Local Anesthesia Review and Update

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Disclosure

• I am not paid by, nor do I hold any financial interest in any of the devices or materials being presented in this lecture today
What we are covering

• Gow Gates Mandibular Block Injection
• Computer Controlled Local Anesthetic Delivery & the Anterior Middle Superior Alveolar Injection
• Oraverse - Local Anesthesia Reversal
• Onset - Local Anesthesia Sodium Bicarbonate neutralizing solution
• Kovacaine Mist™ - Intranasal Dental Anesthetic
The FEAR of PAIN

The PAIN of FEAR
So what are we afraid of?
What are we afraid of

- 1. Snakes
What are we afraid of

• 2. Spiders
What are we afraid of

• 3. Confined Spaces
What are we afraid of

• 4. Public Speaking
What are we afraid of

• 5. Heights
What are we afraid of

• 6. The Dark
What are we afraid of

- 7. Thunder and Lightning
What are we afraid of

- 8. Flying
What are we afraid of

• 9. Dogs
What are we afraid of

• 10. Dental Care
The Greatest FEAR our patients have is PAIN
We are judged by our patients on two primary criteria:

#2 Did we cause them pain during treatment

#1 Did we give a painless injection
The Pain Threshold

- Sleep deprivation
- Stress
- Fear
- Age
- Gender
- Culture
- Socio-economic status
- Pain (chronic or acute)

Patient may over-react to stimulation or interpret non-painful stimuli as painful
Hyperresponders

Fear of dentistry
Sleep-deprivation
Long-term chronic pain
Short-term acute pain
• Getting the “Shot” is the most traumatic part of the dental experience
Local Anesthetics are the SAFEST and MOST EFFECTIVE drugs in medicine for the Prevention and Management of Pain

If a Local Anesthetic drug is deposited close to a nerve it WILL produce pain control
So........

If Local anesthetics are so effective, then why is achieving effective pain control elusive on occasion?
NB vs. Infiltration

All of the Local Anesthetics provide a longer duration of both soft and hard tissue anesthesia when administered via a Nerve Block (NB) then by infiltration.

<table>
<thead>
<tr>
<th>Local Anesthetic</th>
<th>Nerve Block (duration)</th>
<th>Infiltration (duration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mepivacaine plain (3%)</td>
<td>60 min</td>
<td>20-40 min</td>
</tr>
<tr>
<td>Prilocaine plain (4%)</td>
<td>60 min</td>
<td>~10-20 min</td>
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<tr>
<td>Bupivacaine + epi (0.5%)</td>
<td>~up to 12 hours</td>
<td>~60-90 min</td>
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Redheads are more difficult

• Anesthetic requirement is increased in Redheads
Time of day

• Teeth are most sensitive in the morning and become less sensitive in the afternoon
Mandibular Anesthesia

- The IANB (Halsted approach) has the lowest success rate of all major nerve blocks administered in medicine, and it is the single most common injection administered daily in dentistry

- The density of the cortical plate prevents successful administration of supraperiosteal anesthesia
- The lack of consistent landmarks
- The thickness of soft tissue at the injection site leads to increased needle deflection
- Accessory innervation (may be the biggest problem)
Mandibular Anesthesia

- The thickness of soft tissue at the injection site leads to increased needle deflection
Mandibular Anesthesia

• Accessory innervation may be the biggest issue
• Common with mandibular molars
  – Distinct separate branch of the IA n.
  – Buccal
  – Lingual
  – Auriculotemporal
• If accessory innervation connects to the main nerve trunk in the pterygomandibular space superior to the mandibular foramen then repeated deposition of local anesthesia at the site of the IANB will be unsuccessful

Daniel Haas, DDS, PhD
Alternative mandibular nerve block techniques, JADA 142(9suppl) Sept 2011
Mandibular Nerve Block: Gow-Gates Technique

• True mandibular nerve block
  – Sensory anesthesia to $V_3$

• George Albert Edwards Gow-Gates (1910-2001)

• Advantages
  – Greater success than IA
  – Lower positive aspiration rate (less vascular)
  – No problems with accessory innervation
Cool Mandibles
Mandibular Nerve Block: Gow-Gates Technique

• Disadvantages
  – Difficult to teach “old dogs” new tricks

• Nerves anesthetized
  – IA, mental, incisive, lingual, mylohyoid, buccal (75%), auriculotemporal

• Areas anesthetized
  – Mandibular teeth to midline, buccal soft tissue, anterior 2/3 of tongue, floor of mouth, lingual soft tissue, body of mandible and inferior portion of ramus, skin over zygoma, posterior cheek and temporal region
Mandibular Nerve Block: Gow-Gates Technique

• Indications
  – Procedures on multiple mandibular teeth, buccal soft tissue anesthesia needed, lingual soft tissue anesthesia needed, lingual anesthesia needed, when IA nerve block is unsuccessful

• Contraindications
  – Infection or inflammation in area of injection, patients who might bite lip and tongue, patients who cannot open wide (trismus)
Mandibular Nerve Block: Gow-Gates Technique

• Advantages
  – One injection (vs. IA and buccal) 75%
  – Higher success than IA (with experience)
  – Minimum aspirations (2%)
  – Fewer post-injection complications
  – Successful anesthesia where a accessory innervation exists
Mandibular Nerve Block: Gow-Gates Technique

- Disadvantages
  - Lingual and lower lip anesthesia is uncomfortable
  - Longer time for onset of anesthesia than IA
    - 5 min vs. 3 min (larger nerve trunk, more distance for site of deposition)
  - Learning curve
  - Patient remains open 1-2 minutes after injection
Mandibular Nerve Block: Gow-Gates Technique

• Technique
  – 27 or 25 gauge long needle
  – Area of insertion
    • Mucous membrane on the medial of the ramus of the mandible
    • At the height of the ML cusp of the max 2nd molar
    • Just distal to the maxillary second molar
    • With the needle on a line from the intertragic notch to the corner of the mouth
Mandibular Nerve Block: Gow-Gates Technique

• Technique
  – Target area
    • Lateral side of the condylar neck, just below the insertion of the lateral pterygoid muscle
Mandibular Nerve Block: Gow-Gates Technique

• Procedure
  – Patient supine with neck extended
  – Patient open wide during duration
  – Insert needle just distal to second molar at the height of the ML cusp
  – Barrel of the syringe will be in the contralateral corner of the mouth
  – Align syringe parallel a line from the corner of the mouth to intertragic notch and advance needle until bone is felt
  – Usually 10-25 mm above mandibular occlusal plane
Mandibular Nerve Block: Gow-Gates Technique

• Procedure
  – Average depth of penetration is 25 mm (similar to IA)
  – Withdraw 1 mm, aspirate and inject 1-cartridge over 1-2 minutes
  – Withdraw and safe needle
  – Have patient remain open 1-2 minutes
    • Bite block
  – Return patient upright
  – Wait 3-5 minutes before beginning procedure
Mandibular Nerve Block: Gow-Gates Technique

• Procedure
  – Positive Aspiration
    • Only 2% aspiration rate
    • Positive aspirations generally occur in the internal maxillary artery – inferior to the target area
    • For a positive aspiration, withdraw needle slightly, angle superiorly and reinsert
  – If bone is NOT contacted
    • Medial needle deflection is the most common cause of failure
      – Bring the needle tip laterally; withdraw the needle slightly and redirect by moving the barrel distally
    • May also be caused by patient closing
      – Utilize a bite block
Gow Gates Video
Computer Controlled Local Anesthetic Delivery (CCLAD)

• Advantages
  – Designed to improve the ergonomics and precision
  – Pen grasp vs. palm grasp
    • Allows finger tip accuracy in needle placement
    • Increased tactile feel
    • Beneficial for practitioners with small hands
  – Computer controlled flow rates and pressure
  – Improved injection experience (less threatening to patient)
  – Less tissue damage
  – Less needle deflection with rotational insertion technique
  – Automatic aspirations

• Disadvantages
  – Cost
  – Additional Armamentarium
The CompuDent®/Wand by Milestone Scientific
• WAND was rated as the least anxiety producing injection instrument by patients (Kudo and associates:)

• Use of the WAND leads to less disruptive behavior in pediatric patients. (Gibson and associates)
Other CCLAD’s exist
Anterior Middle Superior Alveolar

• Nerves anesthetized:
  – ASA
  – MSA when present

• Area anesthetized:
  – Pulps of maxillary incisors, canines & premolars
  – Buccal periodontium and bone over these teeth
  – Palatal tissue on associated teeth
Anterior Middle Superior Alveolar

• **Indications**
  – Treatment involving the maxillary anterior teeth or soft tissue
  – When anterior esthetic procedures are performed
    • Muscles of facial expression and upper lip are NOT affected
  – Supraperiosteal injection is contraindicated (i.e. infection)
  – Perform with CCLAD

• **Contraindications:**
  – Patients with unusually thin palatal tissue
  – Patients that cannot tolerate 3-4 minute administration time
  – Procedures requiring more than 90 minutes
Anterior Middle Superior Alveolar

• Advantages
  – Anesthesia of multiple max teeth with a single injection
    • Good injection for periodontal debridement
  – Simple
  – Allows for accurate esthetic procedures since smile line is not affected
  – No postoperative anesthesia of the lip
  – Atraumatic
  – High success
Anterior Middle Superior Alveolar

• Disadvantages
  – Long administration time
    • Can cause operator fatigue
  – Uncomfortable if administered to rapidly
    • Can cause ischemia
    • Avoid high concentration anesthetics (4%)
    • DO NOT do with a 1:50,000 epi
  – May require supplemental anesthesia for centrals and laterals
  – Aspiration: 1%
Anterior Middle Superior Alveolar

• Technique
  – 30- gauge short recommended
  – Area of insertion: on the hard palate, halfway from the midpalatal suture to the contact point between the first and second premolars
  – Target area: palatal bone at the injection site
Anterior Middle Superior Alveolar

• Technique
  – Landmarks:
    • Midpalatal suture
    • Contact between the first and second premolars
Anterior Middle Superior Alveolar

• Technique
  – Procedure
    • Assume the position
      – Right handed
        » 9 or 10 o’clock facing the patient
      – Left handed
        » 2 or 3 o’clock facing the patient
    • Prepare the tissue
Anterior Middle Superior Alveolar

• Technique
  – Procedure
    • Bevel against the epithelium for prepuncture technique
    • Have patient supine with slight hyperextension of head and neck.
    • Apply the bevel of the needle toward the epithelium and cover with a cotton tipped applicator with topical
    • Apply pressure to create “seal”
    • Initiate delivery of local anesthetic
      – Maintain 8-10 seconds.
      – Wait 30 sec to obtain superficial anesthesia
Anterior Middle Superior Alveolar

• Technique
  – Procedure
    • Slowly advance needle until contact is made with bone
Anterior Middle Superior Alveolar

• Technique
  – Procedure
    • Aspirate
    • Deposit 1.4 – 1.8 ml at a rate of 0.5 ml/min
    • Injection takes 3-4 min
    • Withdraw
    • Safe the needle
    • Wait 3-5 minutes before commencing treatment
OraVerse

- Phentolamine Mesylate (0.4mg/1.7ml)
- Vasodilator used in medicine since 1952
- Blocks action of epinephrine
- Was initially developed as an impotence drug (ED)
  - Led to long term erections
- Local anesthetic reversal agent does NOT reverse local anesthetic
OraVerse

- Recovery time

![Graph showing minutes to return of normal sensation for Upper Lip (50 mins, n=240) and Lower Lip (70 mins, n=244) with OraVerse and Control (sham injection) groups.](image-url)
OraVerse

• How to use
  – 0.4mg/1.7ml solution per cartridge
  – Administered 1:1 volume ratio
    • 1 cartridge of OraVerse for each cartridge of LA delivered
    • Delivered to the same injection site
  – Maximum recommended dose
    • 2 cartridges for adults and children 12 years and older
    • 1 cartridge for patients 6-11 years old and over 66 lbs.
    • ½ cartridge for children 6-11 years old and 33-66 lbs.
  – Administered at the end of the procedure when anesthesia is no longer needed
OraVerse

• Pediatric Safety Profile
  – Not recommended for children under age 6
  – Not recommended for children weighing less that 33 lbs.
  – In children 33 – 66 lbs. the maximum OraVerse dose is ½ cartridge (0.2mg)
• **Mechanism of Action**
  – Alpha-adrenergic block of short duration which results in vasodilation of vascular smooth muscle
  – Increased blood flow to the area of injection results in increased uptake of LA form the area of injection and distribution, metabolism and elimination
OraVerse

Safety

- Most common adverse effects
  - Post op pain
  - Tachycardia or bradycardia
  - Headache

Contraindications

- Avoid use in patients with cardiovascular disease
  - May cause cardiac arrhythmias
- Not recommended in children under age 6 or less than 33 lbs.

OraVerse is NOT an antidote for LA overdose
Do we wait long enough?

- How long does it REALLY take for pulpal anesthesia to develop?
Can we improve the curve with drugs such as Articaine?

Sadly NO.
Can we improve the curve by buffering the LA solution?

Happily YES
Buffering

• Local Anesthetics are weak bases
• LA cartridges are formulated in an acidic solution to:
  – make the LA soluble
  – Inhibit oxidation and increase shelf life
    • Lidocaine HCL with epinephrine : pH = 3.9
    • Mepivacaine HCL plain: pH = 5.5
• Physiologic pH = (7.35-7.9)
• Acidic solution creates
  – Pain on injection
  – More delayed onset
Buffering

• Adding Sodium Bicarbonate to the LA solution to increase its pH towards normal physiological pH

Onset mixing pen by Onpharma

• Increasing the pH increases the amount of free base (unionized) form of the LA which is able to cross the neurolemma

• A change from a pH of 3.5 (LA with epi) to 7.4 will create a 6000 fold increase in the free base
Buffering

• Buffering MUST occur just prior to injection
  – LA will become a weak base and precipitate out of solution
  – $\text{CO}_2$ is created which increases the comfort of the injection

– Advantages
  • More rapid onset of action
  • Improved comfort of injection
  • More profound anesthesia
Onset video
Intranasal Local Anesthesia in the Maxilla

- Kovacaine Mist™ (St Renatus)
- 3% Tetracaine and 0.05% Oxymetazoline
  - Sprayed on the nasal mucosa (R and L nares), the anesthetic diffuses to the maxillary dental plexus to provide Maxillary Anesthesia
    - From #4 to #13
    - 84% success first molar to first molar
- Utilized by ENT’s for nasal procedures
- Estimated at $20/dose
- Supposed to receive FDA approval this Fall (2013)
- Phase I & II safety and efficacy studies are already complete
  
http://denver.cbslocal.com/tag/kovacaine/