Injection technique

- Posterior superior alveolar nerve block (PSA)

Posterior Superior Alveolar N. Block (PSA)

- 72% of mesiobuccal root of 1st molar will be anesthetized
- Injection height: Mucobuccal fold above the maxillary 2nd molar
- Bevel: Toward bone
- Depth: 16mm
- Aspirate
- Positive aspiration: 3.1%
- Pterygoid Plexus of Vein (short needle)
- Success rate >95%

- Upward- Direct needle superiorly at a 45 degree angle to occlusal plane
- Inward- Direct needle medially toward midline at 45 degree angle to occlusal plane
- Backward- Direct needle posteriorly at a 45 degree angle to long axis of the second molar
Disadvantages

- Risk of hematoma
- No bony landmarks
- Second injection may be required
- Positive aspiration: 3.1%

Middle Superior Alveolar N. Block (MSA)

- Insertion of needle: 2nd premolar mucobuccal fold
- Bevel: Toward bone
- Anesthetized: 1st, 2nd premolar, mesial root of the 1st molar

Injection Technique

- Infra-orbital nerve block
  - Intraoral approach
  - Extraoral approach

Anterior Superior Alveolar N. Block (ASA) (Infraorbital N. Block)

- Anesthesia: Pulp of the maxillary central incisor through the canine on the injection side
- 72% of patients, pulp of Mx. premolars and mesiobuccal root of the 1st molar
  - (only 28% of population present MSA nerve)
- Area of Insertion: over the first premolar
- Target: infraorbital foramen
- Needle length: 16 mm
- Deposit: 0.9 – 1.2 mL

Infraorbital Nerve Block
Palatal Anesthesia

Traumatic experience
Pain – discomfort
Topical anesthesia
Pressure anesthesia
  - Cotton applicator stick
  - Handle of a mouth mirror
  - Ischemia (blanching)
Deposit solution slowly
Finger rest. Elbow rest.

Nasopalatine N. Block

• Through the palate
• Through the labial

Nasopalatine N. Block

Two approaches:
  i) Palatal: lateral to the incisive papilla
     Anesthetized: anterior portion of the hard palate (soft & hard tissues) from the both sides
     of mesial of 1st premolar
     Advance needle toward foramen (5mm)
     Continue to deposit small amount of anesthetic throughout the procedure (any injections)
     Deposit: 0.45 mL
  ii) Labial approach (2-3 injections)
     a) inject labial frenum
     b) interdental papilla
     c) possible lateral to the incisive papilla
Greater Palatine N. Block

- Extended neck
- Open wide
- Find the depression (distal to the 2nd molar)
- Depth < 10mm
- 0.45 – 0.6mL
- Anesthetized: distal of 1st premolar
  (Hard and Soft tissue)

Maxillary Nerve Block

(2nd Division Nerve Block)

Area anesthetized: Hemimaxilla
Deposit: 1.8ml
Two approaches
1) High-tuberosity approach
   pterygopalatine fossa
   depth: 30mm
1) Greater palatine canal approach
   through the greater palatine foramen
   depth: 30mm
Mandibular Injection Techniques

- Inferior Alveolar N. Block (IAN)
- Lingual Nerve Block
- Gow-Gates (V₃)
- Vazirani-Akinosi
- Mental N. Block
- Incisive N. Block
- Long Buccal N. Block
- Infiltration

Pain and anxiety Control
**Anatomy**

**The Needle**
- Gauge: the larger the gauge the smaller the internal diameter of the needle
  - 25g red cap
  - 27g yellow cap
  - 30g blue cap
- Long Needle: 32mm
- Short Needle: 20mm
- Differences by manufacturer

**Injection technique**
- Inferior alveolar nerve block

**Inferior Alveolar N. Block (IAN)**
- Most frequently used
- Positive aspiration 10 – 15%
- Height of injection: 6 – 10mm above the occlusal plane
- Landmark: coronoid notch, pt. pterygomandibular raphe, occlusal plane etc

**Inferior Alveolar N. Block (IAN) cont.**
- Target area: Before alveolar N. enter into the foramen
- Depth: 20 – 25mm
- If bone is contacted too soon:
- If bone is not contacted:
- Lingual N: Deposit small amount of anesthetic upon withthrouing to anesthetized lingual N.

*Remember lower incisor region overlaps of sensory fibers from the contralateral side.*
Inferior Alveolar N. Block (IAN)

Clinical failure rate: 15-20%
(anatomical variation, depth of soft tissue, height of mandible foramen)
Avoid, if possible, bilateral IAN
Anesthetized area:
Position of patient: supine or semisupine
Location of needle tip: superior to the mandibular foramen
Deposit = 1.5mL

Signs and Symptoms

- Tingling and numbness of lower lip
- Tingling and numbness of tongue
- Elimination of pain
Injection technique

- Remember – Always aspirate before injection!

Failure of Anesthesia (IANB)

1). Deposition of anesthetic too low, too anteriorly
2). Accessory innervation
   - Mylohyoid Nerves
   - Overlapping fibers of the contralateral alveolar nerve

Complications of IANB

1). Hematoma
2). Trismus
3). Transient facial paralysis

Injection Technique

- Gow-Gates Block

Mandibular Nerve Block

(Gow – Gates technique)

1973: George Gow-Gates from Australia described true mandibular n. block

Success rate : >95% (IAN: 80-85%)
Aspiration rate: < 2%(IAN 10-15%)

Gow-Gates Technique

- Distribution of V3
- Target area: Lateral side of the condylar neck
- Landmark: Intertragic notch, corner of the mouth, mesiolingual cusp of maxillary 2nd molar
- Penetration: Distal to the Mx 2nd or 3rd molar
- Height: Mesiolingual cusp of Mx 2nd molar
  (10 – 25mm from occlusal plane)
- Depth: 25mm
- Deposit: 1.8ml
- Time of onset: 5-10”(IAN 3-5”)
- Bone is not contact – no deposit anesthetics
  move the syringe distally
- Keep the mouth open: 1-2”
Varizani-Akinosi Closed-mouth Mandibular Block

- Trismus: Extraoral mandibular block
- 1960: Varizani described technique
- 1977: Dr. Joseph Akinosi – Useful for patient with trismus
- Insertion: Height of the mucogingival junction adjacent to the maxillary 3rd molar
- Depth: 25mm
- Deposit: 1.5-1.8mL
Injection technique

- Long buccal block

Long Buccal Nerve Block

Anesthetized: Soft tissue and periosteum buccal to the mandibular molar teeth
Indications: Scaling, curettage, the use of rubberdam clamp, subgingival tooth preparation, place of matrix band
Insertion: Distal, Buccal of last molar
Length of needle penetration: 1-2 mm
Deposit: 0.3mL
Velvel: Toward the bone
Landmark: Mucobuccal fold
Long Buccal Injection Technique

- Mental nerve block

Mental Nerve Block

- Indications: when buccal soft tissue anesthesia is necessary for procedures in the mandible anterior to the mental foramen
- Area anesthetized: buccal mucous membrane anterior to the mental foramen, lower lip and chin
- Technique: 25-27 gauge short needle
- Least frequently employed
Mental Nerve Block

Area of insertion: mucobuccal fold at or just anterior to the mental foramen
Target area: between the apices of the two premolars
Patient’s mouth: partially closed
Located the mental foramen
Radiograph
Clinical exam
Depth: 5-6mm
Deposit: 0.6mL
Bevel: Toward the bone

Incisive Nerve Block

Indications
• Pulpal anesthesia to teeth anterior to mental foramen
• When inferior alveolar nerve block is not indicated

Incisive N. Bloc

Lingual soft tissue are not anesthetized
Local infiltration through the interdental papilla or partial lingual N. block
Not necessary for the needle to enter into the foramen
Area anesthetized: buccal mucosa, lower lip, pulp of the teeth
Deposit = 0.6 mL
Depth of penetration: 5-6mm

Supplemental Injection Techniques

Periodontal ligament injection (PDL)
Intraseptal
Intraosseous (IO) technique
Intrapulpal injection
Chart Notation for Local Anesthesia

- Give drug name
- Give volume
- Give dosage
- Give location of injection
- Give concentrations
  - local anesthetic agent
  - vasoconstrictor

Lack of profound anesthesia

- Regional block
  - Attempt Gow Gates or higher level IAN
- Deposit more local anesthetic
  - overdose precautions!!
- Use of articaine, prilocaine
  - contraindicated in regional blocks
- PDL, intrapulpal injections
- Consider adjuncts
  - nitrous oxide
  - sedation
- Terminate procedure
  - consider conscious sedation/ GA

LOCAL complications

TRISMUS

- Cause (IAN/Akinosi/Gow Gates)
  - intramuscular injection (Med. Pterygoid, temporalis)
  - Hemorrhage
  - Barbed needle
  - Contamination by alcohol or sterilant
- Treatment
  - Moist towel 20mins/hr
  - Physiotherapy
  - Analgesics &/or muscle relaxants
  - Rule out infection

Complications of LOCAL ANESTHETICS

COMPLICATIONS

Lack of profound anesthesia

- Regional block
  - Attempt Gow Gates or higher level IAN
- Deposit more local anesthetic
  - overdose precautions!!
- Use of articaine, prilocaine
  - contraindicated in regional blocks
- PDL, intrapulpal injections
- Consider adjuncts
  - nitrous oxide
  - sedation
- Terminate procedure
  - consider conscious sedation/ GA

LOCAL complications

Needle breakage

- Cause
  - Unexpected movement by patient
  - Needle size
  - Needle manipulation
- Treatment
  - DO NOT PANIC !
  - visible → remove
  - Not visible → refer to OMFS

LOCAL complications

TRISMUS

- Cause (IAN/Akinosi/Gow Gates)
  - intramuscular injection (Med. Pterygoid, temporalis)
  - Hemorrhage
  - Barbed needle
  - Contamination by alcohol or sterilant
- Treatment
  - Moist towel 20mins/hr
  - Physiotherapy
  - Analgesics &/or muscle relaxants
  - Rule out infection

LOCAL complications

Hematoma

- Cause
  - Arterial or venous disruption
  - Less common in palate
- Treatment
  - KNOW your anatomy (esp. PSA, IAN, mental nerve)
  - Pressure application to site
  - Analgesics
  - Heat application (>6 hours post-injection à vasodilatory)
LOCAL complications

Pain on injection

- Causes
  - pH of local anesthetic (~pH 5.0)
  - Temperature of local anesthetic
  - Rapid injection technique
  - Contamination with alcohol/sterilant
- Treatment
  - Careful administration
  - Transient discomfort

LOCAL complications

Persistent anesthesia/ Paresthesia

- Cause (up to 22% incidence in select cases)
  - Trauma to neural sheath
  - Perineural hemorrhage
  - Articaine and Prilocaine in regional blocks
- Treatment
  - Prevent self-inflicted injury (stickers, short LA)
  - Resolution in 8wks
  - Persistent (>2 months)
    - document degree and extent
    - Refer to OMFS within 3 months for consultation

LOCAL complications

CN VII Paralysis

- Cause
  - Deposition into parotid gland
  - Branches of CN VII
    - Temporal
    - Zygomatic
    - Buccal
    - Marginal mandibular
    - Cervical
- Treatment
  - Transient paralysis
  - Protect cornea

LOCAL complications

Epithelial Desquamation

- Cause
  - Prolonged use of topical anesthetic
  - High concentration of vasoconstrictors
  - Predominantly in palatal mucosa
- Treatment
  - Resolution in 7-10 days
  - Analgesics
  - Na bicarbonate, saline or Peridex mouthrinse

LOCAL complications

Edema

- Cause
  - Trauma
  - Infection
  - Hemorrhage
  - Angioedema (allergy)
LOCAL complications

Treatment
- Analgesics
- Antibiotics (infection)
- Oral antihistamines (allergy)
- Airway compromise
- Activate emergency medical service (911)

SYSTEMIC COMPLICATIONS

Allergy to local anesthetic
- **Cause**
  - PABA in esters
  - Metabisulfite preservatives in vasoconstrictor-containing local anesthetics
  - Sulfa allergy (articaine)
  - Latex

- **Treatment**
  - Obtain accurate history
  - 1% diphenhydramine c 1:100,000 epi
  - Consider GA

Causes of LA toxicity

- **Overdose**
  - 2% lidocaine c 1:100,000 epi
    - 7mg/kg adult
    - 70kg adult = 490mg max
    - 490 / 36mg per 1.8cc carpule = 13.6 carpules

- **Intravascular injection**
- **Altered metabolism/excretion**
  - Hepatic insufficiency
  - Renal dysfunction

Symptoms of LA Toxicity

**Initial symptoms (doses approximately 6.0 mcg/mL)**
- Lightheadedness
- Dizziness
- Visual and auditory disturbances
- Disorientation
- Drowsiness
- Tachycardia

**Higher dose (>10 mcg/mL)**
- Initial CNS excitation followed by a rapid CNS depression
- Brachycardia
- Convulsions/seizures
- Syncope
- Coma
- Respiratory depression and arrest
- Cardiovascular depression and collapse

MAXIMUM DOSES IN PATIENTS WITH CORONARY ARTERY DISEASE

<table>
<thead>
<tr>
<th>Vasoconstrictor concentration/type</th>
<th>Vasoconstrictor (mg/ml)</th>
<th>Dental cartridge (mg/1.8cc)</th>
<th>Max in CAD (mg)</th>
<th>Max cartridges</th>
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<tbody>
<tr>
<td>1:20,000 levonordefrin</td>
<td>0.05 mg</td>
<td>0.09 mg</td>
<td>0.20 mg levonordefrin</td>
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<tr>
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<td>0.02 mg</td>
<td>0.036 mg</td>
<td>0.04 mg epinephrine</td>
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<tr>
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<td>0.01 mg</td>
<td>0.018 mg</td>
<td>0.04 mg epinephrine</td>
<td>2</td>
</tr>
<tr>
<td>1:200,000 epinephrine</td>
<td>0.005 mg</td>
<td>0.009 mg</td>
<td>0.04 mg epinephrine</td>
<td>4</td>
</tr>
</tbody>
</table>

DEGRADATION OF CATECHOLAMINES:
- Selective presynaptic reuptake mechanism
- Catechol-O-methyltransferase (COMT) inactivation
- Monoamine oxidase (MAO) inactivation
Management of LA toxicity

- Reassure patient
- 5mg diazepam or 1mg midazolam IV (5mg midazolam IM) for anxiety and convulsions
- Supplemental oxygen
- Continuous monitoring of vital signs
- Cardiopulmonary resuscitation and activation of EMS in unconscious patients

MALIGNANT HYPERTHERMIA

1:15,000 children and 1:50,000 adults, AD

Pathophysiology:
- Acute elevation in Ca++ levels
- Continuous release of Ca++
- Dysfunction in reuptake mechanism

Symptoms:
- Tachycardia, fever, cardiac dysrhythmia, muscle rigidity, cyanosis, death

Associated agents: succinylcholine (77% of cases), halothane (60% of cases), lidocaine, mepivacaine, bupivacaine

Judicious use of amide local anesthetics, blocks better than infiltrations

Judicious use of vasoconstrictors (not more than 0.04mg per pt)

Treatment: Dantrolene sodium 2-3mg/kg IV bolus

METHEMOGLOBINEMIA

Oxidation of Fe++ to Fe +++ à inability of Hb to release O2 (methemoglobin)

Symptoms: respiratory depression, syncope, cyanosis, chocolate brown arterial blood

Drugs:
- Prilocaine
- Lidocaine
- Large dose benzocaine

Treatment: 1% methylene blue (1.5 mg/kg)

Congenital methemoglobinemia = relative contraindication

Nerve injury caused by mandibular block analgesia


Abstract. Fifty-four injection injuries in 52 patients were caused by mandibular block analgesia affecting the lingual nerve (n = 43) and/or the inferior alveolar nerve (n = 12). All patients were examined with a standardized test of neurosensory function. The perception of the following stimuli was assessed: touch, pain, vibration, temperature, stab, cold, hot, pressure, pinprick, sharp/tall discrimination, warm/cold, point location, brush, stroke detection. Nerve injury was measured by the appearance of a hypoesthesia or anesthesia. Nerve injury was defined as the appearance of hypoesthesia or anesthesia that was not present before anesthesia injection.

Conclusion. Nerve injury is infrequent after injection injury to the lingual nerve. The incidence of injection injury was 1.5% (n = 838,000) or 1:67,130. The observed frequency of injury to the lingual nerve was significantly greater than the expected frequency (p < 0.001) for this agent, based on the distribution of local anesthetic use in Ontario in 1993. These results are consistent with the suggestion that local anesthetic formulations may have the potential for mild neurotoxicity. Further studies are needed to investigate the mechanisms for this, and to determine whether similar findings would be found elsewhere.

Management of complications

Rule #1 always document complications no matter how complicated they are
Rule #2 reassure patient and make them aware of these complications (informed consent)
Rule #3 always document complications to CYA
Rule #4 monitor patient and vital signs
Thank You