Sedation & Anesthesia in Dental Practice

LOCAL ANESTHESIA:

“30+ Years of Hits, Misses and Near Misses”

THE NATIONAL NETWORK for ORAL HEALTH ACCESS
THE 2015 ANNUAL CONFERENCE
Indianapolis, Indiana  November 16th, 2015

Mel Hawkins, DDS, BScD AN
Dentist / Dentist Anesthesiologist
Toronto, ON Canada

www.sedationdentistry.us  melhawkins@rogers.com
AGENDA

1. Anatomy, Blocks, Road Blocks, More Blocks
2. What can go wrong and what to do about it?
3. What’s new? Paresthesia, reversing, buffering, inhalational and more
ANATOMY, BLOCKS, ROAD BLOCKS AND MORE BLOCKS
“Why do I only get a BAD BATCH in the Mandible?”
THE ELUSIVE McDibular BLOCK

...millions and millions served . . .

Trivia: The dental local anesthesia industry combined now serves up 330 million cartridges every year in North America
Inferior Alveolar Block

“Conventional” as opposed to a “mandibular block”
Relationship of:

Conventional (inferior alveolar)

Akinosi, closed mouth

Gow-Gates “condylar neck”

Hybrid, “mix and match” blocks
Reasons for Failure

Anatomical Variations:

• Hard tissue anatomy
• Connective tissue and Neurovascular anatomy
Anatomy of the Mandible
3 Major Factors:

- Internal Oblique Ridge
- Sphenomandibular fascial barrier
- **Risks:** Nerves, Arteries
The distance between the internal and external oblique line of the mandible varies.

Adapted from Dr. N. B. Jorgensen
Anatomical Influences:

The *maxillary* artery, passes through the high *pterygo* *mandibular* triangle region.
The Question is:

What is the risk of an intraarterial injection?

Clinically Unlikely
Internal Maxillary Artery

**Characteristics:**

- Thick smooth muscle wall
- Well innervated
- Constricts or arteriospasms, eliminates lumen
- Artery is mobile within the anatomical area
- Pulse pressure
True Confessions
Horizontal X-S, level of Conventional I.A.N.Block

Courtesy Dr. G. A. E. Gow-Gates, Dr. J. Watson
Horizontal X-S, level of Gow-Gates Mandibular Block

Courtesy Dr. G. A. E. Gow-Gates, Dr. J. Watson
Conventional Advantages

• Intra-oral landmark for 110 years
• Practitioner acceptance for 110 years
• Fast onset if accurate and no neural aberrance, as in grade B and C anesthesia problems (14%)
Conventional Disadvantages

• Increased vascularity
• Anatomical variance
• Macroglossia
• Paresthesia mechanical lingual claims experience
• (Long) buccal nerve “block”
Syndrome: “The Chin on the Chest”
Open the Airway
Coronoid Notch

Definition: Greatest antero-postero indentation depth on the anterior border of the ramus.
Bevel Orientation – faces mid-sagittal plane... this way

...but deflects this way
Long Buccal Nerve: Infiltration or “Block”
QUESTIONS?
WHAT CAN GO WRONG AND WHAT TO DO ABOUT IT?
Infiltration of Mandibular Molars

Buccal and lingual approach
Advantages:

• Thin cortical plate
• Lingual foramina
• Patient acceptance
• Lingual nerve blocked already
Disadvantages:

- Ballooning of tissue
- Avoiding submandibular salivary gland
- Vision
Lingual Infiltration

Patient selection criteria enhancement:

- **Missing** adjacent teeth
- Thinner **alveolar** anatomy
- **Younger/older** patients
- Root anatomy **visible**
- Vertical **buccal** shelf form
Lingual Infiltration

Technique:

• **Apical** to mucogingival junction
• Tissue expands
• **Avoid** submandibular gland
• Vision enhanced by position and tongue retraction
Lingual Infiltration - Summary

Technique:
- Where? Just apical to mucogingival junction
- Bevel – facing bone
- Depth: 2-3 mm
- Volume: 0.5 - 0.7 cc
- Onset time: ~ 5 minutes
CONVENTIONAL MANDIBULAR ANESTHESIA

5 TIPS & TRICKS to think about?
Chin up to the ceiling
Head position consistent every time!
• Consistency
• Roll of gravity?
Scissors
Mouth
“Rester”
Prop or “rester”

Right side goes with right side technique
Volume Considerations

- Amount given, then available time for diffusion
- Neuroanatomy (penetrable diameter)
How many “carps” are enough… 2 ?
are too much… 4 ?
for a block
Leonard M, Local Anesthesia Volume and Success Rates, JADA Vol. 126(833)
Onset Time
Leonard M, Local Anesthesia Volume and Success Rates, JADA Vol. 126(833)

Lip v. Pulpal Anesthesia
The Influence of SOLUTION pH

Primarily due to concentration of $\text{HCl}$ the LA molecules are dissolved in.

Also proportional to vasoconstrictor concentration and it’s antioxidant, $\text{NaHSO}_3 = \text{H}_2\text{SO}_4$
## The Influence of SOLUTION pH

<table>
<thead>
<tr>
<th>generic name</th>
<th>epinephrine</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>3% mepivacaine</td>
<td></td>
<td>~5.4</td>
</tr>
<tr>
<td>4% prilocaine</td>
<td></td>
<td>~5.4</td>
</tr>
<tr>
<td>4% articaine</td>
<td>1:200,000</td>
<td>~4.9</td>
</tr>
<tr>
<td>4% prilocaine</td>
<td>1:200,000</td>
<td>~4.9</td>
</tr>
<tr>
<td>2% lidocaine</td>
<td>1:100,000</td>
<td>~4.3</td>
</tr>
<tr>
<td>4% articaine</td>
<td>1:100,000</td>
<td>~4.3</td>
</tr>
<tr>
<td>2% lidocaine</td>
<td>1: 50,000</td>
<td>~3.9</td>
</tr>
</tbody>
</table>
pH of ~ 5.4 favorable “plain” local anesthetic
ARTICAINE STATUS, REVERSING, BUFFERING, INHALING LOCAL ANESTHESIA AND TOPICALS
LOCAL ANESTHESIA SOLUTIONS EFFICACY
Articaine

Septocaine® with epinephrine 1:100,000
Articaine hydrochloride 4% with Epinephrine 1:100,000 Injection

Contains sodium metabisulfite.
See warnings section of insert for details.

50 cartridges: 1.7 mL each

Made in Canada by
Novocol Pharmaceutical of Canada, Inc.
Articaine Brands: “100” / “200” epinephrine

Septocaine®
Orabloc®
Articadent®
Zorcaine®
Articaine

A statistically significant scientific study demonstrated that 4% articaine 1:100K performed more efficaciously than 2% lidocaine 1:100K in controlled clinical administrations.

Kanaa, MD et al, J.Endod 32:296-298,2006
Articaine solutions had a probability of achieving anesthetic success superior to lidocaine when analyzing infiltration.

Articaine solutions had a probability of achieving anesthetic success superior to lidocaine when analyzing infiltration.

Brandt RC et al JADA 142(5):493-504 2011
Articaine

The pulpal anesthetic efficacy of articaine versus lidocaine in dentistry:

- **Weaker**, but still significant evidence of articaine’s **superiority** for mandibular block anesthesia.

- No difference for **symptomatic** teeth (e.g. irreversible pulpitis)

Brandt RC et al JADA 142(5):493-504 2011
The sulfur atom forming the highly lipid soluble thiophene ring is non-reactive.

There is NO cross allergenicity (Ag-Ab) interaction for a patient allergic to “sulfas” or “sodium or potassium metabisulfites”
Structural formula and physical-chemical data for articaine
Metabolism – ester component

Although classified as an amide local anesthetic, the articaine molecule is 90% inactivated by plasma cholinesterases and only 10% by hepatic enzymes.
The good news is:

1. The metabolite from the ester linkage inactivation is **NOT** para-amino benzoic acid (PABA), a known allergen.

2. The **FAST action** results in a short ½ life (**27 minutes**). This represents a systemic **safety phenomenon**.
These authors could not find a single mortality linked to articaine, in any age group, in it’s years of dental administration in Europe, Canada and currently the U.S.A.

The product has been available in Germany and France since 1976 and has ~90% of the market, in Canada since 1983 with ~35%, in the United States since 2000, also with ~35%.

The authors expected to find ADR reports of post-op sequellae such as lingual nerve and/or inferior alveolar nerve paresthesia.

This was **NOT** the case, implying that:

- **Not being reported**
- Not occurring
- Accepted as an occasional event in dentistry
- Aren’t any lawyers in Europe!
Paresthesia Research is Unavailable

Is a 4% solution neurotoxic?
There is no scientific or research based data to conclude that 4% prilocaine or 4% articaine is directly causitive of dental paresthesia and/or hypesthesia.

...HOWEVER...

Hawkins JM, Articaine: Truths, Myths and Potentials, Academy of Dental Therapeutics and Stomatology 9 2003
What are YOUR choices?

1. Don’t use it for IAN blocks. Do higher blocks?
2. Use selectively – desperation?
3. Mix, match, dilute(?) with 3% mepivacaine plain (Scandanest®, Carbocaine®)
4. Articaine for IAN/Lingual - with consent?
5. Patient selection?

NOTE: Speaker suggests: Do NOT use on lawyers, news anchor women, any media, family, alleged friends or at 4:00 PM Thursday or Friday afternoons
QUESTIONS?
OraVerse™
Phentololamine Mesylate Injection

“Reversing” Local Anesthesia
Phentolamine Mesylate reverses SOFT TISSUE ANESTHESIA ONLY

Phentolamine Mesylate is NOT a LOCAL ANESTHETIC REVERSAL AGENT
13% of pediatric patients receiving IANB suffer post-treatment traumatic injury to soft tissues.

Adults and Adolescents: 60 Minute Efficacy Data
Time to Recovery of Normal Lip Sensation

Mandible
- 54.8%; p<0.000
Phentolamine mesylate accelerates the return to normal sensation by 85 minutes
- 41% phentolamine mesylate patients fully recovered in 60 minutes
- 7% for control patients
Pediatric patients also recover sensation in half the time

- Median time to recovery of normal lip sensation compared to control was reduced by:
  - 120 minutes (67%) in the mandible
  - 53 minutes (47%) in the maxilla

Source: Tavares M, Goodson JM, Studen-Pavlovich D, and colleagues. Reversal of soft-tissue local anesthesia with phentolamine mesylate in pediatric patients. JADA 2008;139(8):1095-1104. Copyright ©2008 American Dental Association. All rights reserved. Excerpted by permission.
Dosing

• Easy to Dose
  - 1:1 cartridge ratio to local anesthetic with a vasoconstrictor using identical injection site

• Maximum recommended dose
  - 2 cartridges for adults & adolescents 12 years of age and older
  - 1 cartridge for patients 6-11 years of age and over 66 lbs.
  - ½ cartridge for children 6 years of age or older weighing 33-66 lbs.
Potential complications

Needle-related:

• Trismus

• Paresthesia
Now sold in sleeves of ten (10)
Phentolamine Mesylate

OraVerse™ Cost?

$8/cartridge
Performance Limitations of Current Anesthetics

• **Onset Time**
  Time for body to buffer anesthetic

• **Analgesia**
  *Is No* pain attainable? Always?

• **Injection Pain**
  Stinging is a concern for patients
71% of the participants receiving buffered anesthetic achieved pulpal anesthesia in under two minutes.

12% of the control participants achieved pulpal anesthesia in under two minutes.
Clinical Data – Pain Free Injections

- 44% of buffered anesthetic patients experienced zero injection pain
- 6% of traditional anesthetic patients experienced zero injection pain

72% of patients rated Onset® as the most comfortable injection.

30-Minute Time Course, Pulpal Analgesia, IANB

Onset® + Lidocaine

Lidocaine

Articaine
Onset® by Onpharma®
The exchange volume is only 0.18 ml.

The first and only chair side approach for precision buffering of local anesthetic

Cartridge Connector
Bicarbonate Solution
Mixing Pen

$299.00
Not autoclavable

$55.00 / day based on X9 use
Topical Anesthetics

Product Analysis
Topical Anesthetic: Compromises

1. Isolate
2. Apply and Reapply
3. Be patient = 90 sec.
4. Dry
5. Saliva ejector
6. Don’t talk!
Topical Anesthetics

• What do you do if you **KNOW** that the area can’t be isolated (saliva, tongue), **or**

• The topical won’t penetrate into tissue far enough to cover a deeper block?
Topical Anesthetics

Patients expect the use of a topical anesthetic!

Dr. Kit Weathers
Endo Magic® Founder’s Technique!
Griffin, GA.
Lidocaine Viscous
FDA announces Box Warning Required
Product Analysis: Lidocaine HCl
“Should not be used for teething pain”
Product Analysis: E.M.L.A.®

Eutectic Mixture of Local Anesthetic: 2.5% lidocaine + 2.5% prilocaine
Product Analysis: Oraqix®
5 Local Anesthetic News:

Pregnancy
A prospective, comparative observational study by the Israeli Teratology Information Services (TIS) – 1999 – 2005

$n = 210$ pregnancies exposed to dental local anesthetics (112 [53%] in 1$^{st}$ trimester)

vs. control group = 794 pregnancies not exposed to teratogens

The rate of major anomalies was not significant between the groups. There was no difference in the rate of miscarriages, gestational age at delivery or birth weight.

The most common type of dental treatment was endodontic therapy initiation (43%) and exodontia (31%). Most women were not exposed to additional medications. ~ one-half (51%) were not exposed to dental radiography. 44% were exposed to radiation, mostly bite wings.

Lidocaine (1947), prilocaine (1955) and etidocaine are assigned to US Food and Drug Administration pregnancy Category B.

Mepivicaine (1955), bupivacaine and articaine (2000) are assigned to Category C.

Epinephrine is a catecholamine, which normally is present in the body, with no clear evidence of increased risk of malformation when used during pregnancy with local anesthetics.

Local anesthetics readily cross human placenta
Minutes after administration they reach the fetus, which has the ability to metabolize them.

Practical Implications:

There seems to be no reason to prevent pregnant women from receiving dental treatment and local anesthetics during pregnancy.

Conclusions:
The use of dental local anesthetics, as well as dental treatment during pregnancy, does not represent a major teratogenic risk.

Pregnancy: Safety- Local Anesthetics

Despite the reassuring considerations…

Dentists are still reluctant to perform dental treatment in pregnant patients
AND

Women are still reluctant to receive dental treatment during pregnancy.

QUESTIONS?
LOCAL ANESTHESIA:

“30+ Years of Hits, Misses and Near Misses”

THE NATIONAL NETWORK for ORAL HEALTH ACCESS
THE 2015 ANNUAL CONFERENCE
Indianapolis, Indiana November 16th, 2015

Mel Hawkins, DDS, BScD AN
Dentist / Dentist Anesthesiologist
Toronto, ON Canada

www.sedationdentistry.us melhawkins@rogers.com