the molars and possibly the **premolars** are anaesthetized by infiltration anaesthesia of the branches of the greater **palatine nerve** and those of the **nasopalatine nerve**.

Regional block anaesthesia is also **possible via** the **greater palatine foramen** and the **nasopalatine canal**.
Infiltration anaesthesia of the upper jaw is particularly effective, unless an injection is made into an **inflamed area**.

Regional **block anaesthesia** of the **greater pala**tine, **nasopalatine** and **infraorbital nerves** is equally effective.
In cases of regional block anaesthesia using a **high tuberosityblock**, it is usually only the **posterior superior alveolar** and **medial branches that are numbed**, but sometimes also the **palatin**e and infraorbital nerves



Incisors and canines:

Anatomical aspects

Before leaving the **infraorbital foramen** the infraorbital nerve branches off in the infraorbital canal towards the **incisors and canines,** the **anteriorsuperior alveolar nerves**. These nerve branches provide the sensory innervation of the **incisor and canine pulp**, as well as the **vestibular fold**, **the gingiva, the periosteum and the bone.**

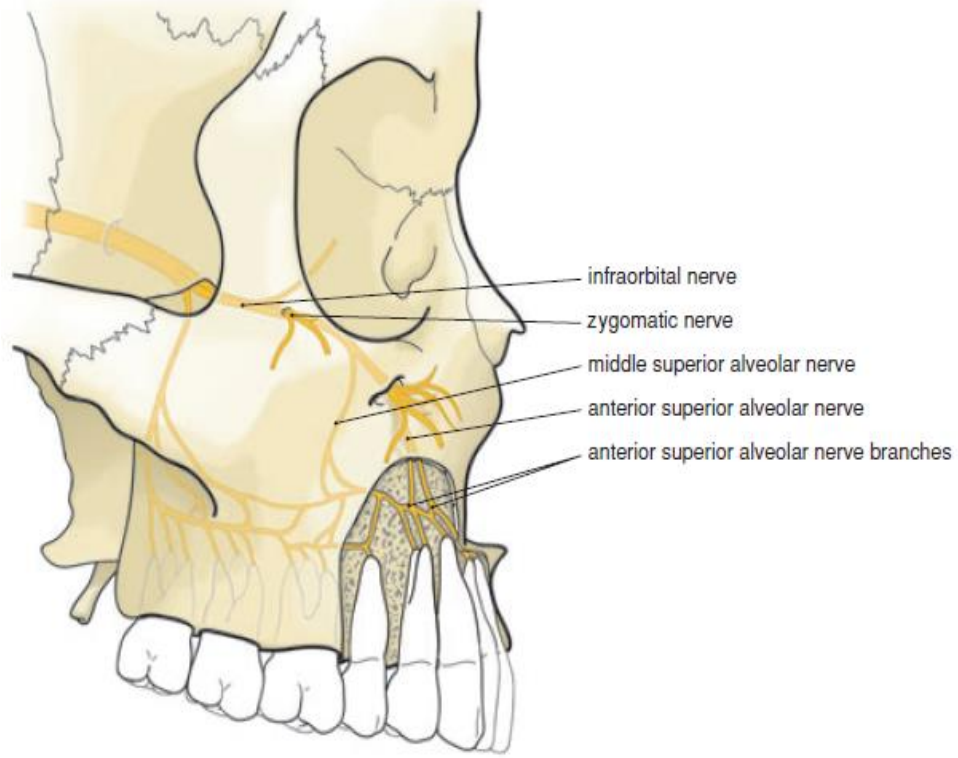
They anastomose with small branches of the other vestibular side .

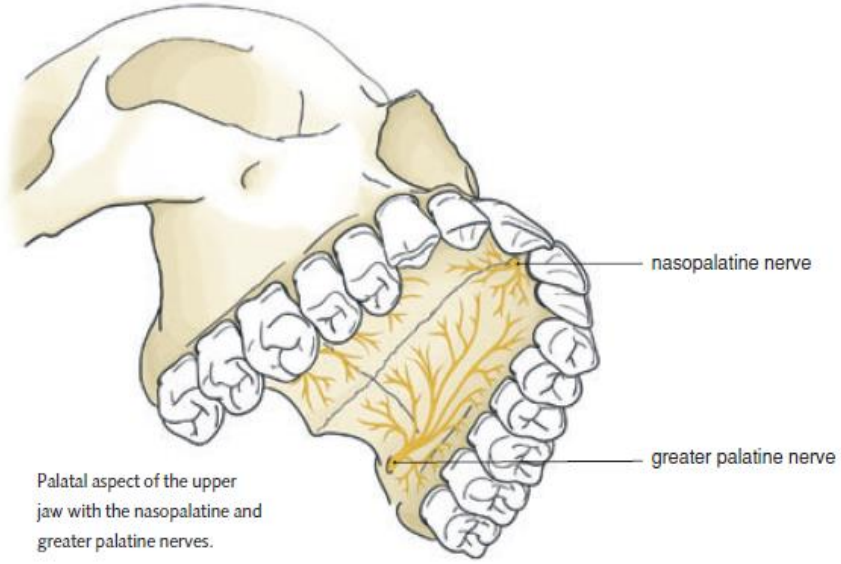
The nasopalatine nerve leaves the incisive foramen, and provides the sensory innervation of the palatine bone, periosteum and mucosa

Because of the relatively **thin** and **porous nature of the maxilla's cortical bone**, an **extraperiosteal (infiltration) anaesthetic can spread easily within the maxillary bone**.

The apices of the root of the central incisor and canine are found on the buccal side of the bone, **whilst the apex of the lateral incisor is found on the palatinal side**. This must be taken into consideration when infiltration anaesthetics are given, especially when used for an **apicoectomy**.

The anterior superior alveolar branches run from high lateral to low medial. For this reason, infiltration anaesthetics may best be applied laterally, just above the apex

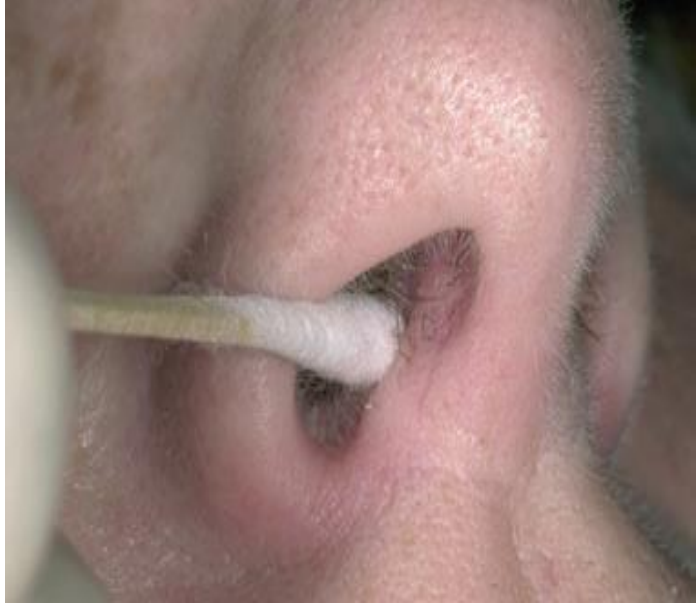




Palatal aspect of the upper jaw with the nasopalatine and greater palatine nerves.

Indication:

For **cavity preparations** in the upper frontal teeth, buccal or labial infiltration anaesthesia is usually sufficient. T
he same applies to **endodontic treatments**. In cases where a **cofferdam** is used, or **wedges**,supplementary palatine anaesthesia is sometimes required.
For crown preparations, it is sensible to use **buccal and palatine infiltration anaesthesia**.
For surgical procedures in the upper frontal teeth area, such as **periodontal surgery**, **implants**, **extractions** and **apicoectomies**, it is advisable to anaesthetise a larger area using **regional block anaesthesiawith** supplementary **infiltration anaesthesia**.
Because regional block anaesthesia is **highly effective in this area**, it can be directly followed by infiltration anaesthesia.
The infraorbital and **nasopalatine nerves** can be **reached** via the **infraorbital foramen** and the **nasopalatine canal**.
Infiltration anaesthesia is given in the buccal area and, if necessary, in the **interdental (palatine) papillae**. Nevertheless, there are exceptions where **good anaesthesia** is not achieved.
The intraossal branches of the **nasopalatine nerve are responsible for this**. These smaller branches can be anaesthetised by an **injection or the application of a cotton bud with**
anaesthetic ointment in the respective nostril



A cotton bud, soaked with a topical anaesthetic, in the nose of a patient in order to numb the intraossal branches of the nasopalatine nerve.

Technique:

Buccal infiltration anaesthesia of the upper frontal teeth is performed by lifting the lip with the free hand, gently pinching the lip and then piercing the mucosa of the buccal fold with the needle, just above the apex of the respective tooth. The syringe is thereby held parallel to the longitudinal axis of the tooth. The needle is inserted no more than 3–5 mm. Any contact of the needle point with the periosteum or the bone must be avoided, and the fluid must be injected slowly.

Aspiration is recommended but **not really necessary**: there are no large blood vessels in this area

Palatine infiltration anaesthesia is applied in the palatal gingiva of the respective tooth.

This anaesthesia is particularly painful if the needle is moved up over the periosteum and when not injected extremely slowly.

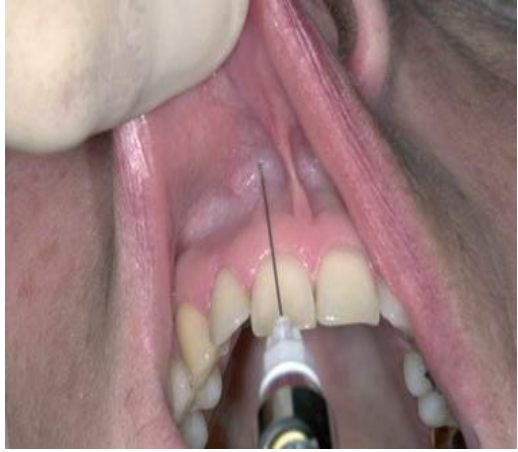
It is, therefore, sensible to insert the needle tangentially and not to move it up, or to resort to palatine conduction anaesthesia for the central and lateral incisors There is usually enough space for an anaesthetic around the canines at the transition between the vertical and horizontal sections of the palate.

Here the space for injection fluid is maximum **sub- and supraperiostally.**

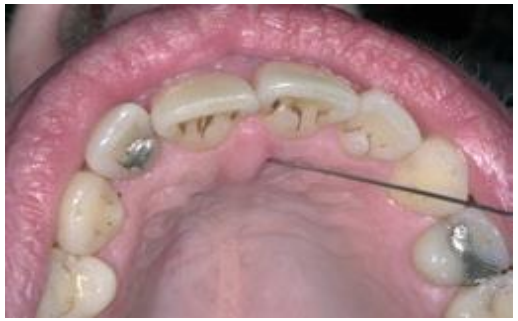
Here too it is necessary to inject extremely slowly.

The required amount of local anaesthetic is small, both for buccal and palatine anaesthesia.

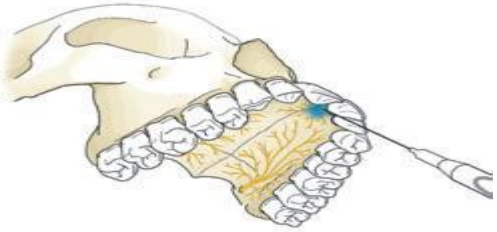
For buccal anaesthesia a quarter of a cartridge per tooth is sufficient, whereas a maximum of an eighth of a cartridge is needed for palatine anaesthesia.



Infiltration anaesthesia for the I1 superior right.



Drawing (**A**) and photo (**B**) of regional block anaesthesia of the nasopalatine nerve. The needle is inserted at an angle into the incisive papilla to avoid damaging the nerve and bleeding from the vessels in the nasopalatine canal.

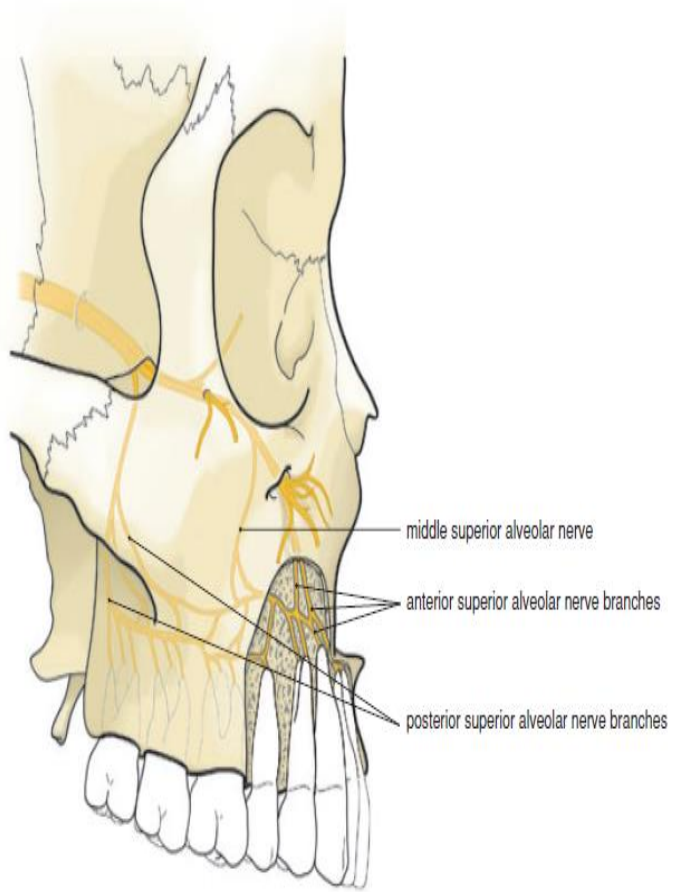


Sometimes it is necessary, in cases of **periodontal** or implant procedures, to inject anaesthetics into the interdental papillae, but this is painful for the patient.
The dentist
should, therefore, **wait until the vestibular and/or palatine infiltrationanaesthetic takes effec**t, before anaesthetising the interdental papillae.

Premolars:

Anatomical aspects

Sensory innervation of the **first and second premolars in the upper jaw** arises from the superior alveolar nerve, via the **middle and anterior superior alveolar branches**.
The middle superior alveolar branches run from high dorsal to low ventral, whereas the anterior superior alveolar branches come from the upper frontal area
Furthermore, because the lateral aspect of the upper jaw in this area is **concave**, the needle must be inserted a **fraction from out to in**, in order to **inject close to the periosteum**.



The facial artery runs near the first premolar, high in the buccal fold, so **aspiration prior to injection is indispensable**.

Innervation of the premolar area arises on the palatal side from branches of the **greater palatine nerve** and also from **smaller branches of the nasopalatine nerve that run dorsally**

Besides the branches of the **greater palatine nerve**, the greater palatine artery and vein also run along the palatinal side, at the transition from the vertical to the horizontal aspect. **An intravasal injection must be avoided by careful aspiration**.
Piercing the artery here also has the disadvantage of causing persistent bleeding from the needle hole. On the other hand, the injection must **not be too superficial**, since a high injective pressure is then required, which will result in a **lot of pain**, and **ischaemic necrosis of** the palatal mucosa may occur after treatment.

Indication:

Buccal infiltration anaesthesia is sufficient for cavity preparations and endodontic treatments. If the first premolar of the upper jaw (P1sup) has two **diverging roots**, additional **palatal anaesthesia may be needed**.

This supplementary **palatal anaesthesia** is also needed for crown preparations.
For surgical operations, such as periodontal surgery, implantology, extraction and apicoectomy, a larger anaesthetised area is required. For this reason, the anaesthetic is injected into the **vestibular area** at a point much higher than the apices, and in the **palatinal area the anaesthetic is injected near the apices at the point of transition from the horizontal to the vertical aspec**t.
Though palatine block anaesthesia is possible, it is discouraged as it requires two injections: one into the greater palatine foramen and another into the incisive papilla.

Technique:

In the upper jaw the transversal width of the alveolar process is narrowest in the area of the canines and rapidly increases in a dorsal direction. The apices of the roots of the first premolar lie, when they are bi-rooted and divergent, immediately below the buccal and palatal cortical bone, respectively.

The single-rooted second premolar has an apex that lies more centrally in the alveolar process. This must be kept in mind when a local anaesthetic is applied here.

The corner of the patient's mouth is lifted and the free hand should pinch the lip carefully, so that the needle's penetration into the buccal mucosa is hardly felt. With the point of the needle a small amount of anaesthetic fluid is deposited just above and dorsal to the apex

Aspiration for injection near the first premolar must be carried out in order to **avoid an intravasal injection**.

If the fluid is **injected intravasally** the patient will **feel a short**, sharp shot of pain in the face, and the **skin of the cheek** and **lower eyelid will pale immediately (*blanching*).**

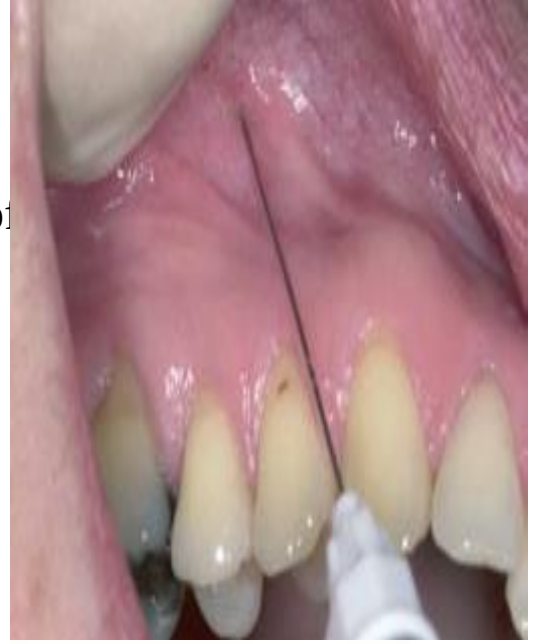
The needle must be **inserted from out to in**.

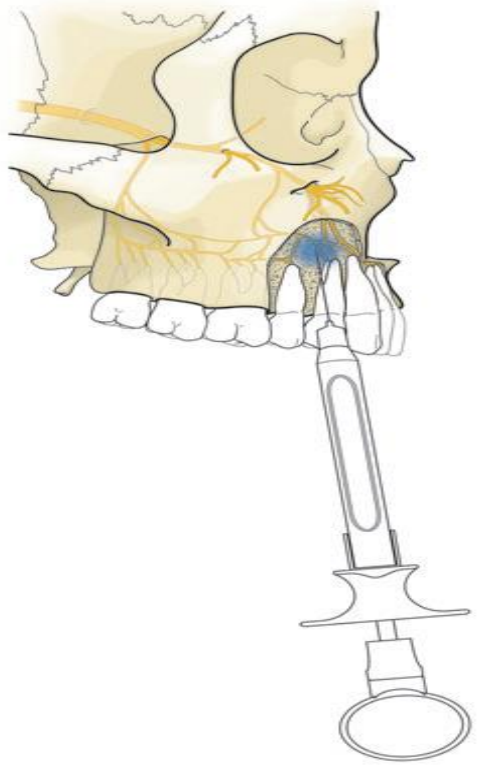
For restorative dental treatments the needle point **should be approx. 5 mm above the apex**.

For surgical procedures a more **cranial infiltration anaesthesia is required**.

On the palatal side, the needle is inserted counter-laterally and vertically at the transition of the horizontal to the vertical aspect of the palate

After aspiration, the fluid is **injected extremely slowly**. The amount of anaesthetic fluid used in the buccal area is approx. 1 ml and a maximum of 0.25 ml is used for the palatal side.





Molars:

Anatomical aspects

The posterior superior alveolar branches innervate the buccal side of the molar region of the upper jaw.

The source of these branches of the second trunk of the trigeminal nerve is high in the pterygopalatine fossa and they run along the maxillary tuberosity to the low ventral area.

The zygomatic buttress is found in the buccal area above the apices of the M1. The point of attachment can vary, however, so that an impermeable cortical layer of bone may sometimes be found lateral to the buccal roots of M1, depending on the length of the vestibulary radices and the crest's point of attachment.

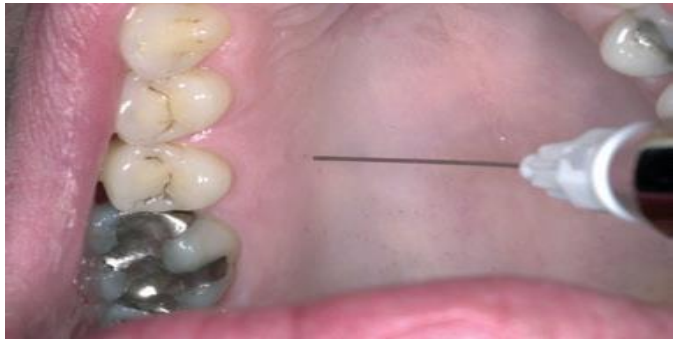
The position of the roots of the M2 and the erupted M3sup is more or less central in the bone, depending on the level of convergence. The transversal width of the alveolar process in the molar region is considerable, so that more anaesthetic fluid is needed for adequate numbing.

The pterygoid venous plexus is found laterally high to the maxillary tuberosity.

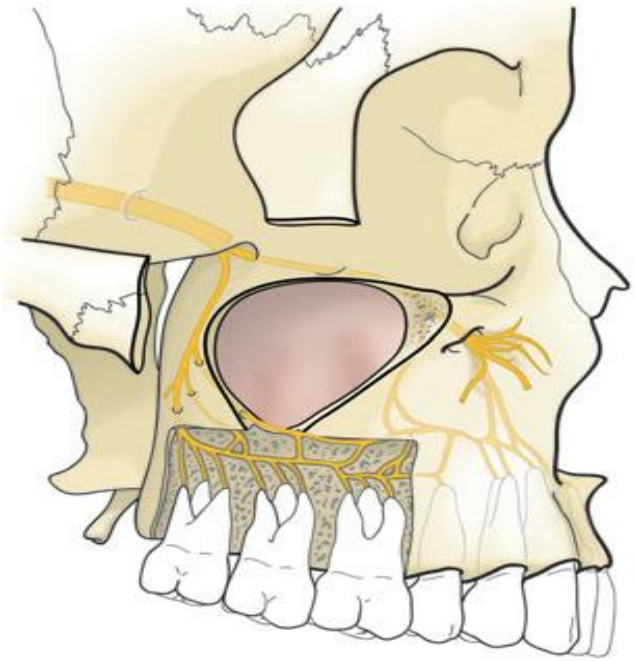
Indication:

For cavity preparations in the M1sup both buccal and palatal infiltration anaesthesia is required. For the second and third molar in the upper jaw, vestibulary anaesthesia will suffice for these indications. The same applies with regard to endodontal treatment of this area. If the M1sup happens to have long buccal roots and/or a low-positioned zygomatic buttress, the infiltration anaesthesia must be applied behind the crest, i.e. higher and more dorsal.

For operative treatments such as **periodontal surgery**, **implantology**,**extraction** or **apicoectomy** (of the buccal roots), **regional block anaesthesia** is commonly used high above the maxillary tuberosity and at the position of the greater palatine foramen, supplemented with some buccal infiltration anaesthesia.



Palatine infiltration anaesthesia of the P1 and P2 superior right. The needle is inserted from the left into the transitional area of the horizontal to vertical sections of the palate



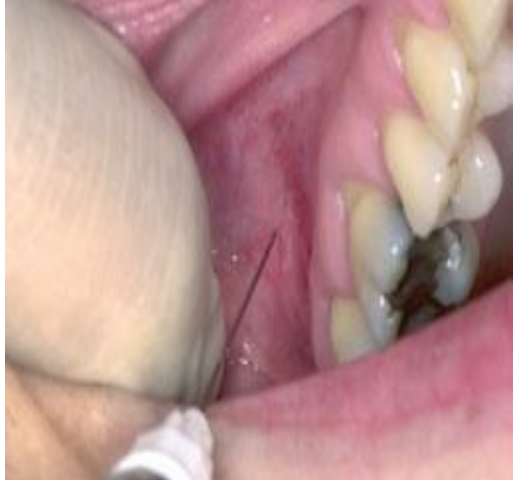
The course of the superior alveolar nerve and the posterior superior alveolar branches.

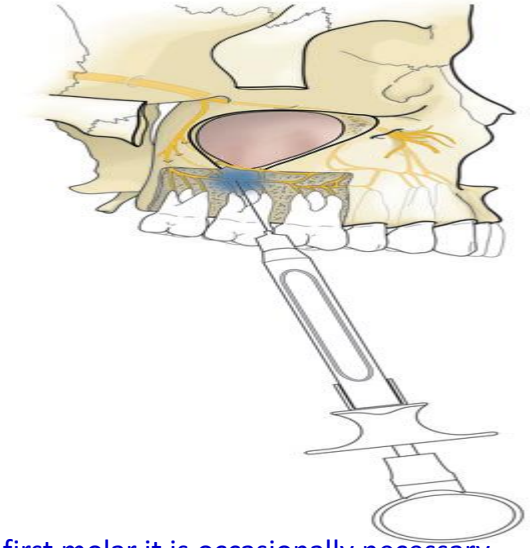
The method of high tuberosity anaesthesia is described in Section
Regional block anaesthesia of the major palatine nerve is administered vertically from the counter-lateral corner of the mouth.
The needle must not be inserted too deeply in the direction of the foramen in order to avoid damage to the nerve or piercing the artery. **Aspiration prior** to the actual injection is prescribed.
The amount of anaesthetic fluid for buccal infiltration anaesthesia should be approx. 1–1.5 ml. For palatine infiltration or block anaesthesia, no more than 0.25 ml is required.

Patients that are given an infiltration anaesthetic in the molar region of the upper jaw can have the impression that the anaesthetic has not worked. They compare the feeling they observe with the sensation that they know from an infiltration anaesthetic in the premolar region or the front teeth or from mandibular regional block anaesthesia. It is therefore wise to explain to patients this difference in sensation.

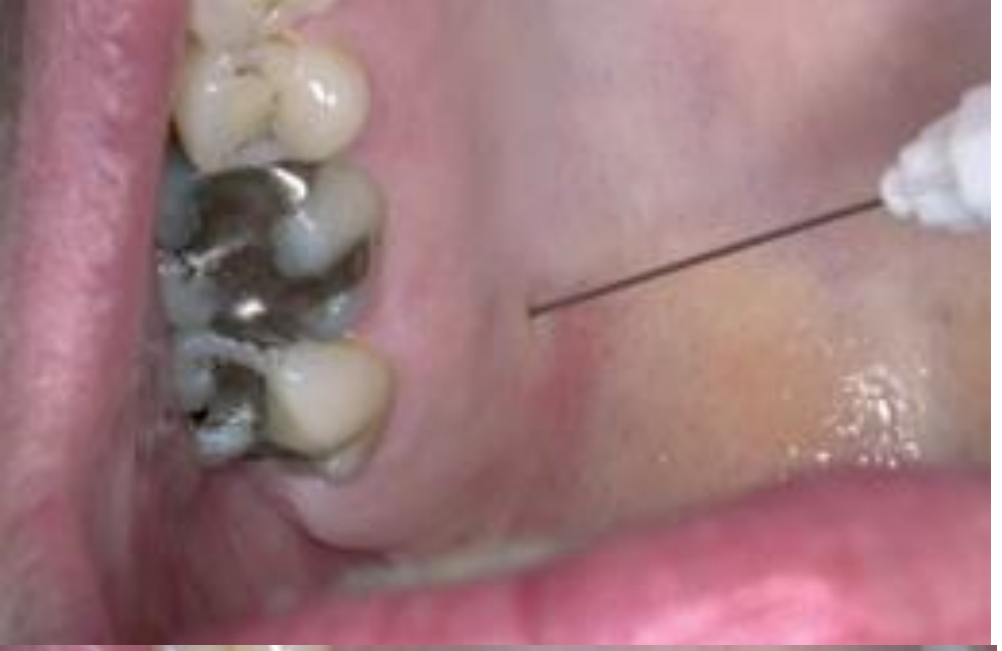
Technique

Infiltration anaesthesia on the buccal side of the upper molars is applied,at an angle from the front. The jaw here is flat to convex.
The zygomatic buttress sticks outwards and is found **near the first molar**. The point of the needle should be inserted right above and **dorsal to the apices**

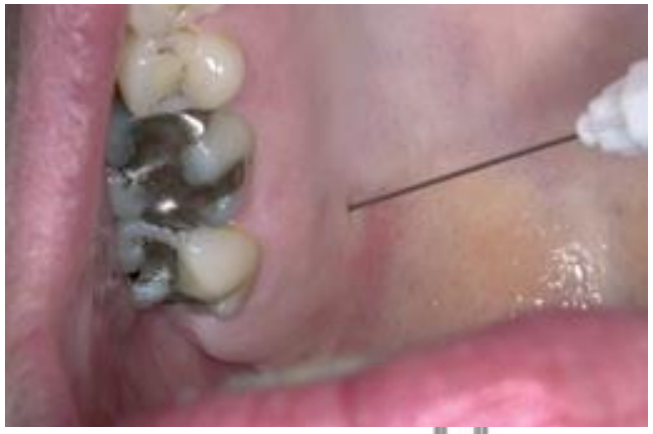


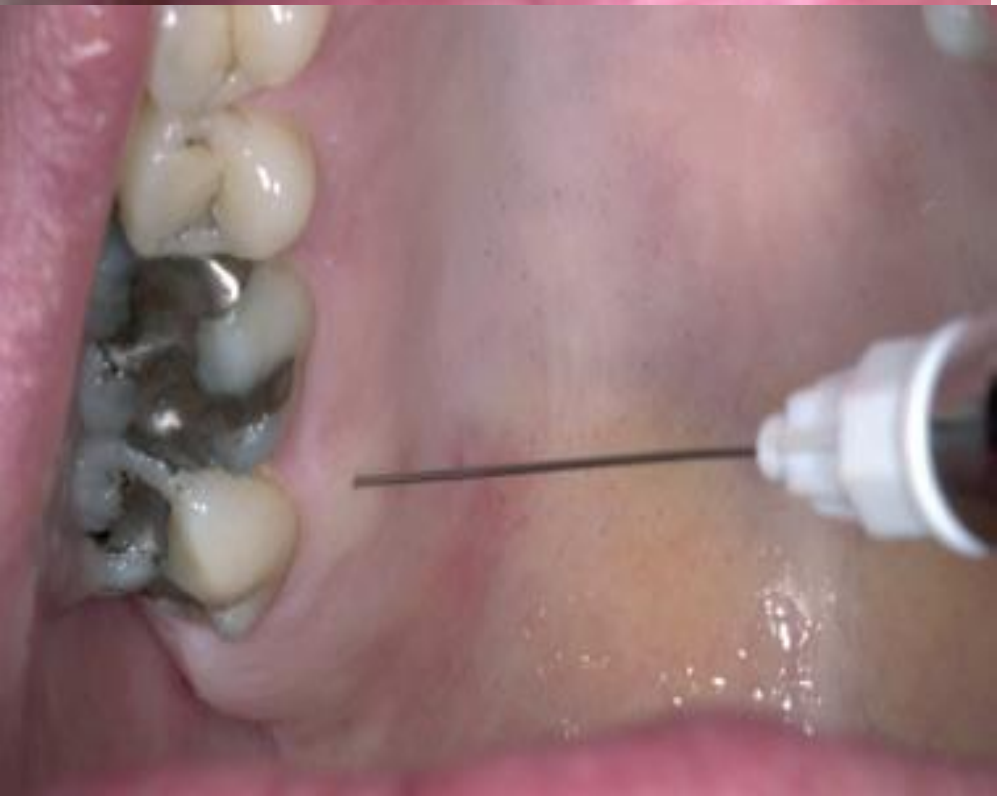


For the first molar it is occasionally necessary to inject
behind the crest and slightly higher, due to the inaccessibility
of the buccal roots through the thick cortical bone. For the palatal side,
infiltration anaesthesia of the major palatine nerve at the first molar, and
regional block anaesthesia for the second and third molar, are sufficient

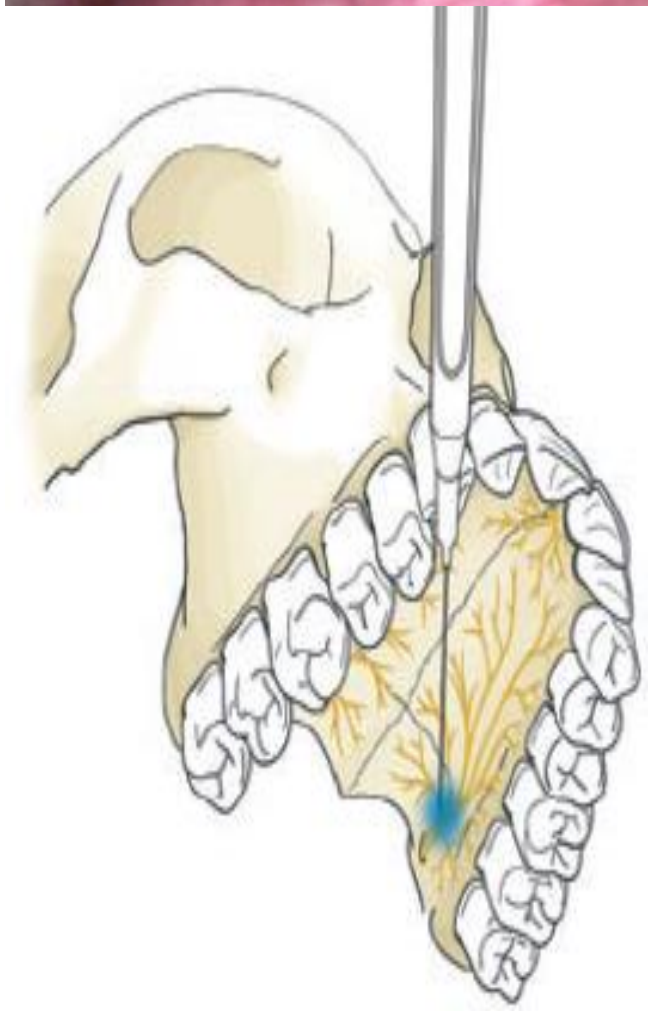


Drawing (**A**) and photo (**B**) of the palatal regional block anaesthesia of the greater palatine nerve. Careful aspiration prior to injection is required!





For an extraction of the second and erupted third molar, an injection of 0.25 ml fluid next to the gingival fold on the palatal,

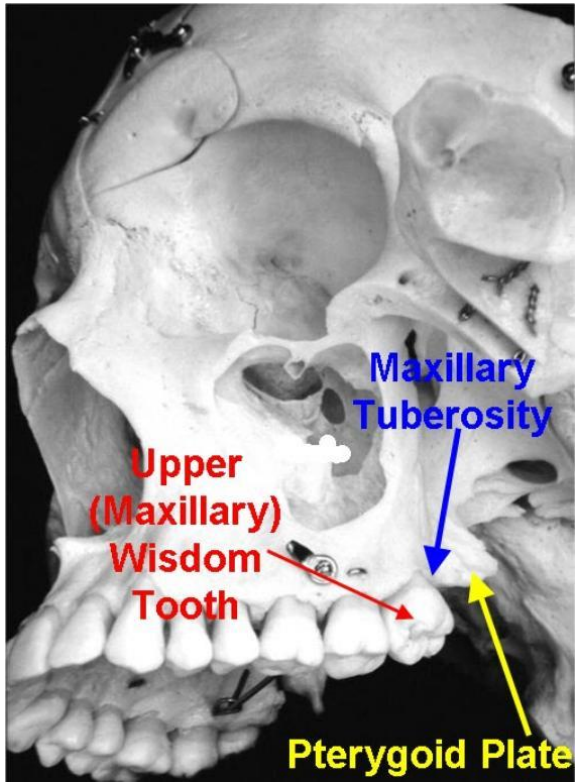


Palatal infiltration anaesthesia of the gingiva on the level of the M2 superior right

The impacted third molar of the upper jaw

Anatomical aspects:

The impacted third molar of the upper jaw (M3sup) is usually found completely **in the maxillary tuberosity** with a slight **distovestibular inclination**.
Here, the buccal cortical bone is very thin. Slightly higher and in a more lateral position is the pterygoid venous plexus.
The branches of the second trunk of the trigeminal nerve, and the maxillary artery and vein, run **behind the tuberosity** and **higher in the pterygopalatine fossa**.
On the **palatine side** of the impacted M3sup are the greater palatine foramen and the lesser palatine foramina, from which the palatine nerves branch off that innervate the palatine gingiva and the soft palate. The greater palatine arteries and vein also come from the greater palatine foramen.
Therefore, the area **lateral**, **dorsal** and **medial** to the impacted M3sup is richly **innervate**d and **vascularised**. **Here surgery outside of the periosteum is risky**.

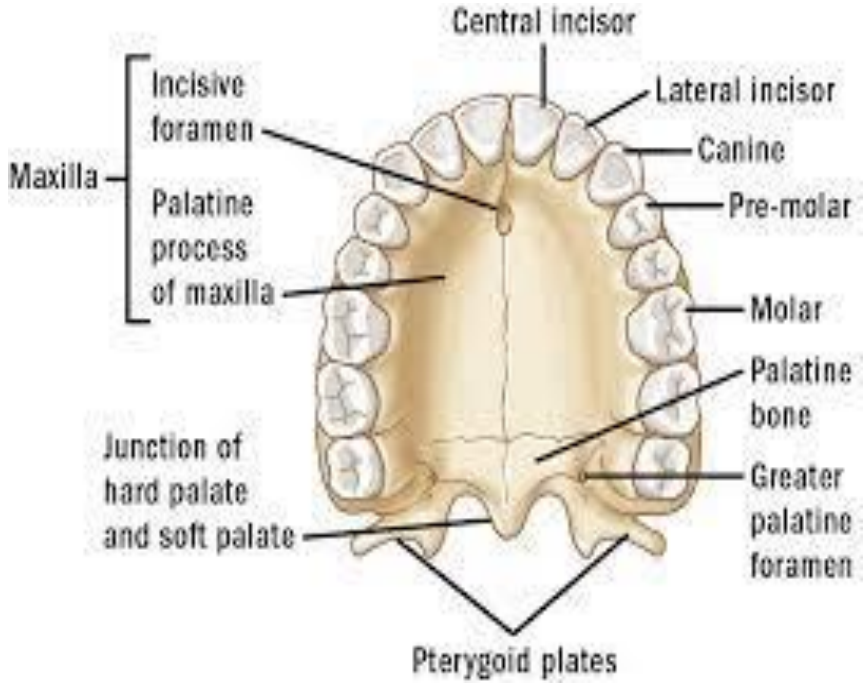


Indication:

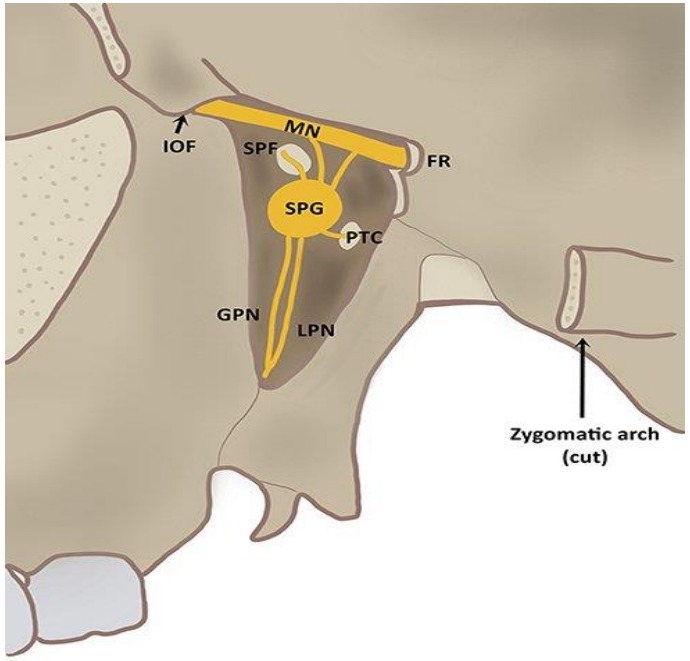
In dental practice, local anaesthesia will only be used in this area for the removal of an impacted M3sup or for harvesting bone for pre-implant treatment elsewhere in the mouth.

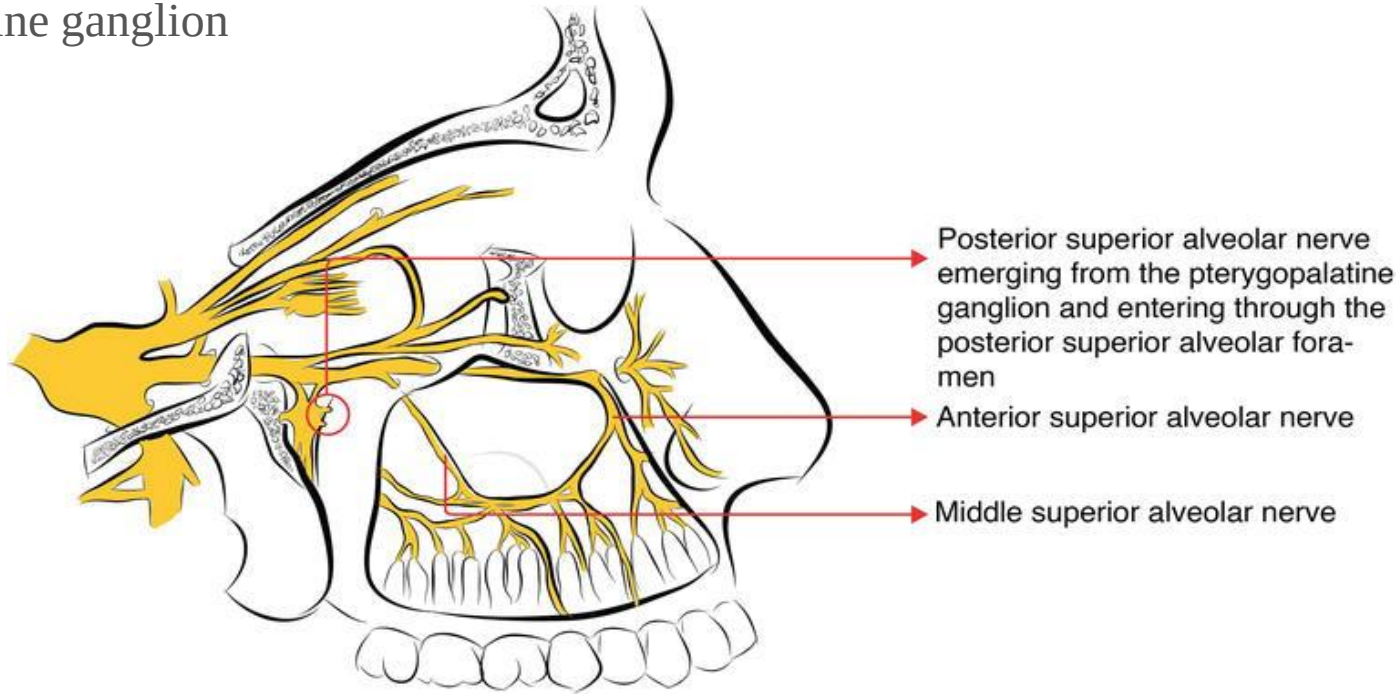
Technique:

Anaesthesia of the entire greater palatine nerve and, if necessary, of the lesser palatine nerves is performed with regional block anaesthesia.
The needle is brought forwards from the counter-lateral corner of the mouth in the direction of the **greater and lesser palatine foramens**.
Touching the nerve or piercing the artery must be avoided.
For this **reason aspiration** is necessary. Approximately 0.25 ml anaesthetic fluid is Sufficient in this area .



Schematic illustration of the pterygopalatine fossa.
Abbreviations: FR, **foramen rotundum**; GPN, **greater palatine nerve**; IOF, **inferior orbital fissure**; LPN, **lesser palatine nerve**; MN, **maxillary nerve**; PTC, **pterygoid canal**; SPF, **sphenopalatine foramen**; SPG, sphenopalatine ganglion





Maxillary nerve block

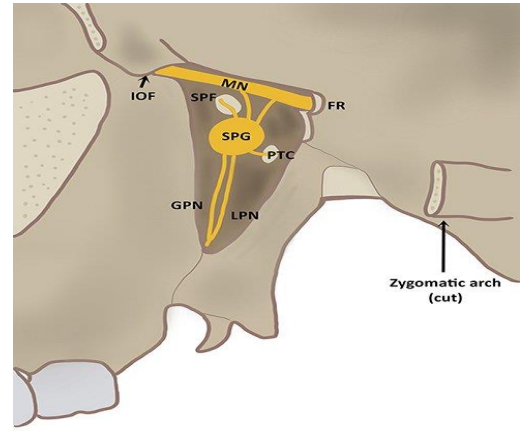
Blockade of the maxillary nerve **induces anaesthesia of half of the maxilla**, which enables **surgical treatment in the upper jaw** and **maxillary sinus under local anaesthesia.** This regional block can also be used to counteract pain in cases of **inexplicable pain complaints**. A maxillary nerve block can be achieved **via high tuberosity anaesthesia** or via the **greater palatine foramen**. A local anaesthetic with vasoconstrictor is **used**, applied with anaspirating syringe and a **25-gauge needle (bent at approximately 45 degrees).**

High tuberosity anaesthesia

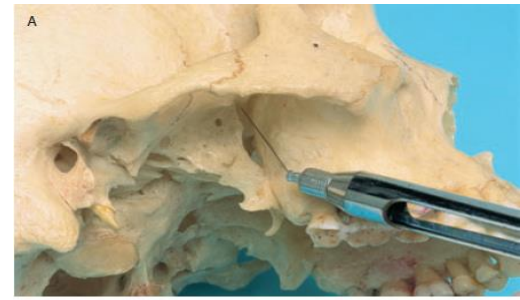
The maxillary nerve leaves the skull through the **foramen rotundum**.The nerve runs through the **pterygopalatine fossa** and then **on through the orbit as the infraorbital nerve**. The infraorbital nerve runs through a canal at the bottom of the orbit and leaves the canal again through the infraorbital foramen.

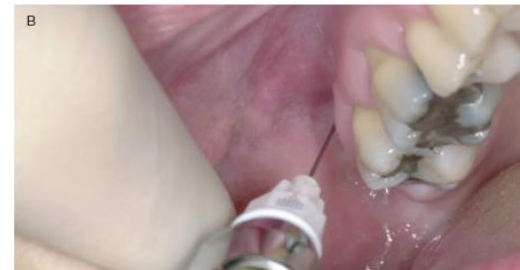
The pterygopalatine fossa is accessible from the mouth. This fossa can be reached with a **35-mm-long 25-gauge needle** if the needle is bent to **approximately 45 degrees**. This bent needle must **pass the mucosa behind the zygomaticoalveolar crest**, about 1 cm from the **alveolar proc**ess, and then be **directed dorso-medially .**

After aspiration, about one cartridge may be injected. **Two to three minutes later, half of the upper jaw** will be anaesthetised. In some cases the infraorbital nerve is insufficiently numbed by this technique. Furthermore, there is a chance of injecting intothe pterygoid plexus, so that there is a risk of intravasal injection and developing a haematoma.



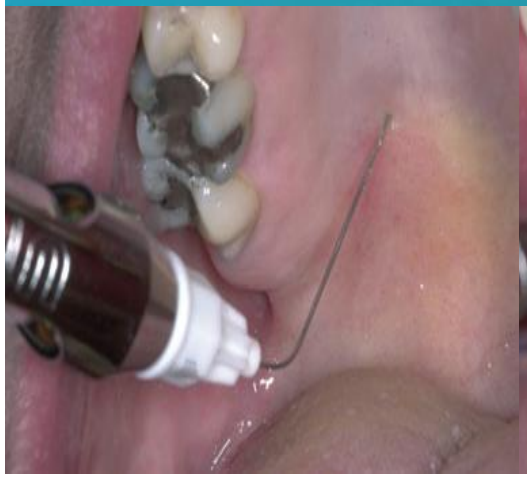
Photos of skull (**A**) and patient (**B**) show a high tuberosity anaesthesia. The (bent) needle is inserted from out to in, high in the pterygopalatine fossa, just by the split of the maxillary nerve into the infraorbital and superior alveolar nerves. The injection is given after aspiration.

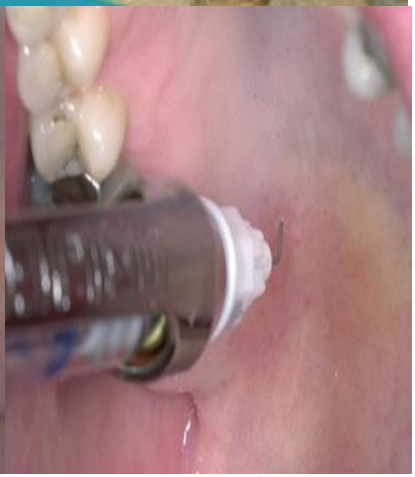




Greater palatine foramen block

A greater palatine foramen block is used less frequently than high **tuberosity anaesthesia**, but can be easily carried **out intraorally**. The greater palatine foramen lies approximately **1 cm palatinally to the M2–M3.** region and **approximately 0.5 cm in front of the pterygoid hamulus. The** direction of the canal is 45 degrees to dorsal in relation to the occlusion plane. The bent needle is carefully inserted into the foramen, and by inserting the needle slowly, the entire length of the needle can be used. **After aspiration**, a half to one cartridge may be injected.
Within 2–3 minutes, **half of the maxilla will be anaesthetised.**
It is not always easy to find the **entrance to the foramen**. Moreover, inserting the needle roughly can lead to **long-term damage of the nerve**.
Finally, if the patient has a small maxilla, the anaesthetic fluid may reach the **parasympathetic sphenopalatine ganglion** so that unintended side effects may occur, such as **diplopia (double vision)**





Infraorbital nerve block

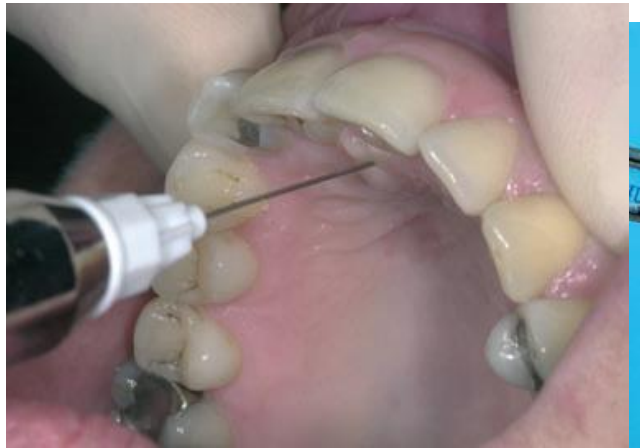
The infraorbital nerve runs almost horizontally through the canal in the orbital floor until it leaves through the infraorbital foramen, approximately 5–10 mm caudally to the infraorbital rim. The nerve supplies sensibility to the nostril, cheek, lower eyelid, upper lip, gingiva and upper frontal teeth. An infraorbital nerve block is suitable for the dental treatment and surgery of frontal teeth.

Nasopalatine nerve block

The nasopalatine nerve, which runs over the floor of the nose through the incisor canal to the incisive papilla, provides sensibility to the anterior third of the palate. Anaesthesia of this nerve is appropriate for crown preparations in the entire upper front and for surgical treatment, such as ligating or removing an impacted canine, periodontal surgery and implantology.

An anaesthetic with a vasoconstrictor is administered with a regular cartridge syringe with a 25-gauge needle at least 20 mm long. With the mouth open, the needle point is placed right on the incisive papilla. The needle is introduced slowly, parallel to the direction of the buccal cortical bone contour .This is almost vertical in some patients; for others it is inclined dorsally. **The direction is important to avoid the needle getting stuck in the canal or having to be reinserted because it can no longer follow the canal. After approximately 1 cm a quarter cartridge is injected very slowly**

This injection technique is painful, even in expert hands. With explanation, precision and expertise, however, this anaesthesia can be used very successfully with children, e.g. for ligating an impacted canine or removing a mesiodens. **If the nerve is damaged, an anaesthetised area may arise at the anterior of the palate durum and last for 3–4 months**



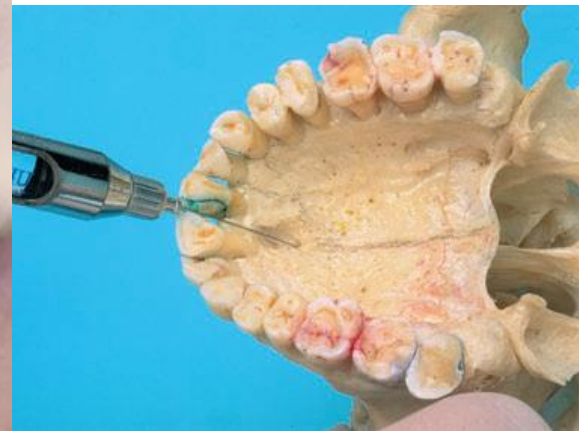


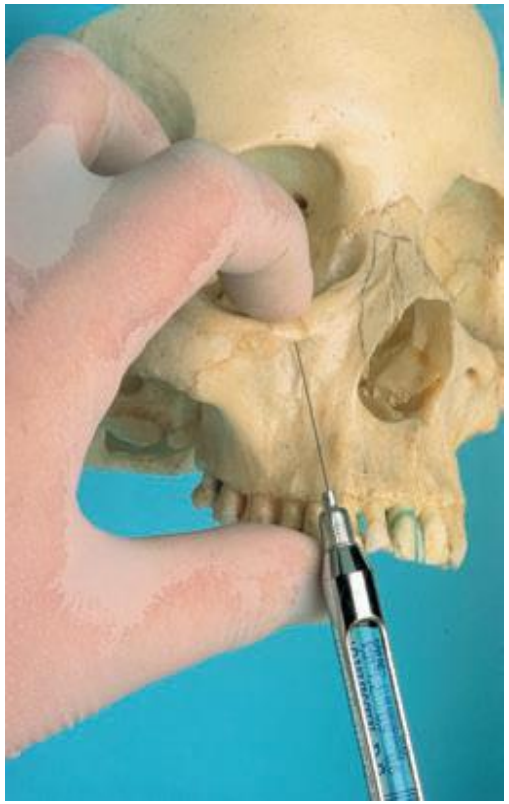
Photo of skull (**A**) and photo of patient (**B**) show block anaesthesia of the nasopalatine nerve. The needle is inserted upright into the incisive papilla and introduced carefully for approx. 1 cm into the nasopalatine canal. This runs parallel to the axis direction of the central incisor. The injection is given after aspiration.

A vasoconstrictor containing anaesthetic is used for this block, applied with a customary cartridge syringe with a 25-gauge needle of 25–35 mm. There are two intraoral methods for **blocking the infraorbital nerve**. The first involves the needle being positioned approximately 0.5 cm laterally from P2sup, whilst the other method involves the needle being inserted approximately 1 cm from the alveolar process of Csup. The lip is lifted with the thumb, and the index finger of the same hand feels the infraorbital rim extraorally. The needle is then moved in the direction of the finger. With the method in which the needle is inserted in the buccal sulcus at the level of the Csup, the needle is directed towards the pupil of the eye .With the 'P2sup method', the needle is inserted in the direction of the longitudinal axis of this tooth. After about 2 cm the needle will make contact with the bone at the level of the infraorbital foramen.

The unaltered position of the index finger prevents the needle from being fed in so far that it touches the eyelid or eyeball. **A depot of half a cartridge is enough.**

The method is simple, effective and safe. However, if a vein or small artery is damaged, a hematoma may occur directly under the eyelid, and touching the nerve with the needle leads to prolonged anesthesia and paraesthesia. bone contour .

This is almost vertical in some patients; for others it is inclined dorsally. The direction is important to avoid the needle getting stuck in the canal or having to be reinserted because it can no longer follow the canal. After approximately 1 cm a quarter cartridge is injected very slowly.



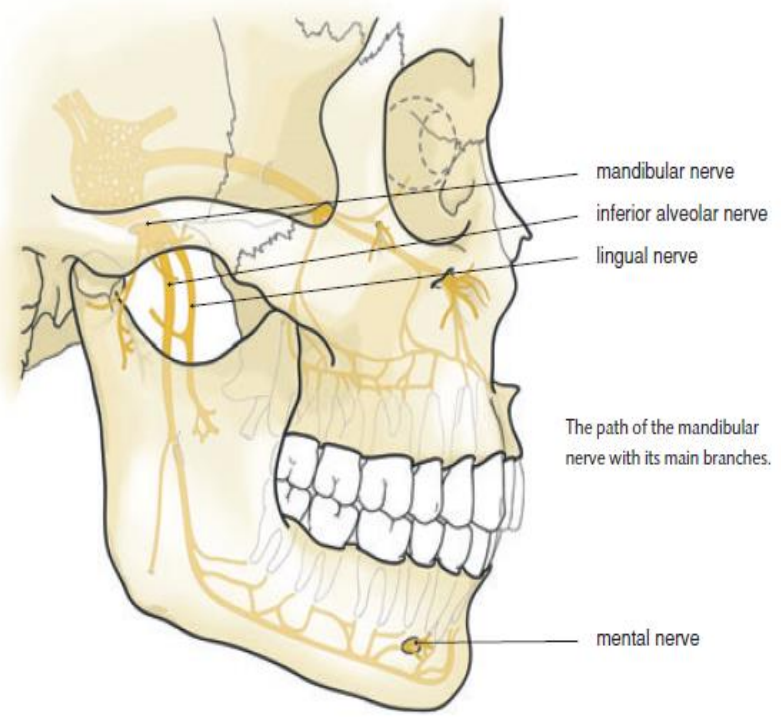
Local anaesthesia in the lower jaw

Introduction

The buccal cortical bone at the premolars and molars of the lower jaw impedes the diffusion of anaesthetic fluid to the apices of these teeth, located centrally in the jaw bone. Adults require mandibular block anaesthesia for an effective anaesthesia. In the area of the lower canines and incisors the cortical bone is thinner and the roots lie on the buccal side of the jaw. Here, infiltration anaesthesia is effective.

The mental nerve leaves the jaw through the mental foramen and innervates the buccal mucosa and gingiva, the lower lip and the skin of the chin. Therefore, anaesthetising the mental nerve will not anaesthetize the teeth in adults. However, in **children the molars are anaesthetised,because the apex of these through the thinner cortical bone.**

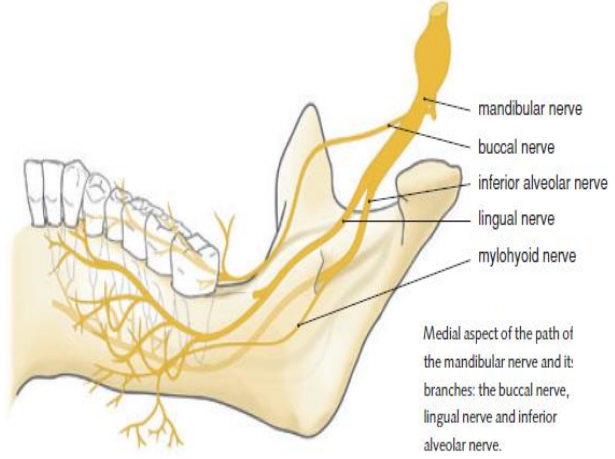
The lingual side of the mandible is innervated by the lingual nerve.
This nerve can be anaesthetised both by **block anaesthesia** as well as by **infiltration anaesthesia**.
The dentist must avoid pricking the floor of the mouth too often as this **increases the risk of a haematoma** in combination with **transport of bacteria via the injection needle.**
This may cause a **phlegmonous infection of the mouth floor**, a life-threatening complication.



The path of the mandibular nerve with its main branches.

Block anaesthesia of the buccal nerve is possible. This nerve runs from high lingual and crosses the front side of the mandibular ramus above the occlusion plane. Then the buccal nerve continues caudo-ventrally to innervate the buccal mucosa and gingiva in the area of the (erupted) M3inf to P2inf.
Because the height at which the buccal nerve crosses the mandibula varies, **infiltration anaesthesia applied buccal to the respective teeth** is also an **excellent technique to**

anaesthetise the gingiva and mucosa

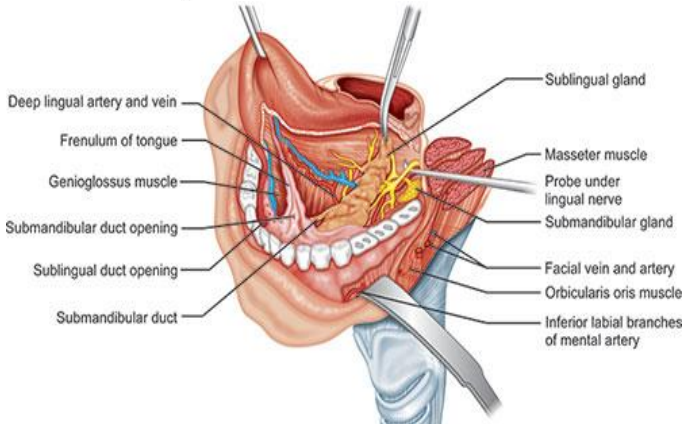


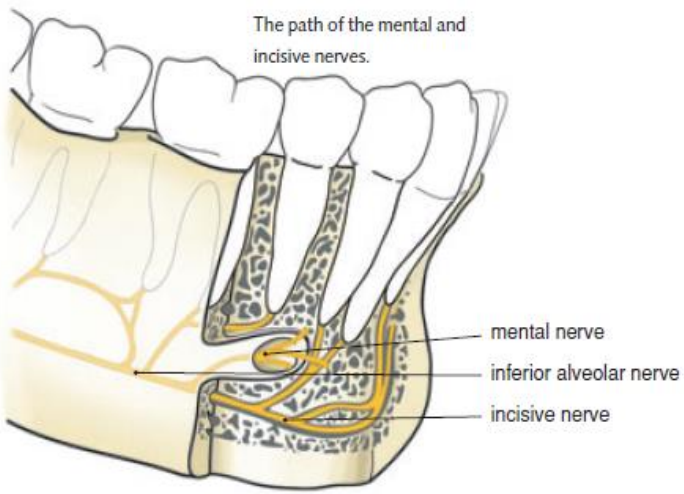
Medial aspect of the path of the mandibular nerve and its branches: the buccal nerve, lingual nerve and inferior alveolar nerve.

Incisors and canines:

Anatomical aspects

Once the alveolar nerve has separated from the trigeminal nerve, the nerve runs laterally and enters the mandibular foramen. The inferior alveolar nerve divides into a branch, the mental nerve, at the mental foramen and then continues as the incisive nerve. The incisive nerve no longer runs in a bony canal and divides into little branches leading to the roots of the lower canines and incisors (Figure 6.3). In the mandibular symphysis
area, sensory anastomoses from the contralateral side are present, both
lingually and buccally.
This must be taken into account, particularly with extensive surgical treatment in the lower frontal area.





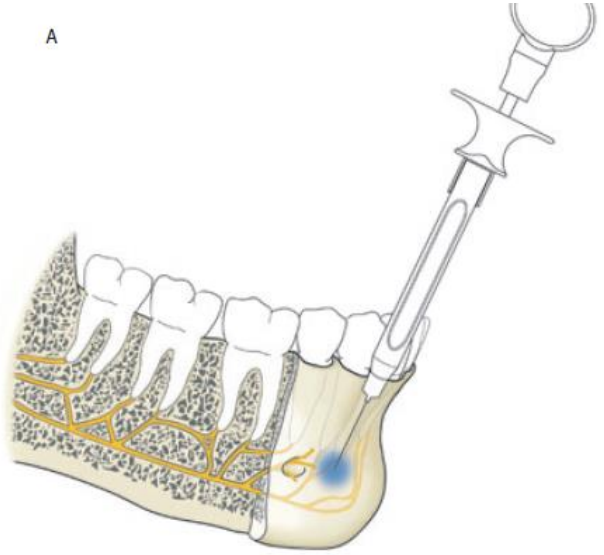
The roots of the lower incisors and canines are found against the buccal cortical bone. The mental muscle is attached to the jaw at the height of
the I2inf so that infiltration anaesthesia in this area can be painful and less effective

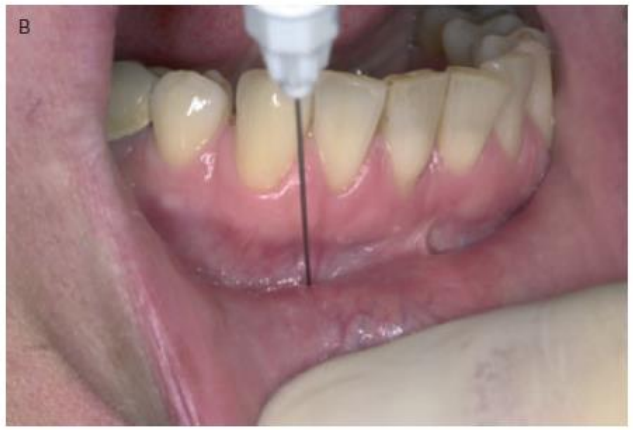
Indication

Buccal infiltration anaesthesia will be **sufficient for cavity preparations** and **endodontic treatment** in the lower frontal area, ***unless*** a **cofferdam** and/or **matrix band** and **wedges** are used.
In that case, it is necessary to **apply additional anaesthesia lingually**, or **perhaps in the interdental papilla on the lingual side**.

Infiltration anaesthesia is also used for **surgical treatment** in the lower frontal area, in which case the needle is inserted more caudally to the apex.
The dentist must take the sensory anastamoses into account by also anaesthetising the contralateral nerve branches.

The point of attachment of the mimic muscles, such as the orbicularis oris muscle and the mental muscle, also requires special attention during anaesthesia. Injecting into these muscles causes bleeding, is painful and does not lead to a good anaesthesia





A and B Drawing (**A**) and photo (**B**) of infiltration anaesthesia of the **I2 inferior ri**ght.
The buccal gingiva is also anaesthetised. In order to anaesthetise the lingual gingiva, it is necessary to inject into the floor of the mouth.

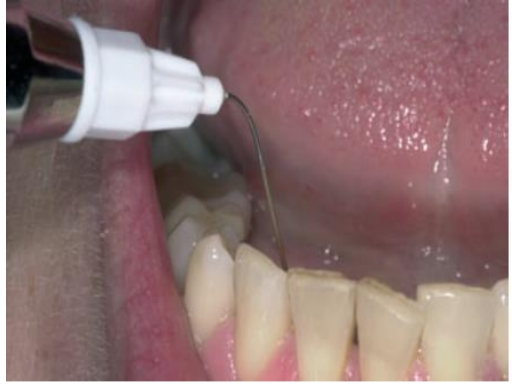
Technique:

For infiltration anaesthesia in the lower frontal area, the non-injecting hand pulls the lip forwards and pinches the lip softly at the moment the needle penetrates the mucosa. The needle is inserted right under the apex of the tooth that is to be anaesthetised, up to the bone. Preferably, the needle isinserted vertically and not pushed into the periosteum. The dentist sits or stands behind the patient in an **11–1 o'clock position**.

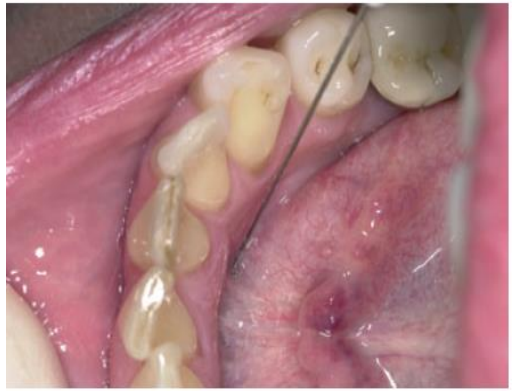
The same position is assumed for infiltration anaesthesia of the lingual mucosa and gingiva. When anaesthetising from an **8–9 o'clock position**, it is better to bend the needle **45–90** degrees for a lingual injection but a disadvantage of this is that the needle cannot be returned to its protective cap. With lingual anaesthesia it is important to prevent a haematoma occurring.

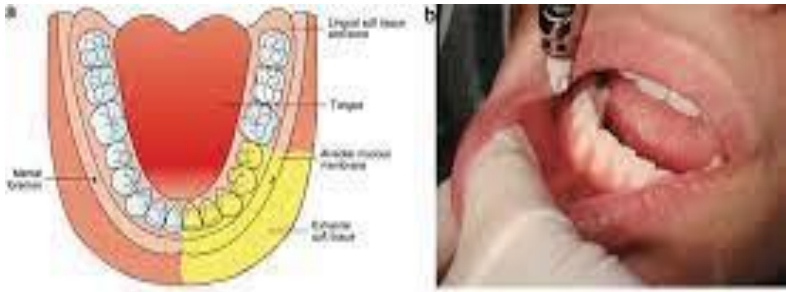
Bilateral mandibular block anaesthesia, with additional **local infiltration anaesthesia**, is recommended for surgical treatment of the **lower front**, such as **extensive pre-implantological treatments** (e.g. a chin bone transplant) and **implantological treatments** (two or four dental implants). This reduces the required number of injections to a minimum, as well as the chance of haematomas and infections. Furthermore, a maximum of 4–6 ml of anaesthetic fluid will be sufficient.

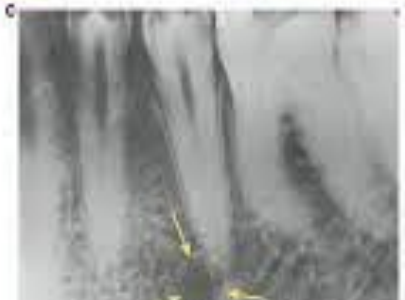
Lingual anaesthesia with a bent needle with the dentist in an 8 to 9 o'clock position.



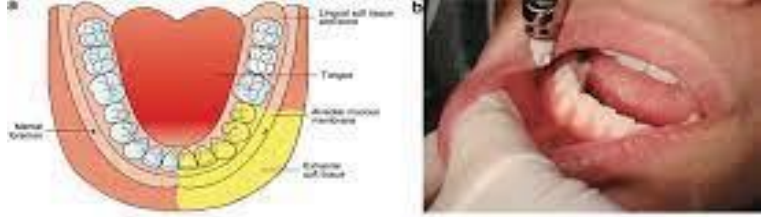
Lingual anaesthesia with a non-bent needle with the dentist in an 11 to 1 o'clock position.

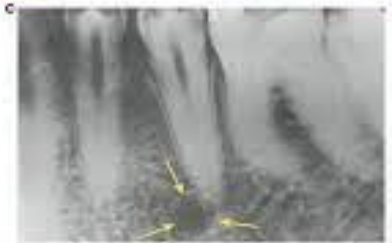






In this situation it is recommended that the dentist administers the double-sided mandibular block first and then waits until the patient spontaneously indicates that the lower lip and border of the tongue have started to tingle.
The dentist can then give a buccal infiltration anaesthesia.

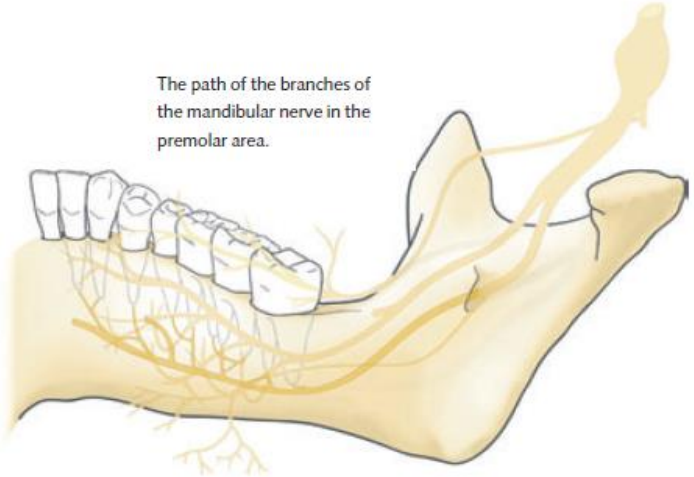




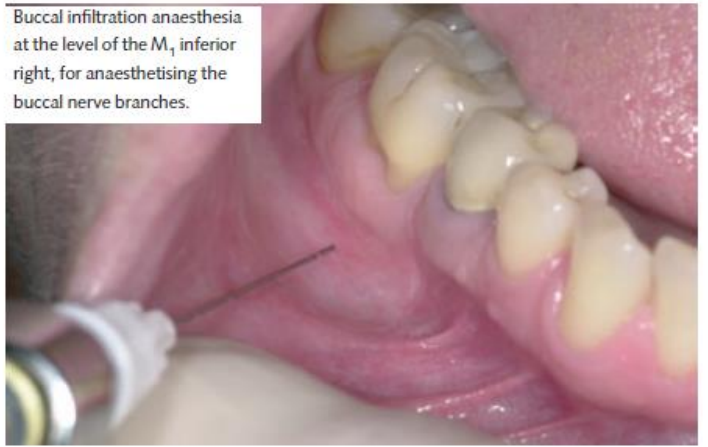
Premolars:

Anatomical aspects

Innervation of the premolars in the lower jaw takes place in the bone through the inferior alveolar nerve, buccal through the buccal nerve (at the P1inf also through the mental nerve) and lingually through the lingual nerve.



Because of the **thickness** and **impermeability of the buccal cortical bone**, infiltration anaesthesia is not really possible for the treatment of the (pulpa of) **premolars in adult patients.**
Use of block anaesthesia of the mandibular nerve, i.e. of the inferior alveolar and lingual nerves, is therefore a more obvious choice, if necessary supplemented with local infiltration anaesthesia of the branches of the buccal nerve
The mental nerve is found lower than the apices, exactly between the two premolars. Block anaesthesia of the mental nerve branches must be given superficially to avoid damage to the mental nerve, with subsequent long-term anaesthesia of the lower lip half.



If a combination of block anaesthesia of the **mandibular nerve** and **local infiltration is chosen**, then the mandibular block must, of course, be given first.
A supplementary infiltration anaesthetic is applied locally once the **patient spontaneously reports that the lower lip** half and edge of the **tongue have begun to tingle.**
When the inferior alveolar nerve appears to be anaesthetised after block anaesthesia of the mandibular nerve, but the lingual nerve does not, then **lingual infiltration anaesthesia at the level of the respective premolar will be sufficient**.
Generally, a repeated mandibular block injection should be avoided, because the partial anaesthesia that has already set in will limit the patient's ability to give a **warning if the lingual** or **inferior alveolar nerve is touched by the needle.**

Indication:

Mandibular block anaesthesia is used for cavity preparation and endodontic treatment, if necessary supplemented by buccal infiltration anaesthesia (Figure 6.6). It should also be used for extensive surgical treatments such as periodontal surgery, implantology, extraction and
apicoectomy, where the buccal infiltration anaesthesia is more extensive and more caudal. Extra attention to the path of the mental nerve is required here. **When giving additional anaesthesia, it is most undesirable** to damage this nerve by **pricking it accidentally.**

Technical aspects:

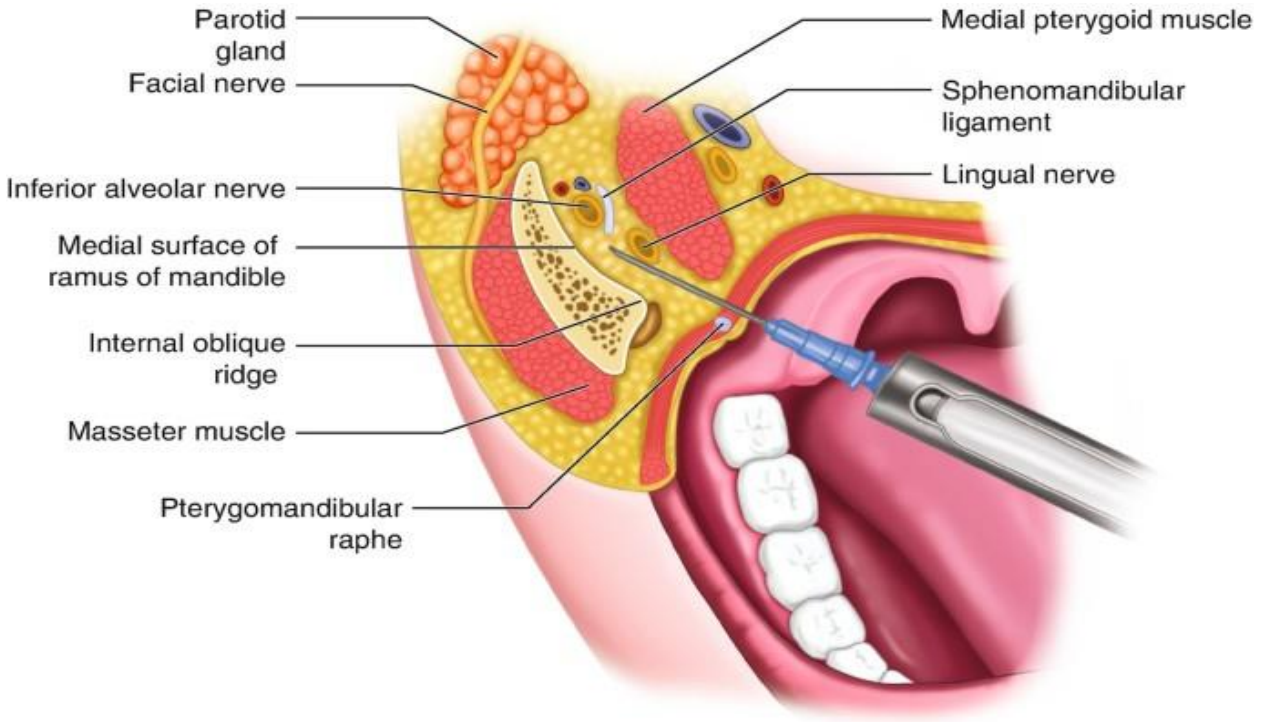
Only a single injection is required to anaesthetise the mandibular nerve, i.e. the inferior alveolar and lingual nerve. An aspirating cartridge syringe is used with a 25-gauge needle that is 35 mm long.
When anaesthetising the mandibular nerve, the point of the needle is placed in **the buccal infiltration anaesthesia at the level of the M1 inferior right**, for anaesthetising the buccal nerve branches.

Lingual aspect of an adult mandibula with the lingula exactly in the middle between the front and back sides.

Pterygomandibular space. :

This space is bordered ventrally by the mucosa of the pharyngeal arches.

This is where the **injection needle** is inserted in the **pterygomandibular space**.
This space is **bordered laterally by the ascending branch of the lower jaw** and **dorsally by the median part of the parotid gland** and the **skin**.
The attachment of the medial pterygoid muscle is found caudally and also borders the space median. The lateral pterygoid muscle borders the space cranially.

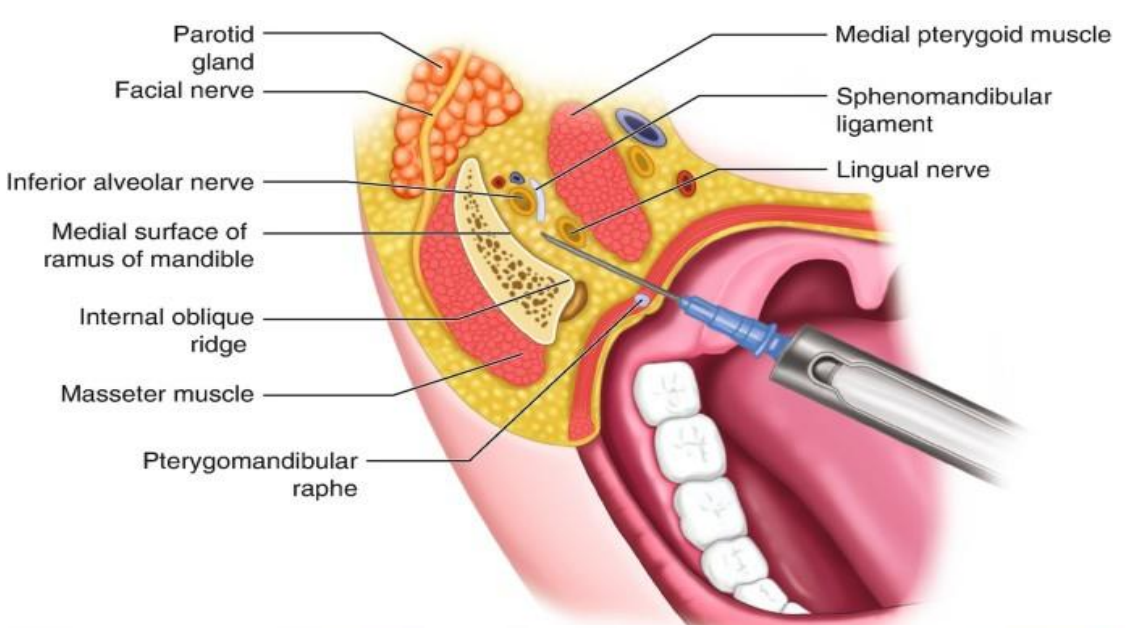


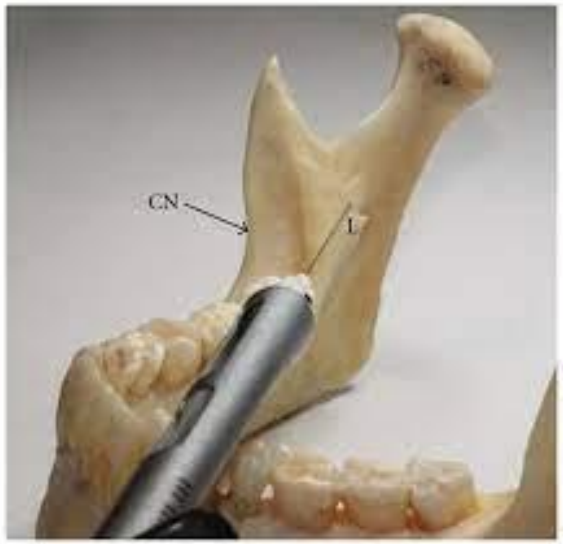
The mandibular nerve, **inferior alveolar nerve**, **lingual nerve**, **buccal nerve** and **branches of the arteries** and **maxillary veins run within the space**.
The space runs ventro-caudally into the submandibular space and caudo-cranially into the parapharyngeal and retropharyngeal spaces, which eventually lead to the mediastinum and pericardium.

The direct and indirect technique

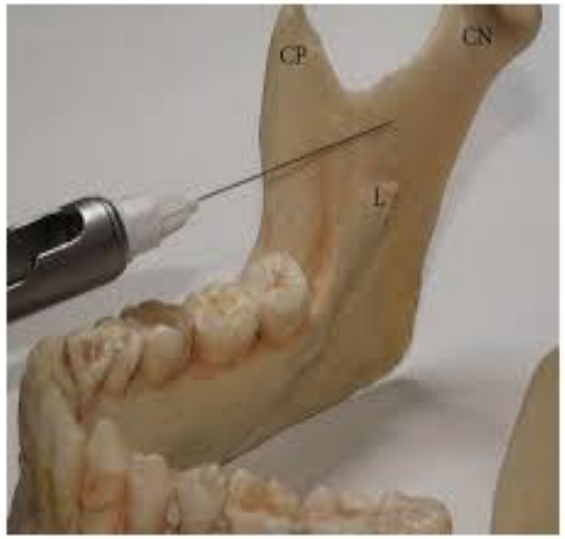
The inside of the mandibular ramus is more or less divergent dorsally. Therefore, various techniques can be used to anaesthetise the mandibular nerve ('**mandibular block**').
A distinction must be made between the **so-called direct** and **indirect technique.**

The direct technique is performed from the **homolateral side**. The risk of this is that the **anaesthetic fluid may be applied too far medially**. This has led to the indirect technique, which is performed from the **contralateral commissure**.
The danger of this is that the **medial pterygoid muscle** may be **damaged** or **anaesthetic fluid** may be injected into this muscle. **This would lead to postoperative trismus**, which may persist for days or weeks, or to a **haematoma**.





The indirect technique



The direct technique

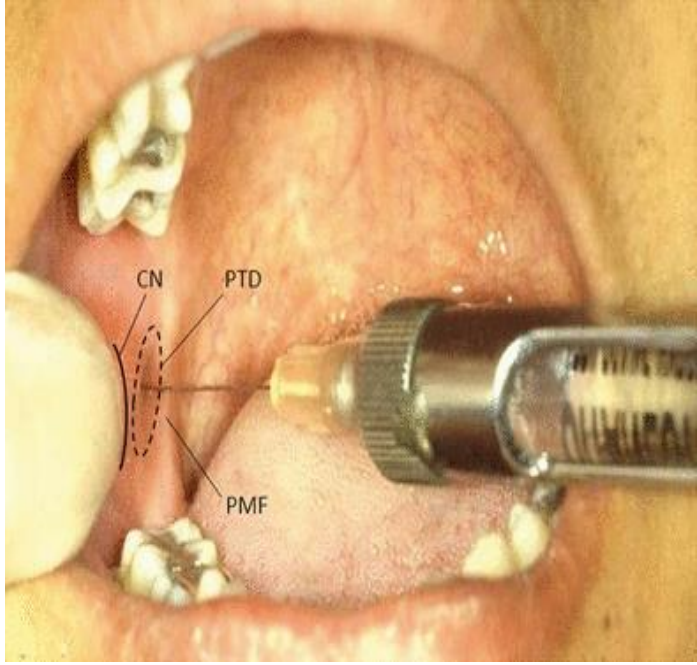
The direct technique

does not have these risks, but lacks the relative certainty of a truly effective anaesthesia. For administration of anaesthesia with either the direct or the indirect technique, a number of characteristic anatomical structures are of great importance. The following anatomical structures determine the place,

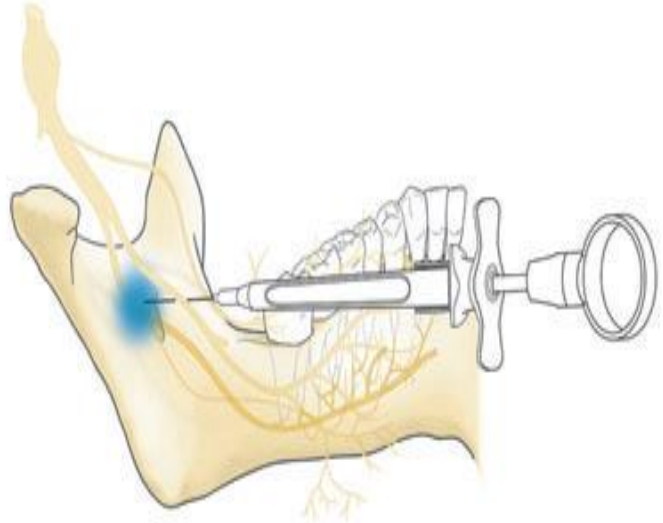
direction and penetration depth of the needle:

- ***The plane of occlusion.*** Anaesthesia is given parallel to the plane of occlusion, approx. one finger width above (1–1.5 cm).
- ***The deepest point of the front of the mandibular ramus*****.** If the noninjecting hand feels along the front of the ramus, the entrance of the mandibular canal appears to be on the same level as the deepest point.
- ***The triangle at the front of the pterygomandibular space*** that is formed by the cheek mucosa that runs into the throat and pterygomandibular plica running from the palate to the retromolar pad. The needle must be inserted in the middle of this triangle.
- ***The thumb of the non-injecting hand feels along the front of the ramus,*** while **three fingers of the same hand feel along the back of the ramus**.

Exactly halfway between the **thumb** and **fingers** is the ***mandibular foramen***, where the alveolar nerve enters the jaw. In adults the foramen is found exactly in between the front and back. **In children the foramen** lies about a **third in from the front**. This determines the depth of the needle's insertion.



Mandibular block anaesthesia. The drawing shows the position of the needle point in relation to the mandibular foramen.



With the *indirect* technique the anaesthesia is given from the contralateral commissure and the syringe is moved to the middle of the mouth opening while the needle is pushed in. With the *direct technique* the anaesthesia is given from the homolateral corner of the mouth and the syringe is moved to the middle of the mouth opening if necessary while the needle is inserted.

Whilst inserting the needle, the dentist must attempt to move the needle as close to the bone as possible without touching the periosteum unnecessarily.

It is also important to hold the tip of the needle in such a way that it does not get stuck in the periosteum.

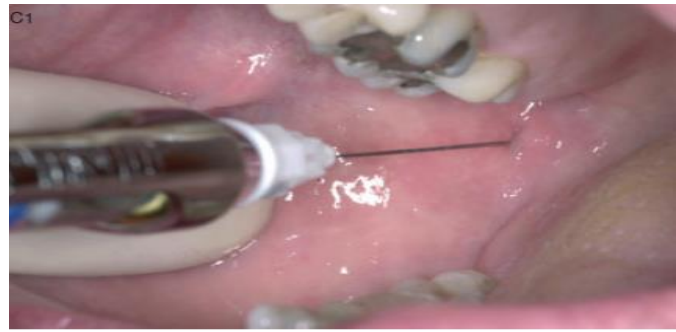
The thumb of the non-injecting hand seeks for the deepest point of the right ramus and the fingers feel along the back of it. **The needle is held parallel to the plane of occlusion, about one finger width above it.**

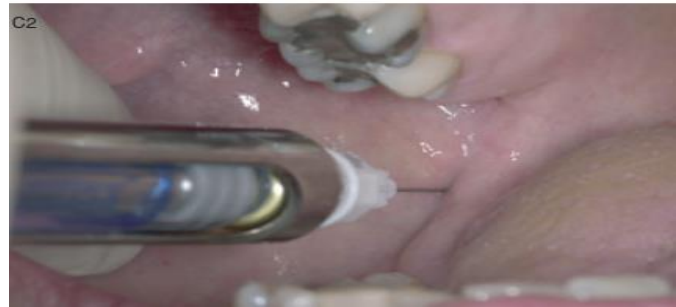
The needle point is then **inserted in the middle of the mucosa triangle until it makes contact with the bone**. Following this, the needle is carefully pushed up by moving the syringe to the middle of the oral cavity and holding it **parallel to the plane of occlusion.** The level of divergence inside the mandibular ramus **differs from person to person**.

When 1 cm of the needle still remains visible and the point is exactly in the middle between the front and back of the ramus, the dentist carefully aspirates. Approximately 1.5 ml of anaesthetic fluid is injected .

The needle is then pulled back about 1 cm and the dentist aspirates once again.

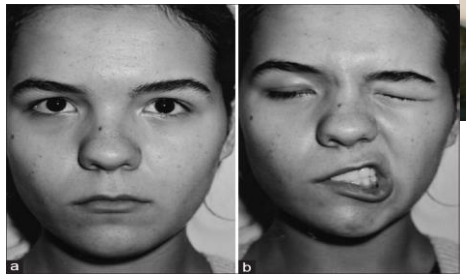
The technique of mandibular block anaesthesia from the left corner of the mouth (indirect technique). The needle is inserted to the bone, pulled back a millimetre and then the syringe is moved to the middle of the mouth and carefully pushed in so that about 1 cm of the needle remains visible. The injection is given after aspiration.





Failing of the lingula is the most common reason for an ineffective mandibular block. The point of the injection needle is then found to be too far medially, too low or too far dorsally. Other complications may also occur. **In approximately 15% of cases, blood is aspirated**. It is also possible for the **needle to touch the lingual nerve** or the **inferior alveolar nerve.**

In the case of **positive aspiration** or when a nerve has been touched, it is enough to pull the needle back a **few millimetres**. If the needle is in **too deep**, this can lead to local anaesthesia within the **capsule of the parotid** gland.

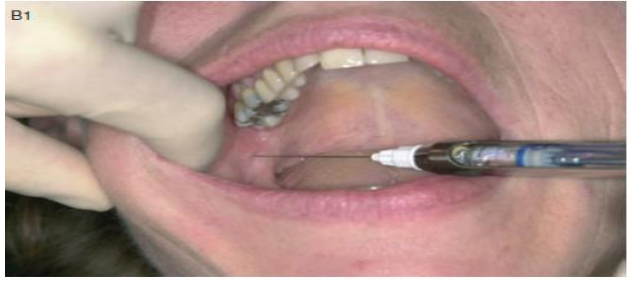


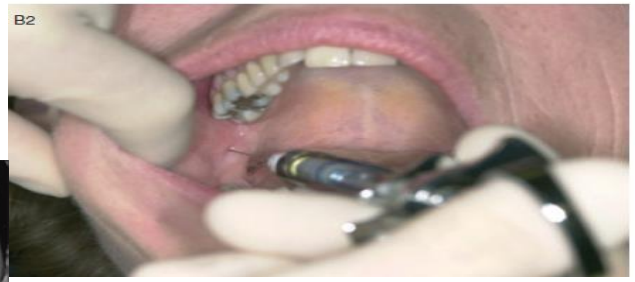
This may result in one-sided paralysis of the facial nerve, which fortunately lasts only a few hours.

When the **mandibular block** is not effective, **another injectio**n may be given. There is a chance that, during the **second injection**, the **patient will not notice a touching of the lingual nerve**, the **inferior alveolar nerve** or the **mandibular nerve** by the needle. The nerve may then be damaged without the patient or dentist noticing.

It is therefore advisable to **employ intraligamentous anaesthesia**, particularly if the **lingual nerve and the inferior alveolar nerve are not anaesthetised**.

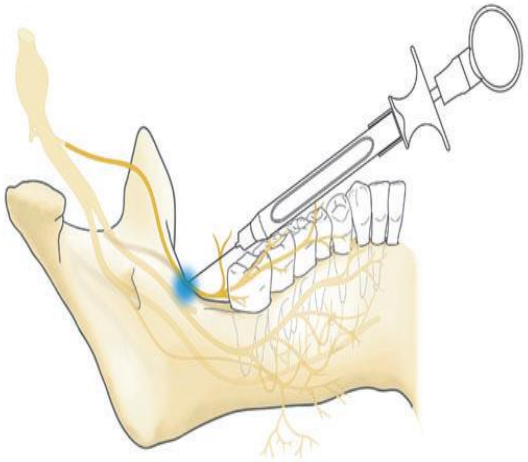
An **additional injection also** has the **disadvantage that an 'acidic environment'** slowly develops inside the **pterygomandibular space** due to the addition of another 1.7–1.8 ml of anaesthetic fluid with a **low pH.**





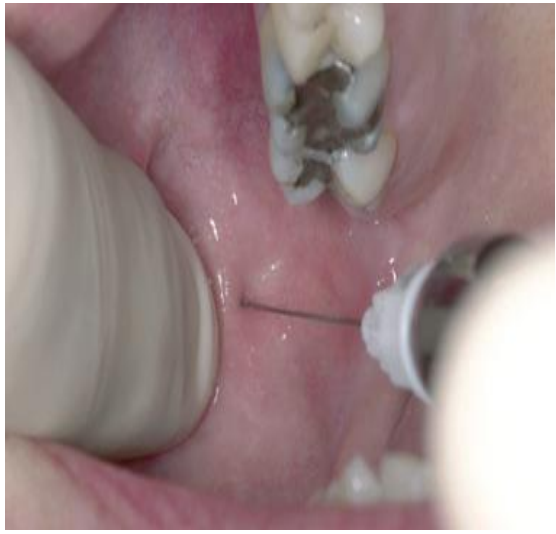
The technique of mandibular block anaesthesia from the left corner of the mouth (indirect technique). The needle is inserted to the bone,pulled back a millimetre and then the syringe is moved to the middle of the mouth and carefully pushed in so that about 1 cm of the needle remains visible. The injection is given after aspiration.

The rest of the **carpule** is then injected in order to anaesthetize the **lingual nerve .**
Now the syringe is taken **out of the mouth**.
The patient closes the mouth and is given a compliment for his/her cooperation during the anaesthesia.
The dentist also asks about the patient's experience:
'Was it painful?
Do you feel the effects of the anaesthesia?'



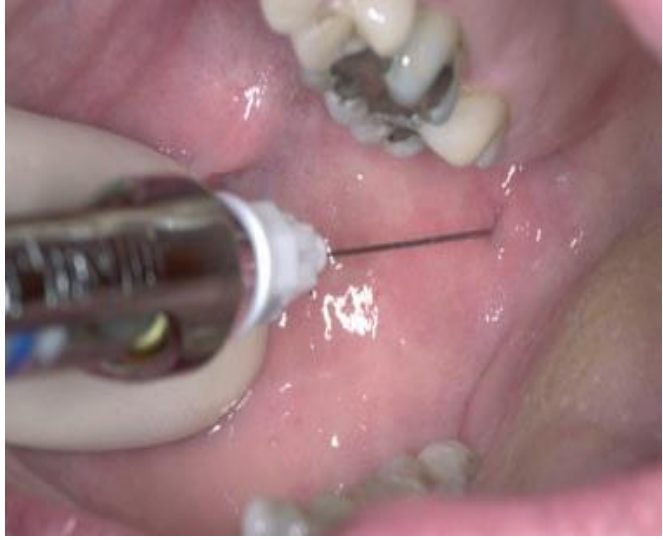
Drawing (**A**) and photo (**B**) of block anaesthesia of the buccal nerve that runs from high lingual, crosses the front of the ramus (at the level of the finger) and then runs

If necessary, the **cartridge is replacedand anaesthesia** is given to the **buccal nerve**, also one finger-width above the point of **occlusion exactly on the front side of the ramus** down to the gingiva and mucosa in the region M3–P1inf .
The path of the buccal nerve varies, however, so that the dentist may elect to give an infiltration anaesthesia buccal to the element **to be anaesthetised**.
About **2–3 minutes** after giving a **mandibular block** the patient should indicate that the corner of the mouth, lower lip, edge and tip of the tongue have begun to tingle and feel odd. One minute later the lower lip and tongue will be anaesthetised on one side and the treatment can start.
An experienced dentist, who takes the characteristic **anatomical structures** that were previously mentioned into account, will achieve a **good mandibular anaesthesia** in about **85% of cases**. **Block anaesthesia may fail due to individual anatomical differences**, such as a progenic mandibula, a **divergent angle** between the horizontal and vertical part of the mandibula, or **the absence of teeth**

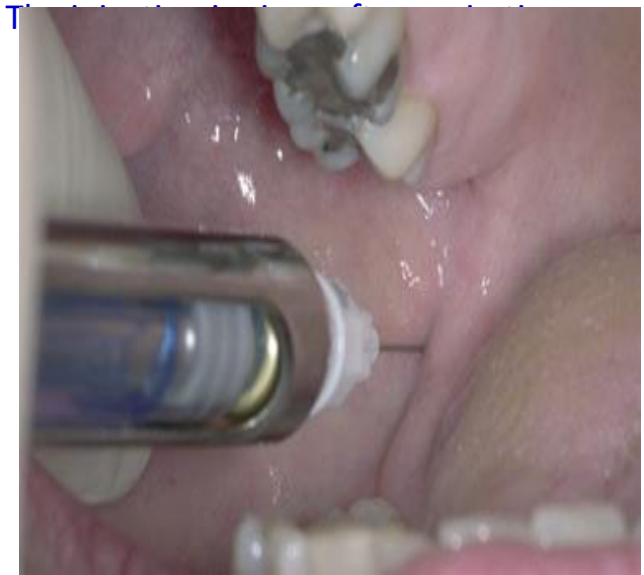


In this environment, the **ionised** form of anaesthetic will increase.
This form is unable to pass through the myelin sheath, thus reducing the effectiveness of the local anaesthetic.

Mandibular anaesthesia on the **left side** of the patient is conducted in the same way as on **the right side**.
The only difference is that the **left hand injects instead** of the **right hand**.
If a dentist **still prefers to use the righthand**, he/she must move to an **11–12 o'clock position**.
The left hand holds the **patient's cheek to the side** and **feels along the front of the mandibular** ramus, while the **right hand gives the anaesthetic.**
In some situations, such as **two-sided extractions in the lower jaw**, **extensive periodontal treatment** and **(pre-)implantological treatments** in the **interforaminal area**, a **two-sided mandibular block** may be given to healthy patients.
The entire mandibula is then anaesthetised, including the **lower lip** and the **front two-thirds of the tongue.**
The tongue's motorics remain **undisturbed**, however, as well as **reflexive swallowing**. **Reflexive swallowing** begins at the back third of the tongue and pharynx. Because the foremost part of the tongue is anaesthetised, the patient will **not notice** if anything is **lying on i**t, such as a broken part of a molar or a piece of filling.
The dentist and assistant must, therefore, keep a good eye on the oral cavity and throat



Mandibular block anaesthesia from the right corner of the mouth (direct technique). The mouth is opened as much as possible and the needle is inserted carefully on the lingual side of the mandibular ramus so that 1 cm of the needle remains visible.

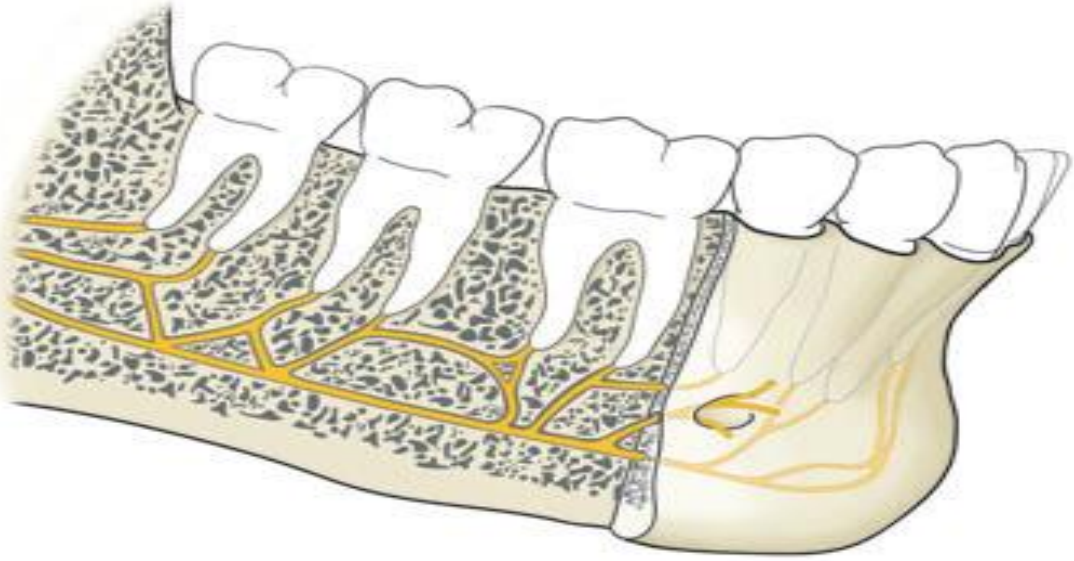


Molars

Anatomical aspects

Both on the buccal and on the lingual side, the roots of the molars are covered by **a thick layer of cortical bone**. The external oblique rim and the mylohyoid rim form an extra barrier for the **diffusion of anaesthetic fluid to the apices of the molars** .

The roots of the **molars lie on the lingual side,** usually below the **level of the mylohyoid muscle** and **buccal to the M2inf under the point of attachment of the buccinator muscle. Infiltration of these muscles must be avoided** as a **haematoma increases**the **risk of infection**.



Anatomical drawing of the inferior alveolar nerve and its branches to the apices of the molars.

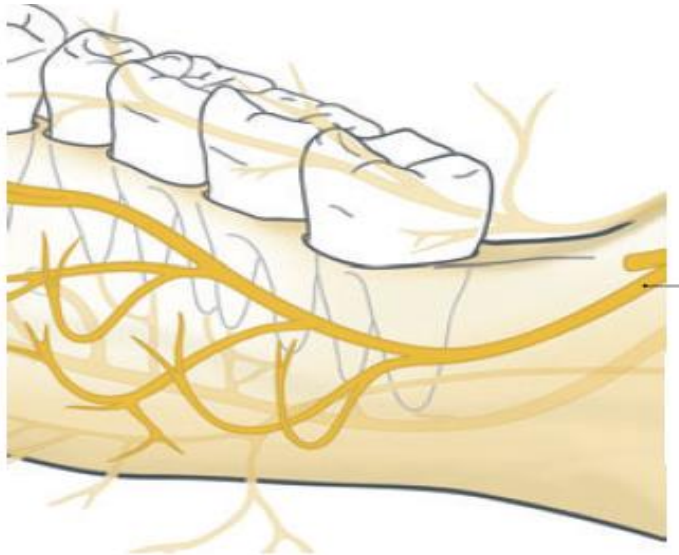
Indication:

Cavity preparations, endodontic treatment and surgical treatments require

a mandibular block, supplemented by **block** or **infiltration anaesthesia** of

the buccal nerve.

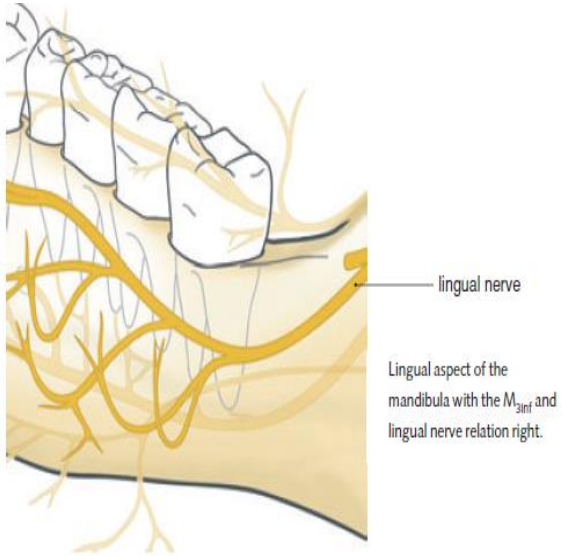
Intraligamentous anaesthesia should, theoretically, also suffice for cavity preparations and endodontic treatments.



Lingual aspect of the mandibula with the M_{3inf} and lingual nerve relation right.

Technique:

see the previous text above for the technical aspects of a mandibular block and buccal nerve anaesthesia.



Lingual aspect of the mandibula with the M_{3inf} and lingual nerve relation right.

Third molars in the lower jaw

Anatomical aspects

The impacted M3inf lies in the **mandibular angle region**, dorsal to the M2inf. This area is innervated not only by the mandibular nerve but also by sensory branches that leave the **spinal column at C2 and C3**, and run over the platysma to the angle.

This must be taken into account when surgically removing the M3inf.

The lingual nerve runs caudo-laterally from its source in the direction of the jaw and is found at the height of the M3inf approx. **5 mm lingually** and **caudally to the bone edge**, and dorsally to the M2inf. The path of the lingual nerve, however, shows great individual variation: the lingual nerve can also be found on the lingual side of the alveolar process above the impacted M3inf at the height of the bone

Indication:

Surgical treatments such as **trigone bone transplant**, an **operculectomy and removal of the (partly) impacted** M3inf require mandibular block anaesthesia and anaesthesia of the buccal nerve. If the M3inf is deeply impacted, anaesthesia is also needed for the sensory **branches from C2 and C3 by applying** infiltration anaesthesia deep in the fold behind the M2inf.

Technique

See the text above for the mandibular block technique and block anaesthesia of the buccal nerve.

Mental nerve block

The mental nerve leaves the mandibular canal via the mental foramen approximately 5–8 mm under the P1–P2inf **apices** and provides sensitivity to the lower lip, skin of the chin and oral mucosa, ventral to the foramen. **The lower frontal teeth**, including P1inf, are not innervated by the mental nerve.

Blocking the mental nerve is advised for **surgery of the lower lip** and the **anterior edentous alveolar process front**, and **for biopsy of the relevant are**a.

A cartridge syringe with a short **25-gauge** needle is used, and a local anaesthetic with **vasoconstrictor**.

The mouth is almost closed and the thumb holds the lip to the side. The fingers of the same hand feel the inferior border of the mandible. **The short needle penetrates the mucosa by the P1inf**, approximately **0.5 cm from the alveolar process.**

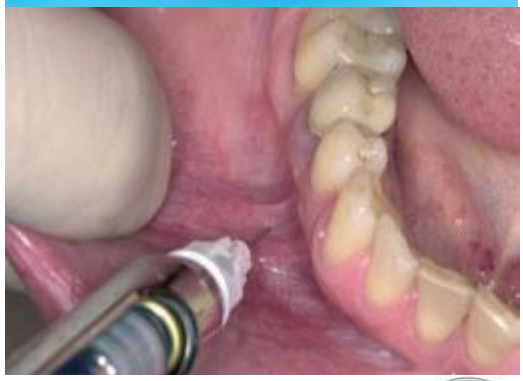
The needle point is introduced slightly medially and dorsally, so that contact with the bone occurs after approximately 1.5 cm .Half a cartridge isinjected after aspiration. The half lower lip, skin of the chin and buccal mucosa are anaesthetised within 2–3 minutes.

If the needle is inserted **too far dorsally**, the foramen will be **missed**.

When the needle is inserted too far laterally, the fluid will accumulate subcutaneously.

Additional infiltration anaesthesia is often needed for surgery of the soft parts of the lip area, because of the vasconstrictive effect.

A small injection is sufficient at the level of the corner of the mouth, where the labial artery reaches the lip area



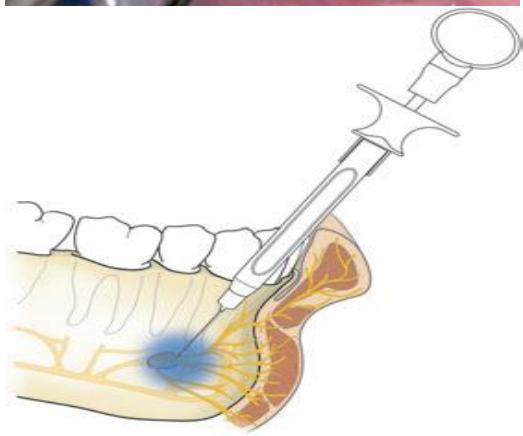
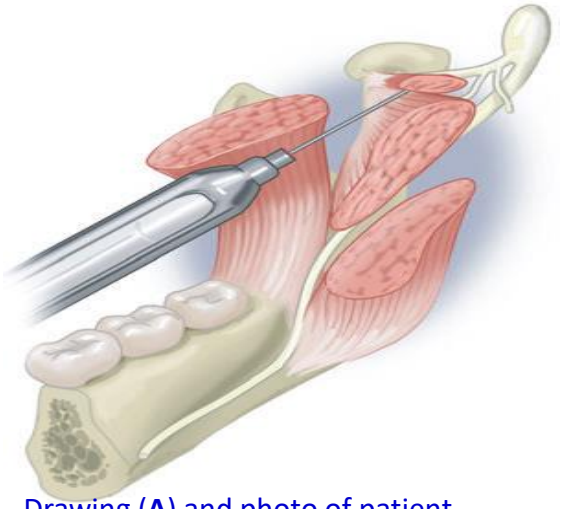


Photo of skull (**A**) and photo of patient (**B**) show block anaesthesia of the nasopalatine nerve. The needle is inserted upright into the incisive papilla and introduced carefully for approx. 1 cm into the nasopalatine canal. This runs parallel to the axis direction of the central incisor. The injection is given after aspiration.

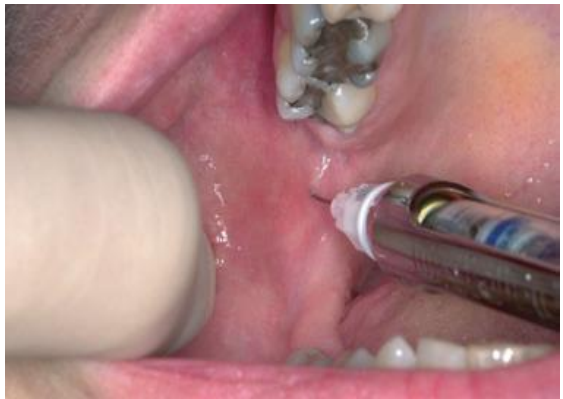
Gow-Gates technique

Usually the direct or indirect technique is selected for a mandibular block where two consecutive injections anaesthetise first the inferior alveolar nerve and lingual nerve and second the buccal nerve.
In 1973, **the Australian George Gow-Gates** described a block anaesthesia that is a mandibular block at a much higher level. **This method anaesthetizes the entire mandibular nerve with a single depot**, so that an additional block of the lingual or buccal nerve is no longer necessary.
The chance of a successful anaesthesia of the entire mandibular nerve
following the Gow-Gates technique is **about 95%.**
The success rate of a classical inferior alveolar nerve **block is 85%.** The advantages of the Gow-Gates technique, **however, are limited.**
The thumb feels along the attachment of the temporal muscles to the coronoid process.
Medial to this, the needle is inserted into the mucosa at the height of the occlusal plane of the M_{2sup}.
The index finger of the same hand is placed in the external auditory canal and the needle is then inserted about 25–27 mm in the direction of the index finger.
Bone contact is made with the **medioventral side of the condyle It is necessary to aspirate** because the needle point may enter the maxillary artery. After aspiration, an entire cartridge of anaesthetic fluid is injected.
After 2–3 minutes the **following branches of the mandibular** nerve will be anaesthetised: the inferior alveolar nerve, the lingual nerve and almost always the buccal nerve.

If the needle is introduced too far, the mandibular caput may be missed and the needle will shift over the mandibular incisura into the masseteric muscle.



Drawing (**A**) and photo of patient (**B**) show the Gow-Gates technique for anaesthesia of the mandibular nerve. On the lingual side of the coronoid process, at the height of the M2sup the needleis inserted in the mucosa inthe direction of the external auditory canal. The needle isintroduced almost completely until bone contact is made with the medioventral side of the condyle.



Supplemental injection techniques

The development of **safe** and **effective local anesthetic agents has been an important advancement in dental therapeutics**. Their anesthetic effectiveness, however, sometimes is inadequate, particularly after the administration of a **mandibular nerve block**. **The nerves supplying mandibular teeth and periodontal tissue are encased in the bone.** The thick cortical plate of the mandible impairs diffusion of anesthetic solutions into the mandible, often limiting the effectiveness of infiltration anesthesi

Alternative anesthetic techniques that can overcome this barrier are available. The periodontal ligament (PDL) anesthetic technique involves using high injection pressure to force the local anesthetic solution through the PDL into the cancellous medullary bone surrounding a tooth. The intraosseous (IO) anesthetic technique requires mechanical perforation of the thick cortical plate between the roots of the teeth to permit deposition of the local anesthetic into the medullary bone surrounding the tooth. These techniques permit diffusion of anesthetic around the tooth socket to anesthetize all of the nerves supplying the dental pulp. The anesthesia often is limited to the specific tooth undergoing treatment

The intraosseous (IO) anesthetic technique

The intraosseous (IO) anesthetic technique **requires mechanical perforation of the thick cortical plate between the roots of the teeth to permit deposition of the local anesthetic into the medullary bone surrounding the tooth.** Although maxillary infiltration anesthetic injection techniques may have success rates of 95 percent or higher, the **success rates for IANBs generally are 80 to 85 percent.**

Lower success rates may be due to the **greater density of the buccal alveolar plate** (which restricts supraperiosteal infiltration), **limited access to the inferior alveolar nerve** and a **wide variation in neuroanatomy**.
With pulpitis, **hyperalgesia may be another reason for anesthetic failure**. **Inflamed tissues may alter the nerves' resting membrane potentials** and **decrease excitability thresholds**, **changes that are not restricted to the inflamed pulp but affect the entire neuronal pathway**, **extending to the central nervous system**. Therefore, routine local anesthetic techniques may not prevent **nerve transmission adequately** because of the **lowered excitability thresholds**.
A description of the IO anesthetic injection technique was first published in 1910. The author described a technique for delivering local anesthetic to the root tip **via a small drilled hole**. The technique lacked popularity because dentists were reluctant to drill **into cortical bone** and **had difficulties inserting a needle precisely into the tight fit of the drilled hole**.
Early techniques included **instrumentation** with a half-round bur or a motorized endodontic reamer and a standard 27-gauge short needle.
The volume of anesthetic administered ranged from **0.5 to 1.5 mL**. Owing to the **lack of intimate** fit between the needle and the hole, the effective volume often was less than the total volume administered because of leakage at the injection site.

Instruments

As the **IO technique evolved**, instruments were designed to **control deposition** of the solution, including the **Stabident system** (Fairfax Dental, Miami) and the X-Tip dental anesthesia system (Dentsply Maillefer, Tulsa, Okla.).
The technique requires perforating the **cortical bone** by **creating a small hole between the roots of the teeth with a specialized rotary instrument**.
The dentist makes the **perforation approximately 5 millimeters apical to the buccal papilla.** Applying constant pressure when the perforator is against the cortical plate can lead to a **buildup of heat**. The X-Tip system has a unique design that leaves a guide in place after perforating the cortical bone to make it easier to insert the needle through the perforation. The administration of an injection of one-quarter to one-half of a cartridge of local anesthetic by means of a small needle guided into the trabecular bone can induce anesthesia .

Initially, dentists used the IO anesthetic technique as a supplementary technique when the IANB failed, especially in cases of **irreversible pulpitis**.

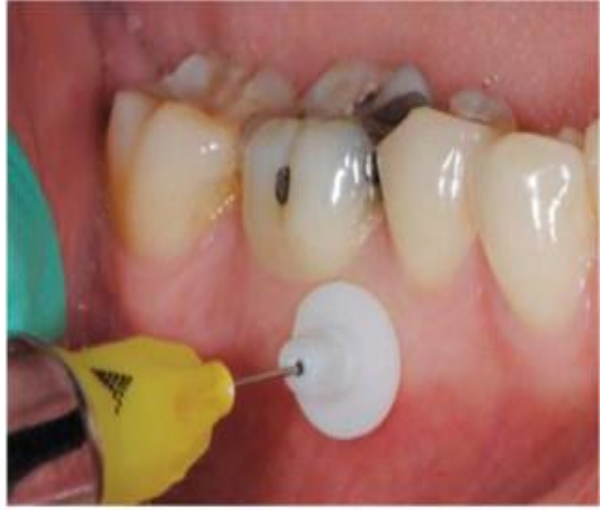
With the advent of products such as Stabident and the X-Tip, the technique has gained in popularity as a primary technique for anesthetizing a single mandibular tooth.

Although dentists use the IO technique most often to provide anesthesia in a single tooth, they may use it to anesthetize multiple teeth in the same quadrant, depending on the injection site and volume of anesthetic injected.

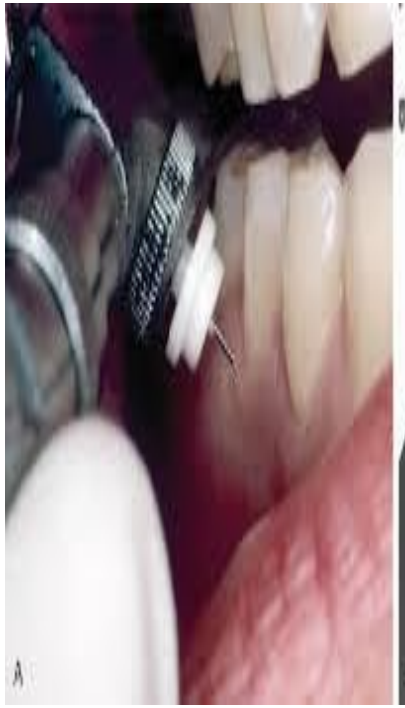
When an IANB was supplemented with an IO injection, investigators reported a substantial increase in the overall anesthesia success rate for first molars and second premolars.

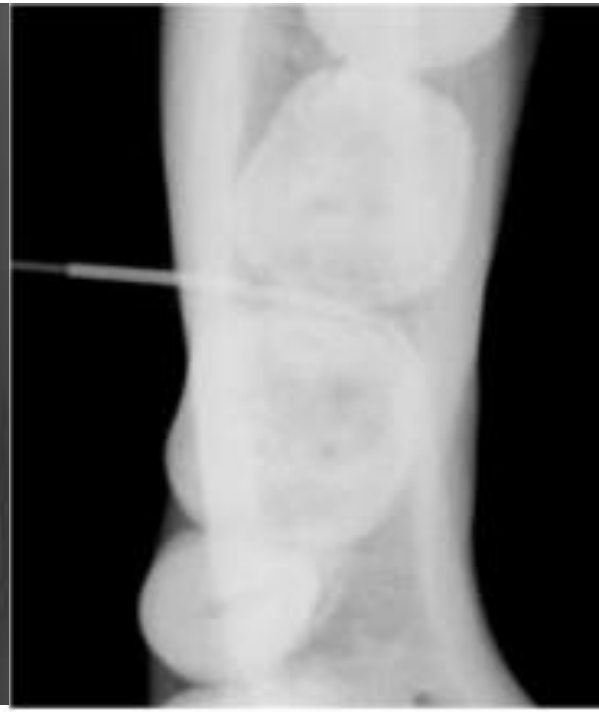
For teeth with **irreversible pulpitis**, the administration of a supplemental mandibular IO injection increased total **pulpal anesthesia success.**

The onset of anesthesia after the IO injection was administered was **almost immediate**.



Intraoral photograph showing the position of the needle for the intraosseous anesthetic injection technique





Contraindications

Contraindications to the use of the IO anesthetic injection technique include gross periodontal disease or acute peri-apical infection. Formation of fistula has been reported at perforation sites.[7]

This technique should be used cautiously in cases in which the roots of the teeth are so close together that they preclude clear access to the interdental trabecular bone. A relative contraindication is when there is difficulty perforating the cortical plate where it is thick, such as areas distal to the second molar, increasing the chance of perforator fracture.[7]

Some areas of the mandible also may have **constricted cancellous bone**, which may impede anesthetic distribution

Adverse effects and complications

There are some possible **adverse effects** and **complications of using the IO technique**. **Heart palpitations** frequently occur when a **vasopressor-containing anesthetic** is used.

To minimize the risk, a **slow injection using a local anesthetic without a vasopressor**, such as **3 percent mepivacaine**, is recommended.

Only **one-eighth to one-qu**arter of a dental cartridge should be administered **at one time until adequate anesthesia is achieved**.

Because the cancellous bone in the mandible is vascular, keep the volume of local anesthetic to the **recommended minimum** to **avoid possible rapid systemic uptake** and **overdose**.

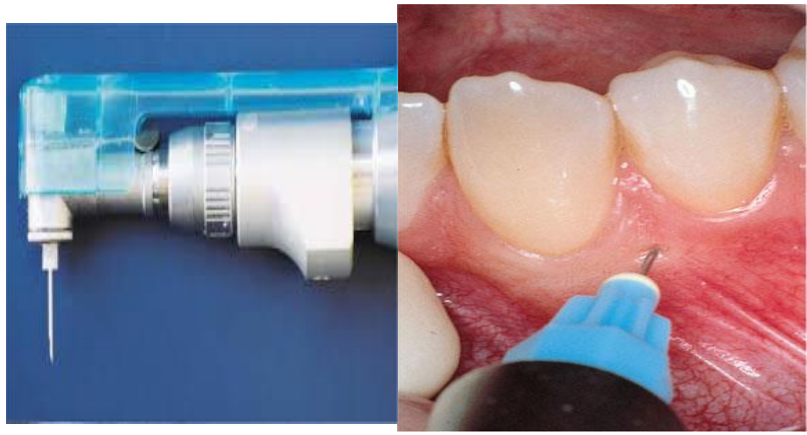
The use of vasoconstrictors is dictated by treatment needs and patients' health histories.

Patients with **moderate** to **severe** cardiovascular disease or who are taking **tricyclic antidepressants** or **nonselective β-adrenergic blocking agents** **are poor candidates for use of the IO anesthetic injection technique** when solutions containing **epinephrine** or **levonordefrin** are used

Investigators have reported a transient increase in heart rate after administration of vasopressor-containing anesthetic solutions by means of IO injections.

Increase in heart rate as determined by subjective questioning after administration of an IO injection of **1.8 mL of 2 percent lidocaine with epinephrine 1:100,000**.

Perforation of the lingual plate of the bone or injury to the roots of the teeth can occur. The IO anesthetic injection technique is not recommended for use in areas of mixed dentition because of insufficient cancellous bone and the possibility of damaging developing tooth buds.



Advantages of intraosseous anaesthesia

The advantages of intra-osseous anaesthesia over conventional methods include:
a smaller dose is required
a smaller area of soft tissue anaesthesia is produced
the method aids in overcoming failure of conventional techniques.

1.Smaller doses are used than in conventional regional block anaesthesia – around 1 mL is normally sufficient.

2.The amount of soft tissue anaesthesia produced is less than that caused by infiltration and regional block methods and this may reduce the possibility of self-inflicted trauma.

3.When used in combination with inferior alveolar nerve blocks, the method increases the success rate for pulpal anaesthesia compared to the use of the regional block in isolation. Similarly, supplemental anaesthesia via the intra-osseous route may be effective in teeth with irreversible pulpitis where conventional methods have failed

Disadvantages of intraosseous anesthesia

The disadvantages of intraosseous anaesthesia include:**technically more difficult** than infiltration anaesthesia
specialised equipment may be required systemic effects may be increased post-injection discomfort may be produced
teeth may be damaged.

1.The method is technically more difficult than infiltration anaesthesia as the entry point made by the perforator must be accurately located. This is simplified with some specialised intraosseous delivery systems that include a locator. This locator remains in position after removal of the perforator and directs the needle into the channel created.

2.Although it is not absolutely essential, specialised equipment makes the method easier.

3.Entry of local anaesthetic and vasoconstrictor into the circulation occurs rapidly following intraosseous anaesthesia and systemic ineffects attributable to catecholamine-entry to the circulation occur early after injection. Patients may report an increase in heart rate during intraosseous anaesthesia with epinephrine-containing solutions.

4.Post-injection discomfort may occur. Post-operative swelling and an exudate may be produced after intraosseous injections and some patients have perforation sites that are slow to heal.

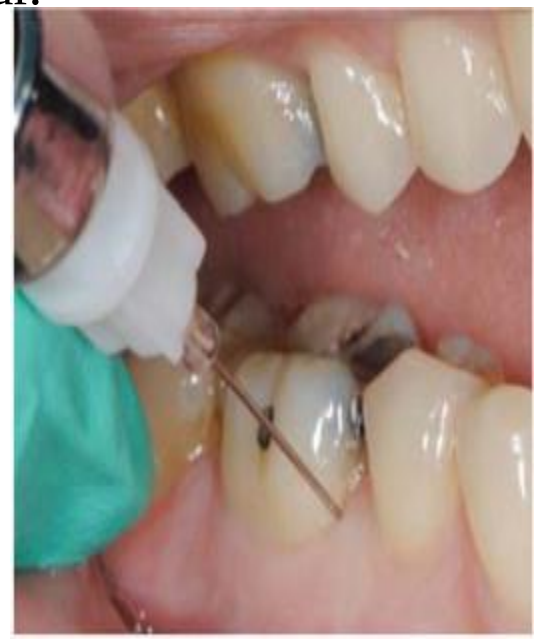
5.The **method may damage teeth**. The perforators can penetrate teeth. Fortunately there is a tactile change detectable when dental tissue is encountered and strong pressure has to be used for this to occur.

The periodontal ligament anesthetic injection

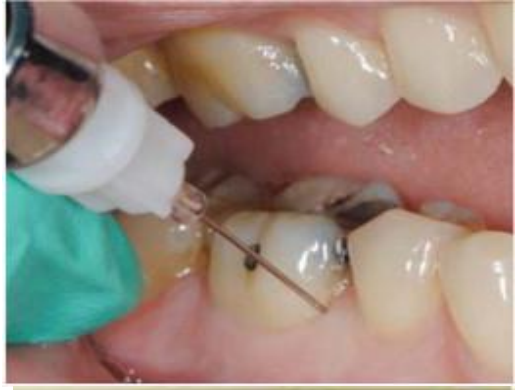
The PDL anesthetic injection technique, also referred to as the "intraligamentary injection technique," can induce local anesthesia in either maxillary or mandibular teeth.

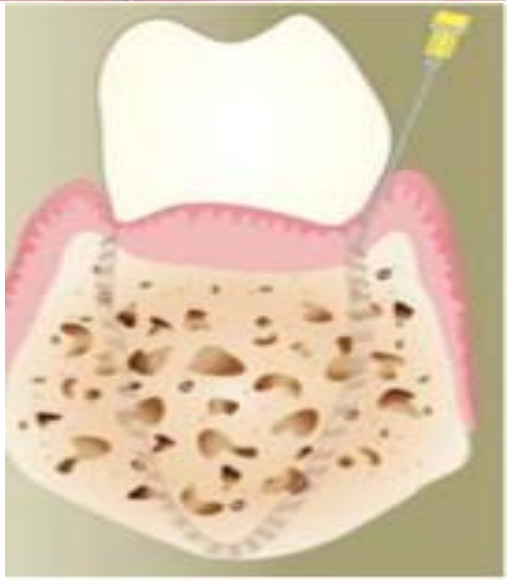
Although occasionally it is **used as the primary anesthetic technique** (when a single tooth requires anesthesia for a short duration), dentists most often use the PDL technique when mandibular nerve **blocks are unsuccessful.**

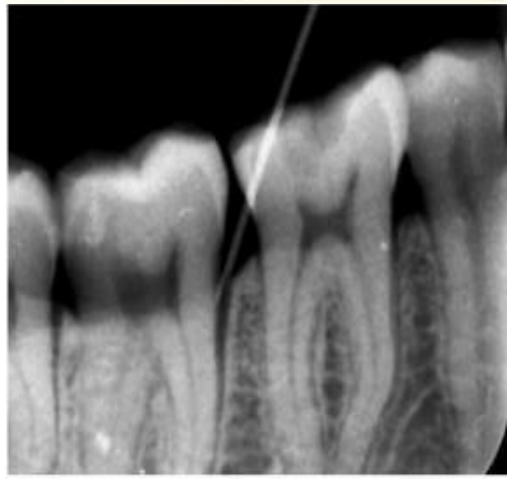
Teeth with irreversible pulpitis generally are considered the most difficult to anesthetize and often require supplemental anesthesia.



The PDL anesthetic injection technique was introduced in the **early 20th century** and gained popularity in the 1970s when dedicated high-pressure dental syringes such as the Peripress Pen (Panadent, Kent, England) and Ligmaject (Henke-Sass, Wolf, Tuttlingen, Germany) were introduced.







These syringes could be operated **with one hand** and were **capable of delivering small volumes of anesthetic from standard dental cartridges** at the **high hydrostatic pressures** required for the PDL anesthetic injection.

It is recommended using short **27- or 30-gauge** dental needles for this technique. With the tip of the needle approaching the **periodontal sulcus** on the mesial or distal aspect of the tooth, advance it to the base of the periodontal crevice. With the bevel oriented toward the root surface, advance the tip of the needle into the PDL between the root surface and the adjacent alveolar bone.

Administer a small amount (**0.2 milliliters**) of anesthetic solution slowly. To ensure that the solution is being forced into the tissue, **you must feel resistance**. Although syringes differ among manufacturers, the technique usually requires deposition of at **least 0.2 mL** for each root of the tooth.

In situations in which anesthesia of a **short duration is required**, the PDL anesthetic **injection technique** might be the **preferred treatment**.
This technique avoids the **deep needle insertion associated with mandibular regional blocks** and **may be considered a safer alternative technique for patients with bleeding disorders**.

The anesthetic efficacy of the PDL anesthetic injection technique can be unreliable if the needle is not positioned precisely. Recommended not **administering injections into inflamed** or **infected periodontal sites.**
The current American Heart Association recommendations do not provide specific guidance regarding antibiotic prophylaxis when administering the PDL injection

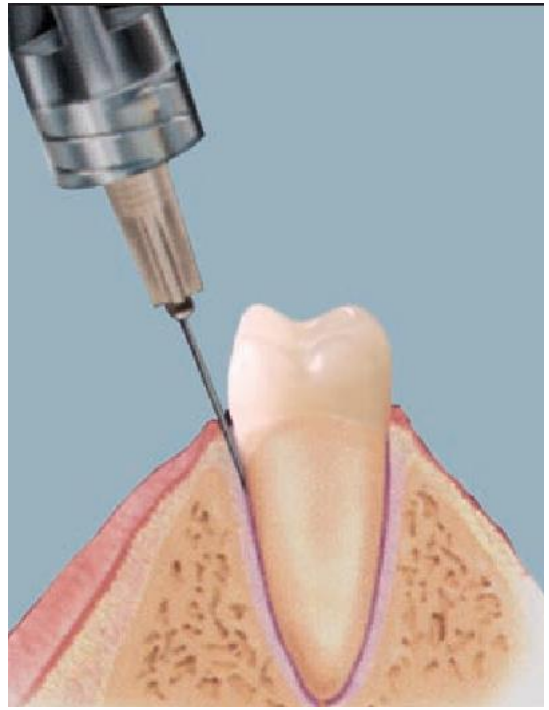
The recommendations state that antibiotic prophylaxis is not needed with routine anesthetic injections through noninfected tissue. However, even when it has been administered through healthy periodontal tissue, the PDL injection has induced **bacteremia.** Because of the potential for bacteremia to induce **bacterial endocarditis**, dentists should consider antibiotic prophylaxis when administering PDL injections, particularly when administering an injection **through inflamed periodontal tissue**.
For the few patients who have a known risk of developing **bacteremia-induced endocarditis**, **avoiding the use of the PDL anesthetic injection technique is a practical alternative when possible.**

A disadvantage of routinely using the PDL anesthetic injection technique is that some patients report **tenderness** at the injection site **for a day** or **two after treatment**.

Among the commonly used local anesthetic injection techniques, patients described **needle placement during the administration of an IANB as most painful**, followed **by the PDL anesthetic** injection technique and the **mental nerve block injection and infiltration anesthetic injection techniques.**
They reported that the PDL anesthetic injection technique was the **most uncomfortable during solution deposition**.

The position of the needle and the **pressure of the injection can cause trauma to tissue** and **subsequent postoperative discomfort.**

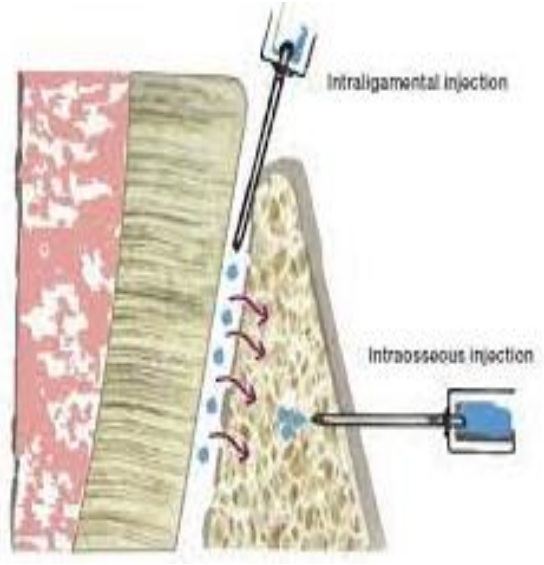
The PDL anesthetic injection technique is not recommended for primary teeth, because there have been cases of enamel hypoplasia and **hypomineralization in permanent teeth adjacent to the injection site.**



Intra Septal injections

Local anesthetic failure is an unavoidable aspect of dental practice. A number of factors contribute to this, which may be related to either the patient or the operator. Patient-dependent factors may be anatomical, pathological or psychological1-3. Work is still going on by dental clinicians and researchers in order to find an optimal local anesthetic agent which it

Although the solution is **deposited into the coronal segment of the PDL**, the anesthetic is **not forced down the PDL** to the **tooth apex** but **instead is redirected into the surrounding cancellous bone through the fenestrations in the dental socket**.



Unlike the cortical plate of the mandible, the dental socket has **multiple passageways** to accommodate the blood **vessels that supply the periodontium**. Investigators used a dog model to simulate this clinical technique and assessed the distribution of the local anesthetic after the PDL injection was administered..
Studies showed The results of the PDL anesthetic injection techniques showed that success rates ranged from **60 percent** for endodontic therapies to 100 percent for periodontal therapies and tooth extractions.
Anesthesia onset was rapid, and **anesthesia duration was 30 to 45 minutes**.

Adverse reactions included **pain during administration** of the injection**, tenderness at the injection site after treatment** and **a subjective sensation that the tooth was elevated in the occlusion** or **“high” after treatment.**

Intraseptal anesthesia for pain-free dental treatment

In order to be a successful dentist, you have to implement a pain-free dental treatment. This can be merely achieved by effective local anesthetic techniques.Considering the complex nature of oral and dental tissues, attaining effective dental local anesthesia may be challenging in certain circumstances. For example, the **failure of local anesthetic injections in irreversible pulpitis** can be **8 times higher than health teeth**. Such issues cannot be ignored as a good number of patients with endodontic complaints attend the dental clinics on a daily basis.

Falure of the local anesthetic injections using inferior alveolar nerve block (IANB) for lower dentition and buccal infiltration for upper teeth in asymptomatic and symptomatic patients requires additional buck-up strategies to achieve pain-free dental treatment. Otherwise, the patient complains of **severe pain** and **hindering the clinician to proceed to the dental treatmen**t .Intraseptal anesthesia (ISA), and specialized equipment may be required. Intraosseous technique can lead to rapid **absorption of local anesthetic** and **vasoconstrictor in the circulation**. Hence, cardiovascular changes are attributable to **adrenaline entry into the circulation that may occur immediately after intraosseous injection**

Intraseptal injection has been reported to be more effective for controlling postoperative pain compared to intraosseous and intraligamentary injections. **The efficacy of ISA is similar** to **intraosseous injection**, and they are both more successful than the **intraligamentary injection** because a **greater amount of anesthetic solution can be delivered during the injection.**

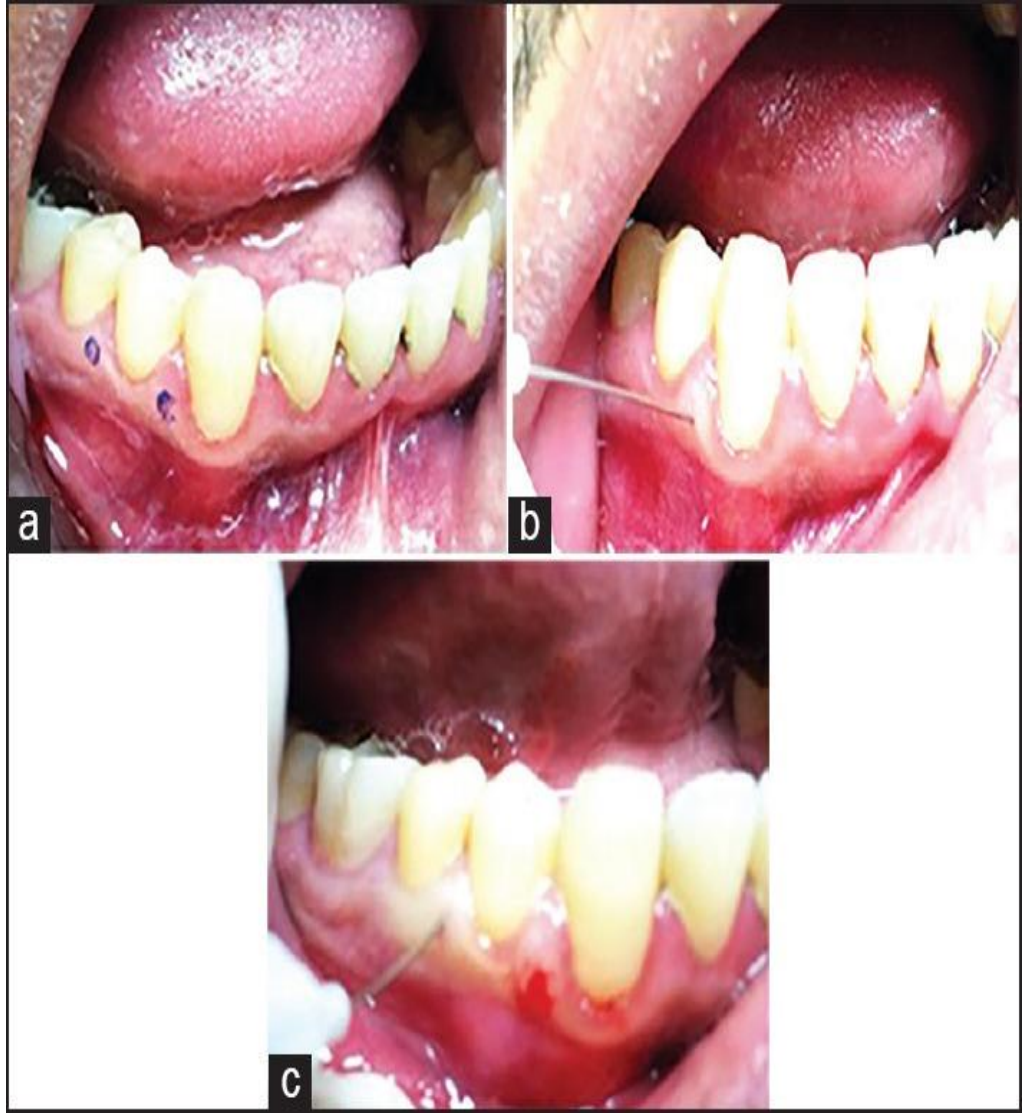
Supplementary techniques might have a **negative effect** on the cardiovascular system, for example, **increased heart rate for a couple of minutes after intraosseous injection .**

Both intraseptal and periodontal ligament techniques is beneficial and appropriate for the **routine tooth/teeth removal.** Intraseptal technique provides local anesthesia of **one tooth including the soft-tissues**.

Intraseptal technique **anesthetizes surrounding nerve endings in the tissues of a particular tooth**.

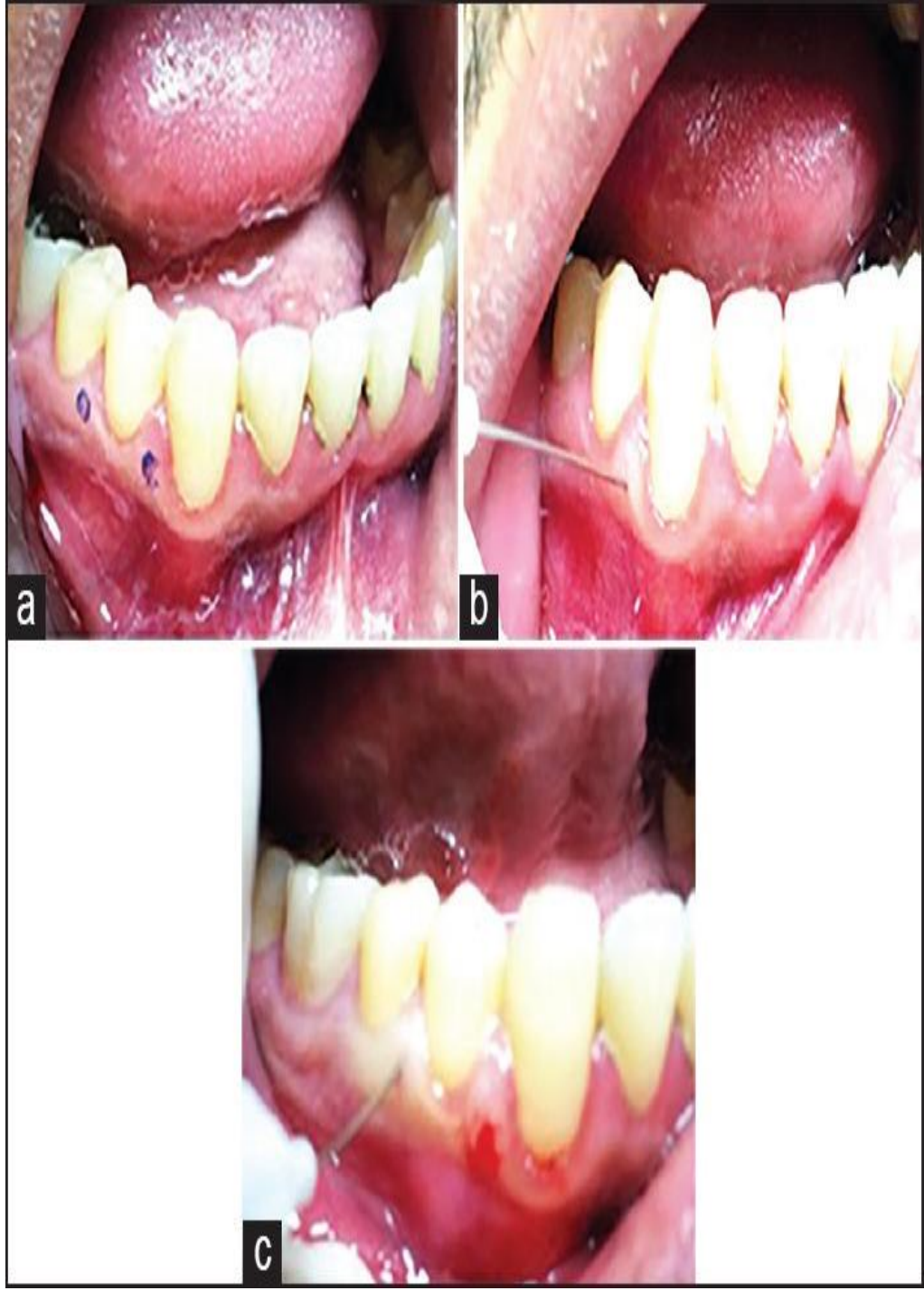
There are a few **contraindications** such as **acute inflammation** or **infection at injection site**. However, **ISA remains a convenient local anesthesia practice for a general dental surgeon.**

The protocol used for the administration of **ISA has been described briefly**. Patient ought to be placed in the supine position. Considering the **thick of soft-tissues**, a **short injection needle** is usually **proffered**. The target region is **located 2-3 mm apical to the apex of the papillary triangle.**



Intraseptal injection technique; (a) marking for the administration of anesthesia (b) positioning of the needle 3 mm apical to the apex of the papillary triangle (c) ischemia of the soft-tissue surrounding the injection site

The needle is introduced into **the soft-tissue** and advanced until contact with bone is made. Pressure must be applied to the syringe and drive the barb slightly deeper (1-2 mm) into the interdental septum. Afterward, anesthetic solution (0.2-0.4 ml) is **deposited in a minimum of 20 s time.** Prevailing resistance to the flow/movement of the anesthetic solution and ischemic discoloration of the neighboring soft-tissues are main signs of success of this technique.This main aim of this review was to **discuss various aspects of intraseptal dental anesthesia and its role significance in pain-free treatment in the dental office**. In addition, reasons of failure and limitations of this technique have been highlighted.



Mechanism of Action for Intraseptal Injection

The route of diffusion and distribution of the anesthetic solution in the intraseptal technique is most likely through the medullary bone It offers anesthesia to the bone, delicate/soft-tissues, and root structure in the region of infusion.

It is best when **both pain control** and **hemostasis are wanted for delicate/soft-tissue and bony periodontal treatment.**

Advantages of intraseptal injection:

In contrast to IANB and local infiltration, the intraseptal technique prevents the anesthesia of tissues such as lips and tongue hence, decreases the chances of cheek or lip biting (self-trauma). It necessitates minimum or least dosage of local anesthetic and minimizes bleeding during the surgical procedure.

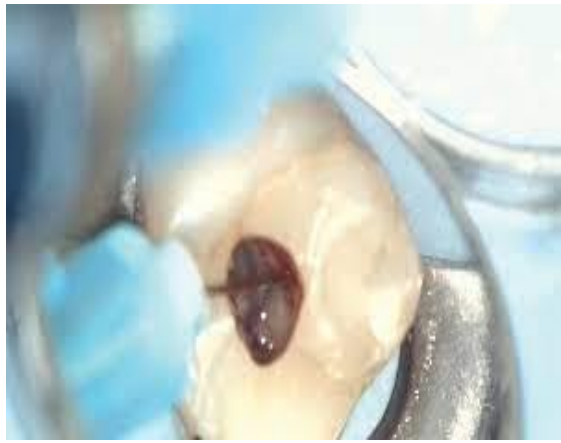
This technique being less traumatic has immediate or instantaneous (<30 s) onset of action and comparatively less number of postsurgical complications. Intravascular injection is extremely unlikely to occur compared to IANB or infiltration. **Assertions that ISA is immediate are properly consistent with previous clinical results**. Their findings reported that the onset of action for anesthesia was within 1 min after injection. Hence, the onset time can be considered rapid if not immediate

Disadvantages of intraseptal injection

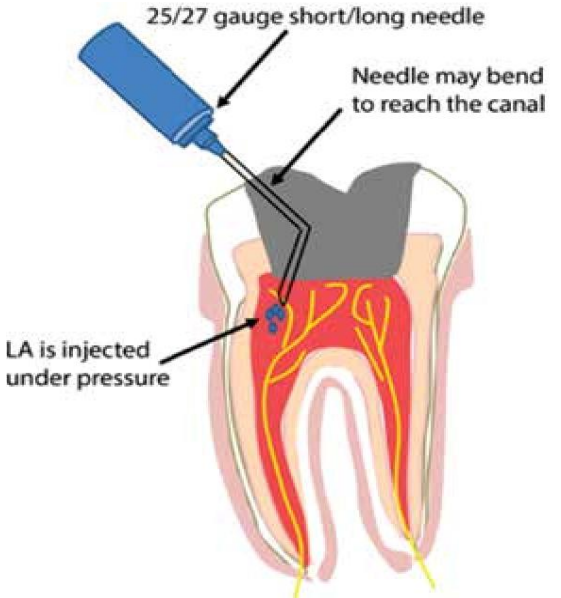
Clinical experience and multiple tissue punctures may be necessary to perform this technique. During the anesthetic procedure, the anesthetic solution may leak into the oral cavity resulting discomfort and an unpleasant or bitter taste. The effective period anesthesia for pulpal and soft-tissues is very limited .Hence multiple repeats may be required for longer surgical procedures.

Dental techniques demanding significant pulpal, bone, and soft-tissue anesthesia can be adequately and securely acquired using ISA. **It can be a first choice anesthesia for teeth extractions and restorative dental procedures**. Intraseptal injection is likewise helpful for giving **hemostasis for surgical flap procedures and periodontal curettage**

Intrapulpal injection(IPI):



In about **5 to 10%** of mandibular posterior teeth with irreversible pulpitis, supplemental injections, even when repeated, do not produce profound anesthesia; **pain persists** when the pulp is entered. **This is an indication for an intrapulpal injection**
The intrapulpal injection technique (IPI) is **one of the commonly employed supplemental anesthetic technique adjuvant to conventional maxillary infiltration anesthesia or mandibular inferior alveolar block in situations**



The **intrapulpal injection** should only be given after all other **supplemental techniques have failed**. Another disadvantage of the technique is the duration of pulpal anesthesia may be short (15 to 20 minutes). Therefore, the bulk of the pulpal tissue must be removed quickly, at the correct working length, to prevent reoccurrence of pain during instrumentation. **Another disadvan**tage is that, obviously, **the pulp must be exposed to permit direct** injection; frequently, anesthetic problems occur prior to exposure while still in dentin

The most significant factor **contributing to the success of IPI** is that its administration must be done under pressure. Monheim has suggested that prolonged pressure may lead to degeneration of nerve fibres in many instances leading to **profound anaesthesia.**

Various suggested methods that aid in pressure build up in such cases include obliteration of a large pulpal opening with either **gutta-percha** or a **cotton pelle**

The advantage of the intrapulpal injection is that it works well for profound anesthesia if given under back-pressure. **Depositing anesthetic passively into the chamber is not adequate; the solution will not diffuse throughout the pulp.**

Complications:

Discomfort during the injection of anesthetic.

The patient may experience a brief period of pain as the injection of the anesthetic drug is started.

Almost immediately, the tissue is anesthetized and the pain ceases

Failures of Anesthesia Intrapulpal Injection

Infected or inflamed tissues.

Changes in the tissue pH minimize the effectiveness of the anesthetic.

Intrapulpal anesthesia invariably works to provide effective pain control

Solution not retained in the tissue.

To correct: try to advance the needle further into the pulp chamber or root canal and re-administer 0.2 to 0.3 ml of anesthetic.


Thank you