

# CLINICAL GUIDE

Computer-controlled local anaesthesia with Calaject,  
Ronvig



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# Computer-controlled anaesthesia

## Mechanism of action



From the patient's perspective, one of the most important things that the dentist can do is to deliver effective anaesthesia to guarantee that the ensuing procedure will be painless. Patients often expect anaesthesia to ensure maximum comfort during treatment and reduce their fear of another visit.

Local anaesthesia can and should be atraumatic. Thanks to the use of special techniques and an appropriate approach, the injection can be painless and thus less stressful in the future.

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## WHY you should swap your traditional syringe or carpule for the CALAJECT system:

- Greater patient safety; anaesthesia is easier to perform and more effective thanks to the computer-controlled injection speed, which improves anaesthetic absorption and minimises the risk of pain. Anaesthesia may also be delivered at a physiological speed for maximum patient comfort.
- A lower drug dose and pressure are needed to achieve the anaesthetic effect, which protects soft tissues, the surrounding bone, the periodontium and the primordia of permanent teeth. Complete real-time control of tissue pressure and resistance.
- Automatic aspiration boosts safety, precision and predictability.
- PDL, intraseptal and intrapulpal anaesthesia, technically difficult to deliver with a traditional syringe, are much easier to perform.
- A wide selection of available techniques allows the anaesthetic procedure to be adjusted to the individual case and clinical situation.

# CALAJECT

## Computer-controlled system for painless local anaesthesia in dental care

Local anaesthesia involves the delivery of an analgesic agent to the tissues in the vicinity of a nerve. Molecules of the analgesic solution will move down the concentration gradient. In the induction phase, the anaesthetic travels from the injection site toward the nerve branch and spreads in all available directions. The actual diffusion speed depends on many factors, the concentration gradient being the most important. The higher the initial concentration of the anaesthetic, the faster its diffusion and the quicker the effect. To completely block all peripheral nerve fibres, it is essential to use the appropriate anaesthetic volume and concentration.



Calaject, a computer-controlled local anaesthesia system, allows the delivery speed and pressure to be adjusted to the tissue absorption capacity. Effective anaesthesia is achieved with a lower amount of the analgesic and without the accompanying discomfort or a sensation of numbness after the procedure.

# Principles

## of effective and atraumatic anaesthesia with Calaject

1. Choose a needle appropriate for the type of injection you are going to deliver (detailed information on different kinds of anaesthesia is provided further on).
2. Deliver the anaesthetic solution at an appropriate temperature (room temperature, max. 36°). A solution stored at a temperature of 22°C does not need to be heated up, but it must be remembered that if the temperature is too low, delivery may be painful.
3. Select the CALAJECT programme dedicated for the required type of anaesthesia:
  - PROGRAMME 1 – PDL, intraseptal, intrapulpal, palatal
  - PROGRAMME 2 – infiltration
  - PROGRAMME 3 – nerve block



4. Control the analgesic flow (in CALAJECT, after the pedal is pressed down for the first time, a drop of the solution should appear on the tip of the needle)
5. Prepare the injection site:
  - cleanse the injection site with an antiseptic agent – particularly important in PDL anaesthesia
  - use a surface anaesthetic

# Principles

## of effective and atraumatic anaesthesia with Calaject



6. Ensure a correct, stable pen grip of the handle and a good hand support. The CALAJECT ergonomic handle can be comfortably grasped close to the needle.
7. Make sure the tissues are tight and place the needle with the drop of the anaesthetic solution on the surface of the mucous membrane.

8. Slowly insert the needle into the tissue and deliver the anaesthetic at a slow rate.
9. Take your foot off the pedal to aspirate. (Aspiration – see page 7)
10. Observe the patient's response as you deliver the anaesthetic (you can modify the flow rate by pressing the pedal again in Programme 2 or with a fast click in Programme 3).
11. After delivery, slowly pull out the needle.



12. Slip the needle securely into the cap at the base of the CALAJECT handle to avoid an accidental needle prick.
13. Observe the patient after the injection.

# Aspiration



**Aspiration should be performed whenever the needle is inserted deep into the tissue and there is a risk of vascular damage.**

Aspiration is possible because of the low pressure created in the ampoule as the piston is pulled back.

## **Aspiration with CALAJECT – that's easy!**

When a drop of solution appears on the needle tip, insert the needle into the tissue. Before you start the fast anaesthetic delivery, take your foot off the pedal (pause delivery) and check the effects of aspiration in the ampoule. If the result is negative, you can continue the delivery. If a drop of blood appears inside, pull the needle out, replace the ampoule, then inject and aspirate again.

## **Please remember:**

- do not insert the needle again at the same site
- insert the needle only when you deliver the anaesthetic

## **PLEASE NOTE**

In traditional syringes and carpules, when the piston is pulled back during aspiration, the whole syringe moves back as well, changing the position of the needle within the tissue. If too much pressure is exerted when the piston is drawn back, the hook may be pulled out of the rubber stopper and reduce the safety of the procedure. When you press the piston again, the needle may change its position and enter the vessel.

**With the Calaject system, all you need to do is to check whether the needle is inserted into the blood vessel and take your foot off the pedal; you do not need to use your hand. This makes anaesthesia safer and aspiration more comfortable.**

# Additional techniques

to make anaesthesia more effective



## Pre-injection technique

Involves the gradual delivery of an anaesthetic to deeper tissues via the epithelium in order to produce surface anaesthesia before anaesthesia proper. The bevel of the needle is placed on the palatal soft tissue and pressed down with the aseptic applicator swab. The bevel should adhere tightly to the tissue surface. The delivery of the anaesthetic begins at the surface of the epithelium with a drop of the solution (the anaesthetic is deposited before the needle is inserted). The role of the applicator is to stabilise the needle and prevent leakage of the excess solution.

## Pre-injection with Calject

- press the pedal to squeeze out a drop of the solution onto the needle; support the bevel against the surface of the mucous membrane, simultaneously pressing onto the site with an aseptic applicator swab.
- press the surface of the epithelium for 8-10 seconds.
- as soon as the tissue turns pale, pause for several seconds to allow surface anaesthesia to take effect, and then continue delivering the solution according to the programme.

## Anaesthetic pathway technique

The needle tip is inserted into the tissue very slowly and the anaesthetic is delivered at a very slow speed. Once a drop of the solution appears on the tip, the needle is placed at an angle of 45 degrees and gently pressed against the surface of the epithelium. This allows the injection site to be pre-anaesthetised. After c. 20 seconds, the needle is gently inserted into the tissue and rotated at the same time. Needle rotation allows it to better penetrate the tissue and improves the diffusion of the anaesthetic. The needle travels at a rate of 1-2mm per 4-6 seconds, delivering the anaesthetic at a pre-programmed rate.

## Bi-rotational insertion technique

The handle is gradually rotated as the needle penetrates the tissue. The technique bears resemblance to methods used in acupuncture and endodontic treatment. The rotational movement makes the bevel continually change position, which allows the perpendicular force acting on the needle to be minimised, prevents deflection and eliminates deviations from the straight path of insertion. The needle smoothly moves forward and requires less effort.



# Periodontal ligament (PDL) anaesthesia

(alveolodental ligament anaesthesia)

Programme 1

## TARGET AREA

the tooth and the adjacent soft tissue



## INDICATIONS

- Single tooth anaesthesia
- Treatment of a single tooth in two quadrants (to avoid bilateral anaesthesia)
- Paediatric treatments – to avoid anaesthetising the soft tissue and prevent self-injury
- Procedures in patients with conditions that rule out nerve block anaesthesia (e.g. haemophiliacs)
- Auxiliary diagnostic anaesthesia (to locate pain); when fitting matrix retainers and orthodontic bands, etc.
- During surgical procedures for better haemostasis

## PREPARATION

- DOSE:  
PDL anaesthesia requires small quantities of the analgesic solution (0.2ml per root); excess fluid should be removed from the ampoule to leave 0.6ml inside before delivery begins.
- For comparison: the rubber stopper in the ampoule roughly corresponds to a volume of 0.2ml.



- NEEDLES: Short 27G needles are recommended.

# Periodontal ligament (PDL) anaesthesia

(alveolodental ligament anaesthesia)

Programme 1

## TECHNIQUE



Fig 1. Needle insertion



Fig. 2. Needle rotation toward the bone

1. Disinfect the injection site with an antiseptic agent before the procedure.
2. Needle position:  
Insert the needle into the interdental space at the apex of the papilla and push until you reach the bone – in the mesiodistal space, parallel to the root axis; in the buccolingual space at an angle of 15-30° to the root (like the way in which the periodontal probe is inserted to assess the depth of gingival pockets). Insertion points depend tooth type – see page 12.
3. Target site: bottom of the gingival sulcus (the needle is inserted to a depth of 1-3mm).
4. **IMPORTANT: The needle should be inserted with the bevel facing the surface of the root, which allows avoiding damage to the root cement.** (Fig. 1).
5. The needle is inserted all the way to the bottom of the gingival sulcus; tissue resistance should be monitored throughout on the control panel. If the needle has been inserted into periodontal space correctly, the LED indicator will stop in the middle of the scale (with children, whose periodontal ligament is wider, resistance will be lower).
6. If the interdental papilla is narrow, the needle should be turned away from the buccolingual surface of the tooth, while it continues to travel along the long tooth axis.
7. **When you reach the bottom of the gingival sulcus, pull the needle back by c. 1mm, rotate it and direct the opening toward the alveolar bone to ensure the best possible absorption of the anaesthetic** (Fig. 2.).

# Periodontal ligament (PDL) anaesthesia

(alveolodental ligament anaesthesia)

Programme 1

## TECHNIQUE



Fig. 3. Injection in the direction of the bone

8. Deposit 0.2ml of the anaesthetic solution onto the tooth root.
9. During injection, slight tissue resistance should be felt; the gingiva should turn pale at the injection site.
10. Pull out the needle; repeat the procedure for multi-rooted teeth.
11. Anaesthesia should take effect in 15-30 seconds and last for 30-60 minutes.

# Injection sites

in PDL anaesthesia

## Recommended injection sites

### BASIC SITES:

On vestibular surfaces:

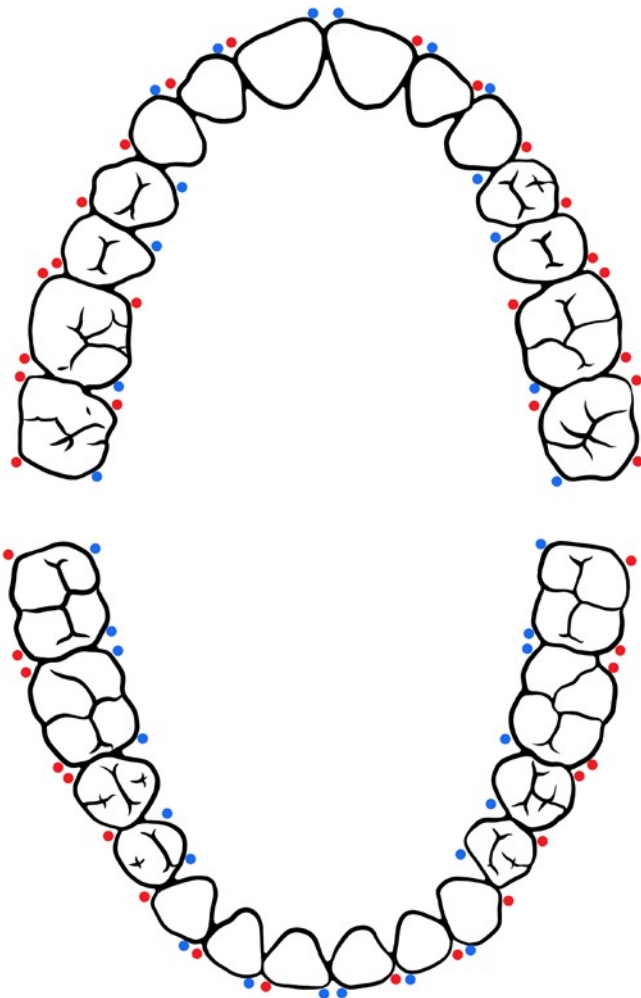
- Incisors – distally
- Premolars and molars – mesially and distally

### ADDITIONAL SITES:

When adequate anaesthesia is difficult to achieve during a prolonged procedure

### LEGEND:

- red – basic sites
- blue – additional sites



# Injection sites

in PDL anaesthesia

## Injection site examples

### BASIC SITES

on vestibular surfaces



Incisors - distally



Premolars and molars- mesially and distally



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### ADDITIONAL SITES

when adequate anaesthesia is difficult to achieve during a prolonged procedure



Molars - distally



Incisors - mesially

# Periodontal ligament (PDL) anaesthesia

(alveolodental ligament anaesthesia)

Programme 1



In the event of difficulties with injection in certain areas (e.g. distally to the second or third molar), the needle may be bent. Because it never travels to a depth of more than 1-3mm, bending is not as risky as in other anaesthetic techniques.

Fig. Needle deflection during anaesthesia in the molar region



## PRECAUTIONS AND POSSIBLE CAUSES OF FAILURE

- The needle should be kept in contact with the tooth to avoid excessive penetration into soft tissue, especially on the lingual side.
- Do not inject the solution directly into infected or acutely inflamed tissue.
- Do not exceed the recommended volume of the anaesthetic per injection site.
- Do not inject again at the same site or insert the needle at closely neighbouring points (risk of papillary necrosis)!
- Inserting the needle into the medial segment of the buccolingual surface may cause splintering or necrosis of the thin bone lamellae in the area.



## CONTRAINDICATIONS

- An infection or acute inflammation at the injection site may cause anaesthesia to fail: infection-related changes in the pH and the vascularisation of periapical tissues reduce the efficacy of local anaesthetics and the procedure may fail.

# Periodontal ligament (PDL) anaesthesia

(alveolodental ligament anaesthesia)

Programme 1

## ADVANTAGES

- Prevents numbness of the lips, cheeks and tongue, which makes it easier to treat more than one quadrant during a single session. Patient satisfaction is increased, as the effects of soft tissue anaesthesia are no longer felt for many hours after the procedure.
- Only a minimal dose of the anaesthetic (0.2ml per root) is needed to produce anaesthesia, which allows its toxicity to be reduced.
- Good alternative or supplement to incomplete nerve block anaesthesia;
- Rapid and profound anaesthetic effect in the pulp and the soft tissues (30-60s);
- Lower risk of trauma than in the case of conventional anaesthesia;
- Recommended for children (lower risk of self-injury, lower anaesthetic volume and lower toxicity).



## ADVANTAGES of using the Calaject system

- The procedure is painless thanks to the constant, fine-tuned, physiological flow rate
- The procedure is safe for tissues; the risk of complications is lower thanks to the tissue pressure and resistance control
- Assistance in needle insertion based on tissue resistance signals
- More effective delivery and a lower required dose – thanks to a customised delivery rate, the anaesthetic is absorbed gradually, penetrates the tissues and does not leak out of the periodontal space
- Comfortable use is ensured by a narrow ergonomic handle and remote foot controller. Thanks to the constant eye contact with the ampoule, the dentist can easily regulate the dose necessary for effective anaesthesia.

# Intraseptal anaesthesia

## Programme 1

### TARGET AREA

Bone, soft tissues, apical tissues and pulp near the injection site



### INDICATIONS

- Bone and soft tissue anaesthesia
- Post-curettage haemostasis
- Gingivoplasty procedures
- Whenever tissue inflammation in gingival grooves rules out a PDL injection

### PREPARATION

- DOSE:  
0.2-0.4 ml
- NEEDLES:  
short 27 needles



# Intraseptal anaesthesia

## Programme 1

### TECHNIQUE

1. Injection site: centre of the interdental papilla distally adjacent to the treated tooth (Fig. 1)
2. Orientation points: the papillary triangle, c. 2mm below the ridge, at an equal distance from both adjacent teeth
3. Needle bevel: toward the apex
4. Before the injection, use an antiseptic agent and surface anaesthetic (60s)
5. Stabilise the handle and position the needle:
  - in the coronal plane: at a 45° angle to the long axis of the tooth
  - in the sagittal plane: at a right angle to soft tissues (Fig. 2)
  - bevel oriented toward the apex of the tooth
6. Start delivery as the needle travels through the tissues, all the way to the bone.
7. Deposit 0.2-0.4ml of the anaesthetic solution (20s); for comparison, the volume of the rubber stopper roughly corresponds to 0.2ml of the solution
8. Evidence of efficacy:
  - resistance during delivery – observe the CALAJECT tissue resistance control system
  - no leakage
  - ischaemia in tissues at the injection site

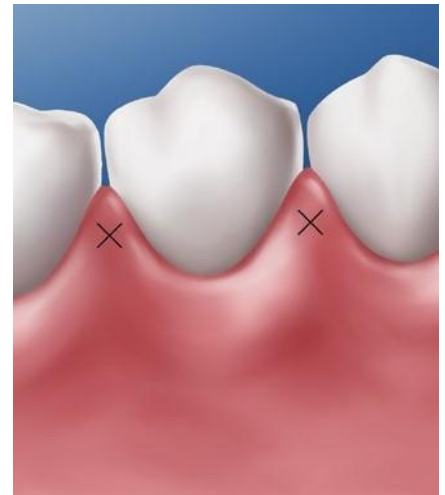


Fig. 1. Injection site

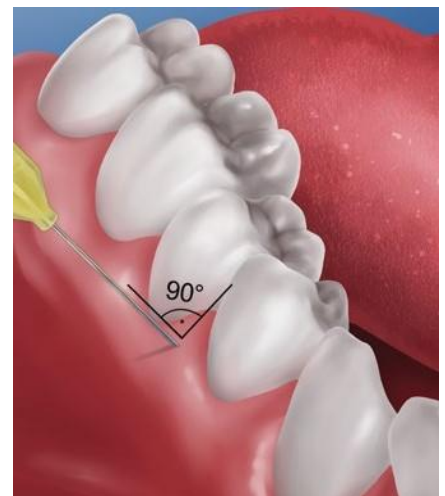


Fig. 2. Needle position

# Intraseptal anaesthesia

## Programme 1

### PRECAUTIONS AND POSSIBLE CAUSES OF FAILURE

#### Precautions

- do not inject the solution at an infected or inflamed site
- do not deliver large doses of the anaesthetic
- do not deliver too fast (20s)

#### Causes of failure:

- tissue infection or inflammation (lower pH reduces the efficacy of anaesthetic agents)
- solution leakage

### CONTRAINDICATIONS

- infection or acute inflammation at the injection site



### ADVANTAGES

- No anaesthetic effect in the tongue and lips
- Minimal volume of anaesthetic solution needed
- Minimal bleeding during surgery (haemostasis)
- Atraumatic
- Immediate anaesthetic effect (30s)
- Useful in the presence of lesions in periodontal tissues (to avoid infected pockets)

### ADVANTAGES of using the Calaject system

- Quick anaesthetic effect
- May be performed where contraindications for PDL exist (gingival pocket infection)
- Only a small volume of the anaesthetic is enough to produce the effect

# Intrapulpal anaesthesia

## Programme 1

### TARGET AREA

Pulp of the target tooth.  
Target nerves: nerve branch terminals at the injection site into the pulpal chamber and canals



### INDICATIONS

- Pain management during endodontic treatment where other methods have proved ineffective
- In pulpal infections, injecting the anaesthetic directly into the chamber ensures effective anaesthesia for pulp extirpation and instrumentation

### PREPARATION

- DOSE:  
0.2-0.3ml
- NEEDLES:  
depending on the clinical situation: short 25G or long 27G needles

Intrapulpal injections reduce pain thanks to the pharmacological action of the local anaesthetic and the pressure created.

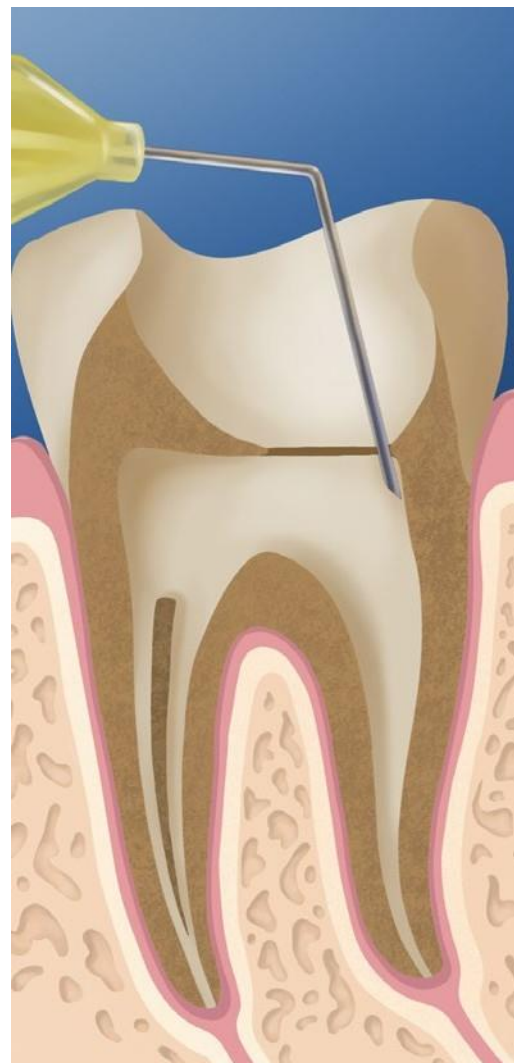


Fig. 1. Needle position for intrapulpal anaesthesia

# Intrapulpal anaesthesia

## Programme 1

### TECHNIQUE

1. Introduce the needle into the pulpal chamber at the outlet of the root canal (Fig. 1 p. 19).
2. Wedge the needle tightly into the root canal or the chamber; if the needle does not fit into the canal despite bending, the solution will be deposited into the chamber or canal. The effect is then produced only by the pharmacological action of the anaesthetic, without the use of pressure anaesthesia. The bending is not dangerous as the needle is not inserted into soft tissues and may be easily removed if it breaks.
3. Deposit the anaesthetic under pressure (0.2-0.3ml); if there is a leak, add more solution.
4. You should feel tissue resistance when delivering the solution (displayed by the LED indicator in the main Calaject panel).
5. A short phase of hypersensitivity will follow and then anaesthesia will take effect.
6. You can start the procedure after c. 30 seconds.

If pain persists and makes access to the pulpal chamber impossible:

- Apply a cotton ball soaked in a local anaesthetic to the floor of the chamber
- Wait 30s and press the cotton ball onto the exposed pulp
- The area may initially become hypersensitive; anaesthesia will take effect in 2-3 minutes
- Remove the cotton ball, open access to the pulp, and perform intrapulpal anaesthesia

### PRECAUTIONS AND POSSIBLE CAUSES OF FAILURE

Precautions:

- do not inject into infected tissue
- do not inject too fast (for at least 20s)
- do not deliver a large dose of the solution (0.2-0.3ml)

Causes of failure:

- tissue infection or inflammation
- loss of solution, leakage

### Advantages of using the Calaject system

- Effective delivery thanks to a constant, fine-tuned flow rate and pressure control
- Creates the effect of pressure anaesthesia difficult to achieve with a traditional syringe
- Shorter period of hypersensitivity during injection

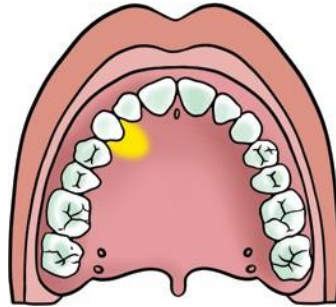
# Palatal infiltration

## Programme 1

### PALATAL INFILTRATION (supraperiosteal)

#### TARGET AREA

The tooth, soft tissues and the palatine bone adjacent to the injection site



#### INDICATIONS

- Procedures performed on maxillary teeth, soft tissues, and the palatine bone, where a palatine nerve block is needed.
- Whenever 1-2 teeth are treated during a single procedure.

#### PREPARATION

- DOSE:  
0.45-0.6ml
- NEEDLES:  
Long 27G and short 30G needles. Size 25 is recommended for all injection techniques at highly vascularised sites or if there is a high risk of needle deflection within the soft tissue.

Highly cohesive palatal mucous membrane, a thin layer of submucosa or its lack requires special caution when delivering the anaesthesia to make sure it is painless and effective.

The Calaject system allows the appropriate anaesthetic pressure to be created for the solution to permeate through the alveolar bone. The bone around the tooth root forms a barrier with small openings. If the solution is delivered at the right pressure, and at a constant, low, flow rate, it will travel through the openings and penetrate the bone.

# Palatal infiltration

## Programme 1

### TECHNIQUE

1. Apply surface anaesthesia to the injection site (press for 2 minutes)
2. Perform pressure anaesthesia before and while you insert the needle, as well as when delivering the solution
3. Control the position of the needle
4. Deliver the anaesthetic agent slowly (0.45-0.6ml is needed), at a rate of 1/4 to 1/3 of the ampoule over 15-30 seconds. Slow delivery helps prevent pain. If the solution is delivered too fast, the pressure will increase and tissues may detach from the bone (thin or lacking submucosal layer), which may cause pain during and after injection
5. When performing anaesthesia in the vicinity of the incisive canal (PASA), remember about aspiration
6. Use additional techniques (description on page 8):
  - a. Pre-injection
  - b. Anaesthetic pathway
  - c. Bi-rotational needle insertion



Fig. 1. Surface and pressure anaesthesia

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### Advantages of using the Calaject system

- Calaject is fitted with a pen-grip handle, which enables needle rotation and position control during the injection
- Constant flow rate and tissue resistance control

# Palatal anaesthesia / AMSA

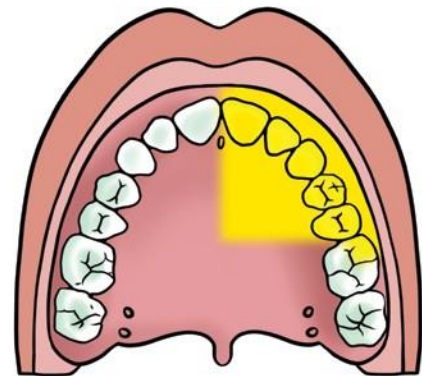
## Programme 1

### AMSA

(anterior and middle superior alveolar anaesthesia)

#### TARGET AREA

- Pulp of maxillary teeth: incisors, cuspids, premolars and molars (with a single injection per quadrant)
- Buccal surfaces of the surrounding gingiva (without the lips)
- Adjacent gingival tissue on the palatine side, from the midline to the free gingival margin



#### INDICATIONS

- Periodontal procedures (scaling, root planning)
- Conservative aesthetic treatments, where the smile line is essential
- Where infiltration proves ineffective (e.g. due to high bone density)

#### PREPARATION

- DOSE:  
c. 1.4-1.8ml
- NEEDLES:  
short 27G (or 30G) needles

# Palatal anaesthesia / AMSA

## Programme 1

### TECHNIQUE

1. Inform the patient about the length of the delivery procedure and the strong pressure that will be applied to the palate during the injection
2. Injection site: on the hard palate in the middle of the line that connects the median palatine suture with the free gingival margin
3. Needle position: the bevel resting on the surface of the epithelium at a 45° angle to the palate
4. Use the pre-injection or anaesthetic pathway technique
5. Deliver the anaesthetic at a slow rate (Programme 1)
6. Insert the needle slowly
7. Once the tissue turns pale, perform aspiration and deliver the anaesthetic at a dose adapted to the patient
8. Evidence of effective anaesthesia: a sense of increased tension and numbness of teeth and palatal tissues (from the medial incisor to the second premolar; tissue ischaemia near the injection site; no numbness in the lips or facial tissue)



### PRECAUTIONS AND POSSIBLE CAUSES OF FAILURE

- If the anaesthetic is delivered too fast, it may cause ischaemia (do not use vasoconstrictors at concentrations of 1:100000 and more) or palatal ulcers
- Due to the long delivery time, the technique is not recommended for patients with maxillary and mandibular joint disorders
- Leakage may occur in patients with very dense tissues



### CONTRAINDICATIONS

- Thin palatal soft tissue
- Patients who cannot tolerate longer anaesthetic delivery times (3-4 minutes)



### Advantages

- One injection is sufficient for several teeth
- Easy to perform
- Lower amount of anaesthetic and fewer injections needed in extensive maxillary treatments
- No numbness in the upper lip and facial muscles



# Palatal anaesthesia / P-ASA

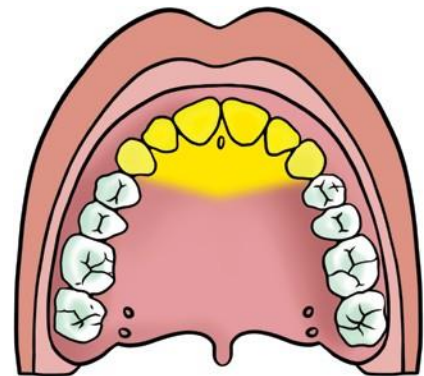
## Programme 1

### P-ASA ANAESTHESIA

(palatal-approach anterior superior alveolar nerve block, anterior infiltration)

#### TARGET AREA

- Pulp of medial and lateral incisors, and partially cuspids
- PDL as above



#### INDICATIONS

- Procedures on anterior maxillary teeth and soft tissues
- Aesthetic treatments that require the evaluation of the smile line
- Bilateral anaesthesia of anterior maxillary teeth with a single injection
- Plaque removal, periodontal treatments in the anterior maxilla

#### PREPARATION

- DOSE:  
0.45 – 0.6ml
- NEEDLES:  
short 27G or 30G needles

# Palatal anaesthesia / P-ASA

## Programme 1

### TECHNIQUE

1. Inform the patient about the length of the anaesthetic delivery procedure and the strong pressure that will be applied to the palate during the injection
2. Injection site: lateral to the incisive papilla in the papillary sulcus
3. Needle position: bevel resting on the surface of the epithelium at a 45° angle to the palate
4. Insert the needle slowly
5. Slowly deliver the anaesthetic (Programme 1)
6. Perform aspiration
7. Continue at a slow rate and maintain contact with the bone
8. Evidence of effective anaesthesia: strong pressure and anaesthesia in the anterior palate; tooth numbness from the right to the left maxillary incisor; pale palatal tissue from on cuspid to the other. No numbness in the upper lip or face should be observed.

### PRECAUTIONS AND POSSIBLE CAUSES OF FAILURE

- If the anaesthetic is delivered too fast, it may cause ischaemia (do not use vasoconstrictors at concentrations of 1:100000 and more) or palatal ulcers
- Leakage may occur in patients with very dense tissues

### CONTRAINDICATIONS

- Patients with very long cuspid roots
- Patients who cannot tolerate long delivery times P(3-4 minutes)

### Advantages

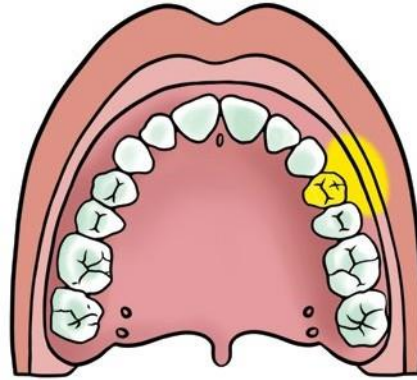
- Eliminates unpleasant numbness in the upper lip and facial muscles
- One injection is enough for bilateral anaesthesia
- Single injection is sufficient
- Minimal anaesthetic dose as compared with traditional techniques

# Infiltration anaesthesia

## Programme 2

### TARGET AREA

Terminal nerve branches that supply the pulp and the soft tissues distally from the injection site.



### INDICATIONS

- Maxillary tooth pulp anaesthesia
- Mandibular incisor and cuspid anaesthesia
- Soft tissue anaesthesia in surgical procedures performed on a limited, small area

### PREPARATION

- DOSE:  
adjusted to each individual patient
- NEEDLES:  
short 25G or 27G needles

Infiltration anaesthesia involves delivering an anaesthetic solution to small terminal nerve branches to prevent pain signals from being transmitted from the tooth to the CNS.



# Infiltration anaesthesia

## Programme 2

### TECHNIQUE

1. The injection and deposition site is located at or near the apex of the target tooth.
2. Injection site: top of the medial buccal flap above the apex of the target tooth
3. Tissue preparation at the injection site:
  - Cleanse the area with a surface antiseptic
  - Apply a surface anaesthetic for c. 60 seconds
4. Lift the lip to ensure adequate tissue tension
5. Press the pedal to squeeze out a drop of the anaesthetic onto the needle tip
6. Position the needle with the bevel facing the bone
7. Place the needle and the handle parallel to the long axis of the tooth
8. Touch the mucous membrane near the top of the medial buccal flap above the target tooth
9. Very slowly, insert the needle and start depositing the fluid until the needle reaches the apex of the tooth root or the area just above. The needle should not encounter any resistance during the injection; this means that it stays inside the soft tissue and the patient does not feel any discomfort
10. Perform aspiration
11. Observe the injection site as you deposit the fluid ( tissue oedema must be prevented)
12. If the delivery rate increases and elicits a patient reaction, press the pedal again to revert to the slow delivery mode (first 20 seconds – do not deliver more than 1/3 of the ampoule)
13. Pull out the needle slowly and securely put it back into the cap
14. Wait 1-3 min. before you start the procedure.



### PRECAUTIONS AND POSSIBLE CAUSES OF FAILURE

Precautions:

- Infection, inflammation at the injection site

Causes of failure:

- The tip of the needle placed below the apex of the tooth
- The tip of the needle placed too far away from the bone (the solution was delivered to buccal tissues)
- Pain may occur if the needle tip touches the periosteum and causes it to detach from the bone!

# Infiltration anaesthesia

## Programme 2

### CONTRAINDICATIONS

- Infection or acute inflammation at the injection site
- Dense bone covering the tooth apices (the first maxillary molar in children, medial maxillary incisor)
- Lower efficacy in maxillary molars because of the thick lamella and a more median position of the nerves
- Larger target area (multiple injections and a larger volume of the anaesthetic solution are required)



### Advantages

- Technically easy to perform
- High success rate
- No patient discomfort

### Advantages of using the Calaject system

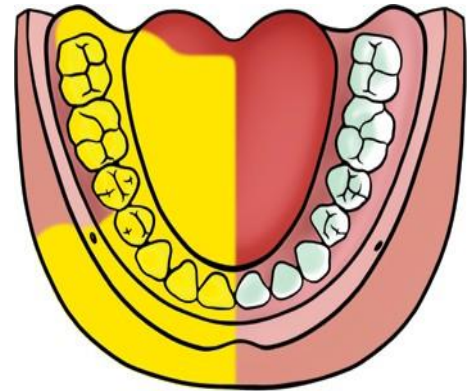
- Low initial flow rate (lesser discomfort)
- Safe and easy aspiration
- Tissue resistance control
- Comfortable, ergonomic pen-grip handle

# Nerve block anaesthesia

## Programme 3

### TARGET AREA

- Mandibular teeth up to the median line
- Anterior 2/3 of the tongue and the floor of the oral cavity
- Lingual soft tissues and the periosteum
- Buccal mucous membrane anterior to the first molar
- Body of the mandible
- Inferior mandibular branch



### INDICATIONS

- Procedures on several mandibular teeth in one quadrant
- Anaesthesia of lingual soft tissues
- Anaesthesia of buccal soft tissues

### PREPARATION

- DOSE:  
1.7ml
- NEEDLES:  
long 25G needles



### Inferior alveolar nerve block

The success rate of block anaesthesia in the mandible stands at 80-85%, due to the higher density of the alveolar bone lamella, limited access to the inferior alveolar nerve and large anatomical diversity.

# Nerve block anaesthesia

## Programme 3

### TECHNIQUE



Fig. 1.

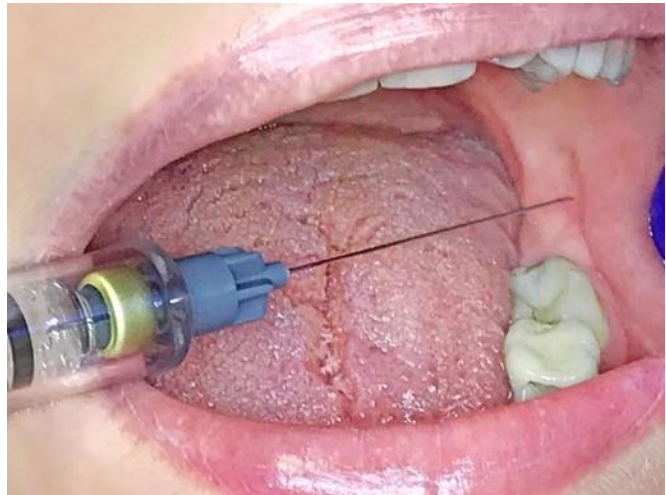


Fig. 2.

1. Handle grip: the pen grip is recommended for greater safety and precision control. Ensure several support points; the handle should be grasped close to the needle  
If the procedure targets molar teeth, the handle can be grasped at a greater distance from the needle. To balance the weight of the handle, it should be held as vertically as possible.
2. Dry the mucous membrane, and then apply an antiseptic and a surface anaesthetic.
3. Injection site: mucous membrane on the medial surface of the mandibular branch (fig. 2).
4. Place the needle at the intersection of 2 points: point 1 lies on a horizontal line that runs from the coronoid process to the deepest segment of the pterygomandibular suture, at a point where it bends up toward the palate; point 2 lies on the vertical line drawn through point 1, at 3/4 of the distance from the anterior mandibular branch (fig. 1).
5. Insertion depth: introduce the needle slowly until you reach the bone. As you insert the needle, slowly deliver the anaesthetic.

# Nerve block anaesthesia

## Programme 3

### TECHNIQUE



Fig. 1.

#### 8. Correcting needle insertion:

- If you reach the bone too early (before less than half of the needle length is inserted), this means the tip of the needle is placed too far forward on the branch (laterally). To correct the position of the needle: pull the needle back slightly, but do not take it out, then turn the tip toward the anterior mouth, above the cuspid or lateral incisor on the opposite side. This will help you to modify the position of the needle until it is inserted to a correct depth. The tip of the needle should now be posterior to the mandibular sulcus.
- If you never reach the bone at all, this usually indicates that the tip of the needle is placed too far away (medially). To correct the position of the needle, pull the needle back slightly, but do not take it out (leave c. ¼ of its length inserted), place the handle in a more posterior position above the mandibular molars, then continue to insert the needle until you reach the bone at a correct depth (20-25mm).

9. When you reach the bone, pull the needle back by c. 1mm to avoid a subperiosteal injection.

10. Perform aspiration. If the result is negative, take at least 60 seconds to deposit 1.5ml of the solution.

11. Pull out the needle slowly; when half of its length is still inserted, repeat the aspiration – if the result is negative, apply 0.1ml of the solution to anaesthetise the lingual nerve.

12. Pull out the needle slowly and put it back into the cap.

13. Wait c. 3 minutes before you start the procedure.

6. The mean insertion depth before the needle reaches the bone is 20-25mm, which corresponds to 2/3- ¾ of the length of a long dental needle.

7. The needle tip should be placed slightly upwards from the mandibular orifice (the orifice cannot be seen or felt) (fig. 1).



# Nerve block anaesthesia

## Programme 3

### PRECAUTIONS AND POSSIBLE CAUSES OF FAILURE

Precautions:

- Always deposit the solution after aspiration and in contact with the bone.

Causes of failure:

- The anaesthetic has been deposited too low (below the mandibular foramen). Correction: repeat the injection at a higher site.
- The solution has been deposited too far (laterally) along the mandibular branch, when the needle has not penetrated the tissue to an adequate depth. Correction: redirect the tip of the needle toward the posterior area.

If anaesthesia is incomplete, an extra PDL injection may be performed.

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### CONTRAINDICATIONS

- Infection or acute inflammation at the injection site
- Mentally disabled children and adults, where there is a risk of tongue and lip biting (self-injury)

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### Advantages

- The inferior alveolar nerve block is particularly useful for producing an anaesthetic effect in teeth, soft tissue, and mandibular bones within a single quadrant.

### Advantages of using the Calaject system

- Painless injection at a slow delivery rate
- Safe and easy aspiration
- Tissue resistance control
- Comfortable, ergonomic pen-grip handle

# Local anaesthesia in paediatric dentistry



Today, local anaesthesia is a safe and effective pain management method performed during all dental procedures, which allows the building of a positive patient-doctor relationship, especially with children and teenagers. When dealing with young patients, it is particularly important to avoid treatment-related pain and prevent the development of dentophobia.

## To ensure the safety of anaesthesia in children:

- select the anaesthetic agent corresponding to the type, duration and extent of target treatment
- choose a dose that produces analgesia and minimises its toxicity
- use a technique adapted to the type of treatment.

Local anaesthesia in children is similar to that used in adults. However, certain anatomical differences in the maxillary and mandibular bone structure should be kept in mind; attention should also be paid to the special pharmacokinetics of the drugs used in children.

Children's bones are less dense, which enables a faster and more effective diffusion of the anaesthetic solution. The needle can also be inserted to a lesser depth.

**In order to perform local anaesthesia in children, consent must be obtained from the patients (aged over 16) and their parents/guardians.**

# Local anaesthesia in paediatric dentistry

To reduce patient stress and fear, use a special technique such as, e.g. minimal sedation, before you deliver local anaesthesia.

**For the comfort and safety of your young patient, use techniques that are as non-invasive and atraumatic as possible:**

- deliver local anaesthetics at room temperature or heat them up to 36°C
- deliver the anaesthetic slowly (c. 1ml/min.), at a low pressure
- split the dose to avoid high drug concentrations
- perform aspiration during every injection to avoid complications associated with intravascular delivery
- with children, a larger volume and rapid absorption into the bloodstream may lead to drug accumulation and increase the risk of overdose
- the total dose includes the surface and the injected anaesthetic
- currently available anaesthetics do not cause adverse incidents and side effects that would limit their use in children



**Please note:**

Children with atopy may be more sensitive to surface anaesthetics (esters) than injected solutions (amides).

In patients with liver and kidney disease, lower the dose and use a vasoconstrictor to reduce the systemic absorption rate and minimise toxicity.

# Calaject for local anaesthesia in paediatric dentistry

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## MAXILLARY TOOTH ANAESTHESIA IN CHILDREN:

- deciduous teeth and the first permanent molar: infiltration anaesthesia (Programme 2)
- palatal anaesthesia:
  - injection into the interdental papilla: once the buccal surface is anaesthetised, introduce a short 27G needle into the buccal papilla right above the interdental septum; as you push the needle toward the palate, inject the anaesthetic until the tissues turn pale. A slow delivery rate (Programme 1) enables the physiological diffusion of the drug and eliminates pain. It also allows the particularly unpleasant palatal infections in children to be avoided!
- there is usually no need to perform a superior alveolar nerve block
- high success rate of PDL anaesthesia in surgical procedures (extractions) and conservative treatments

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## MANDIBULAR TOOTH ANAESTHESIA IN CHILDREN:

- deciduous mandibular teeth: infiltration anaesthesia (Programme 2)
- inferior alveolar nerve block (if necessary) – (Programme 3)
  - mandibular foramen – at the level of the occlusal plane (in adults, moved up by a mean of 7.4mm from the plane)
  - the handle is placed above the first molars on the opposite side of the mouth
  - the needle is inserted to a depth of 15mm
  - before delivery – bone contact and aspiration
  - the lower the position of the mandibular foramen, the greater the chances of success
  - in light of the high risk of self-injury to buccal, labial and lingual tissues, it is only recommended in exceptional cases when all other techniques have failed

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## PDL ANAESTHESIA:

- successfully used in children
- allows long-lasting and profound anaesthesia in a single tooth, without causing numbness in soft tissues

# Local anaesthesia in paediatric dentistry

## Guidelines for local anaesthesia in children:

- infiltration and PDL anaesthesia may be safely performed in children and youth with coagulopathies
- nerve block injections may increase the risk of haemorrhage
- it is essential to choose techniques that limit the target site, duration, and dose of anaesthesia (lower toxicity and risk of self-injury)
- aspiration is necessary after every injection
- nerve block injections are not recommended in children and teenagers with fibrodysplasia ossificans progressiva (infiltration or PDL anaesthesia may be performed instead)
- PDL and intraosseous injections increase the risk of bacteraemia (and require antibacterial prophylaxis in patients with an elevated cardiac risk)



# Local anaesthesia in children – advantages of the computer-controlled Calaject system

## Advantages of using the Calaject system:

- The fine-tuned, physiological delivery rate ensures effective anaesthesia without causing a sense of discomfort, which is particularly crucial in the treatment of children. If the anaesthetic is applied too fast (with a syringe or carpule), it may push the tissues apart and cause pain; as a consequence, negative associations may cause fear and make dental visits more difficult in the future.
- The solution is deposited at the target site with high precision and adjacent tissues are not extensively affected, which is often the case with traditional techniques, which can make the child feel afraid, cry and refuse to cooperate during the treatment. PDL injections also reduce the risk of self-injury.
- The syringe, with its negative associations, is replaced by a handle that resembles a pen: not only does it help alleviate fear, but also enables an ergonomic pencil grip and improves precision.
- When dealing with anxious children, consider using a sound signal to help them calm down or turn their attention away from the procedure, e.g. by a countdown. The signal makes children focus on the device instead. You can also adjust the sound volume according to need.
- If a child begins to grow impatient during slow delivery (e.g. in PDL anaesthesia), you can increase the flow rate to 0.04ml/s and reduce injection time.
- Using the CALAJECT system allows the volume of the anaesthetic (lower toxicity) to be reduced, minimising discomfort during and after injection, and using anaesthetic techniques that are difficult to perform with traditional methods. In order to better prepare the child for computer-controlled anaesthesia, consider using special information materials in the form of comic strips.

**More information: [calajectkids.com](http://calajectkids.com)**



# Calaject anaesthesia - a short overview of available programmes

## PROGRAMME 1

for PDL, palatal, intraseptal and intrapulpal anaesthesia

Use your foot to press and keep down the pedal to start the slow delivery procedure. You can increase the flow rate by lifting your foot off the pedal and quickly pressing it again.

AUTOPILOT (only available in Programme 1): if the sound signal becomes lower after 5 seconds, take your foot off the pedal and continue the delivery. To stop the procedure, click the controller.

**TIP:** During injection, you should be able to feel gentle tissue resistance and observe the gingiva at the injection site turn pale. As you deliver the anaesthetic, monitor tissue resistance on the LED indicator – if the needle is inserted correctly, it should fall in the middle of the scale.

**IN SUM:** Slow insertion and anaesthesia, autopilot, regulated flow rate.



## PROGRAMME 2

for infiltration anaesthesia

Use your foot to press and keep down the pedal to start the slow delivery procedure. For the first 10 seconds, the drug will be delivered at a slow speed; the flow rate will then steadily increase over the following 5 seconds. Before you increase the speed, remember to perform aspiration. After aspiration (pause), CALAJECT will repeat the same sequence: 10 seconds of slow delivery, followed by a gradual increase up to the mean speed.

**TIP:** for the most sensitive patients, prolong the initial slow delivery time by introducing additional pauses.

**IN SUM:** Slow injection and anaesthesia, aspiration, repeat delivery with automatically increasing speed.



## PROGRAMME 3

for nerve block anaesthesia

Use your foot to press and keep down the pedal to start the slow delivery procedure. Before increasing the flow rate, perform ASPIRATION. To increase the speed, lift the foot off the pedal slightly and quickly press it again. The flow rate will increase gradually, reaching a high speed after 5 seconds. In Programme 3, the system remembers the last selected flow rate.

**TIP:** before cranking up the speed, make sure to anaesthetise the injection site properly at a slow rate.

**IN SUM:** Slow insertion and anaesthesia, aspiration, repeat delivery, regulated flow rate.

# calaject™

## Computer-controlled anaesthesia

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