LOCAL ANESTHESIA

“30+ YEARS OF HITS, MISSES AND NEAR MISSES”

The New Hampshire Dental Society
Concord, New Hampshire
November 9th, 2018
Mel Hawkins

is a Scientific Advisor/Consultant for dentist enquiries for two (2) competing local anesthetic manufacturing companies in the U.S.A.:  
  • Septodont Inc., Lancaster, PA and  
  • Carestream Dental, Rochester, NY.

No shares, stocks or ownership. No marketing or sales involvement. Not employed by either. Reimbursed quarterly.

The New Hampshire Dental Society  
November 9th, 2018
AGENDA

1. Anatomy, Technique of Blocks, Road Blocks, More Blocks

2. What can go wrong? and What to do about it?

3. A Few Tips and Tricks
Anatomy and Technique

BLOCKS, ROAD BLOCKS and MORE BLOCKS
THE ELUSIVE McDibular BLOCK
...millions and millions served . . .
A=86%
Level for pulp anesthesia

B=7%
Level for soft tissue anesthesia

C=7%

Duration in hours

Compiled various sources-Hawkins-2016
Relationship of:

Hybrid “mix and match” blocks

Gow-Gates “condylar neck”

Akinosi closed mouth

Conventional (inferior alveolar)
Reasons for Failure

Anatomical variations

• Hard tissue anatomy
• Soft tissue anatomy
• Connective tissue
• Neurovascular anomalies
Anatomy of the Mandible: Hard Tissue
Anatomy of the Mandible: **Hard Tissue**
3 Major Factors:

- Internal oblique ridge / Ramus flare
- 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
Histology
Pterygomandibular Triangle: Histology
Horizontal X-S,
Conventional
I.A.N.Block

Courtesy:
Dr. G. Gow-Gates,
Dr. J. Watson

University of
Sydney
Australia
Horizontal X-S, level of Gow-Gates Mandibular Block

Courtesy: Dr. George Gow-Gates, Dr. J. Watson

University of Sydney Australia
“Conventional” Inferior Alveolar Block vs. a “mandibular block”
Conventional Advantages

- Intra-oral landmark for **113 years**
- Practitioner **acceptance** for **113 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 X 2
- (Long) buccal nerve “block”
“Chin on the Chest” Syndrome
Open the Airway
Coronoid Notch

Definition:

Greatest indentation depth on the anterior border of the ramus.
QUESTIONS?
Akinosi Closed Mouth Mandibular Block

Vazirani 1960
Akinosi 1977
AKINOSI - Advantages

- Mouth closed - less threatening
- Macroglossia – bypasses tongue

Trismus

Positive aspiration

Paresthesia

% Long buccal nerve anesthesia
AKINOSI - Disadvantages

- **Vision** impaired
- Difficult to gauge depth in children
- Flaring ramus + heavy internal oblique ridge (I.O.R.)
- Zygomatic ridge over teeth #3, #14
- #1, #16 buccally extruded + prominent tuberosity = geometrically unfavorable
Clinical Technique
Identify Maxillary Mucogingival Junction
What can go wrong?
## Akinosi Summary

| Onset | 5 - 10 minutes – block  
<table>
<thead>
<tr>
<th></th>
<th>3 minutes - soft tissue</th>
</tr>
</thead>
</table>
| Characteristic | Varies. Generally anterior lip, tongue first.  
|       | Depends on trifurcation location |
| Duration | 1 - 1.5 hours pulpal  
|         | Soft tissue-variable |
| Key Advantages | Children, apprehensive patient acceptance  
|               | Fits “pre-injection” or “injectable topical” concepts |

---

*Mel Hawkins, DDS, BScD AN, Toronto, ON Canada*
QUESTIONS?
Gow-Gates Mandibular Block

Condylar Neck or High Ramus Block
Utilizing External Landmarks

An Intraoral Approach
Gow-Gates: Advantages

Perceptible end point with:

- Vascularity
- Risk of nerve damage

Good buccal nerve anesthesia? YES!

Duration of anesthesia
- Good vision
Gow-Gates: **Disadvantages**

- Mouth must be *wide open*
- Extra-oral landmarks
- Post-injection, *stay open 2 minutes*
- **Hemostasis** needs to be added
Anatomical Considerations
V3 - foramen ovale to the mandibular foramen
Graphic Courtesy of Dr. George Gow-Gates
Onset | 5 - 15 minutes
---|---
Characteristic | posterior $\rightarrow$ anterior onset “wave”
Duration | 1 - 1.5 hours pulpal
| Soft tissue-variable
Post-op analgesia | 0.5% bupivacaine
| 1:200K epinephrine
| $\Rightarrow$ 2 carpules®
QUESTIONS?
What can go wrong?

and

What to do about it
Infiltration of Mandibular Molars Buccal and Lingual
### Lingual Infiltration Summary

<table>
<thead>
<tr>
<th>Where</th>
<th>Apical to mucogingival junction ⇔ unattached, dark red gingiva</th>
</tr>
</thead>
<tbody>
<tr>
<td>How</td>
<td>2-3 mm submucosal</td>
</tr>
<tr>
<td></td>
<td>Bevel faces bone</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Tissue balloons and blanches</td>
</tr>
<tr>
<td></td>
<td>Patient tolerance</td>
</tr>
<tr>
<td>Volume</td>
<td>0.3 - 0.7 ml.</td>
</tr>
<tr>
<td></td>
<td>4% articaine HCL 1:100K epi</td>
</tr>
<tr>
<td>Onset</td>
<td>4 – 6 min</td>
</tr>
</tbody>
</table>

Mel Hawkins, DDS, BScD AN, Toronto, ON Canada
Local Anesthetic News:
Pregnancy
Dental Treatment Safety with Local Anesthetics during Pregnancy

Hagai, A, Diav-Citrin, O, Shechtman, S, Ornoy, A,
JADA 146(8) Aug 2015
Pregnancy Safety

- A prospective, comparative observational study by the Israeli Teratology Information Services* (TIS), 1999 – 2005
- **210 pregnant patients** were exposed to dental treatment, including local anesthetics
- 112 (53%) in 1st trimester
- vs. control group = **794 pregnant patients** were not exposed to any dental treatment or local anesthetics

* Hagai A et al, Pregnancy outcome after in utero exposure to local anesthetics as part of dental treatment: A prospective comparative cohort study, JADA 146(8), Aug 2015
The rate of major anomalies was not significant between the two groups.

There was no difference in the rate of miscarriages, gestational age at delivery, or birth weight.

Hagai A et al, Pregnancy outcome after in utero exposure to local anesthetics as part of dental treatment: A prospective comparative cohort study, JADA 146(8), Aug 2015
Pregnancy Safety

Safest local anesthetics during pregnancy and breast-feeding:

• **Lidocaine** and **prilocaine** are FDA pregnancy risk category **B**

• All others are FDA pregnancy risk category **C**

Donaldson M & Goodchild JH, *Pregnancy, breast-feeding and drugs used in dentistry*, J Am Dent Assoc, 143 (8), August 2012
# Pregnancy Safety

## U.S. Food and Drug Administration pregnancy risk factor definitions.*

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>The results of controlled studies in women fail to demonstrate a risk to the fetus in the first trimester (and there is no evidence of risk in later trimesters), and the possibility of fetal harm appears remote.</td>
</tr>
<tr>
<td>B</td>
<td>Either the results of animal reproduction studies have not demonstrated a fetal risk <strong>but there are no controlled studies in pregnant women</strong> OR the results of animal reproduction studies have shown an adverse effect (other than a decrease in fertility) that was not confirmed in controlled studies in women in the first trimester and there is no evidence of risk in later trimesters.</td>
</tr>
<tr>
<td>C</td>
<td>Either the results of studies in animals have revealed adverse effects (teratogenic, embryocidal or other) on the fetus and <strong>there are no controlled studies in women</strong> OR <strong>results of studies in women and animals are not available</strong>; drug should be given only if the potential benefit justifies the potential risk to the fetus.</td>
</tr>
<tr>
<td>D</td>
<td>There is positive evidence of human fetal risk, but the benefits of use in pregnant women may be acceptable despite the risk (for example, if the drug is needed in a life-threatening situation or for a serious disease for which safer drugs cannot be used or are ineffective).</td>
</tr>
<tr>
<td>X</td>
<td>Results of studies in animals or humans have demonstrated fetal abnormalities or evidence of fetal risk based on human experience, or both, and the risk of the use of the drug in pregnant women clearly outweighs any possible benefit; use of the drug is contraindicated in women who are or may become pregnant.</td>
</tr>
</tbody>
</table>

*Sources: U.S. Food and Drug Administration, [5][20][21]
Safest local anesthetics during pregnancy and breast-feeding:

- **Lidocaine** and **prilocaine** are B
- All others are C
- Risk of methemoglobinemia with **topicals** (especially esters: benzocaine, tetracaine) and injectable prilocaine
- **Epinephrine** is OK!

Donaldson M & Goodchild JH, *Pregnancy, breast-feeding and drugs used in dentistry*, J Am Dent Assoc, 143(8), August 2012
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.

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

Hagai A et al, *Pregnancy outcome after in utero exposure to local anesthetics as part of dental treatment: A prospective comparative cohort study*, JADA 146(8), Aug 2015
Despite the reassuring considerations...

• Dentists are still reluctant to perform dental treatment for pregnant patients and

• Women are still reluctant to receive dental treatment during pregnancy.

Hagai A et al, Pregnancy outcome after in utero exposure to local anesthetics as part of dental treatment: A prospective comparative cohort study, JADA 146(8), Aug 2015
Local Anesthetic News:

Reversal Agent
OraVerse™
Phentolamine 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.

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
Local Anesthetic News:
Buffering Agents
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
Clinical Study Data Pulpal - IANB

Percentage of Participants Profoundly Numb at 2 Minutes

- **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
Buffering of Local Anesthetics

Mixing Pen settings:

<table>
<thead>
<tr>
<th>ONSET® MIXING PEN:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>dial settings for local anesthetic formulations</td>
<td></td>
</tr>
<tr>
<td>2% Lidocaine 1:100,000 Epinephrine</td>
<td>2% Lidocaine 1:100,000 EPI for all lower blocks dial 18</td>
</tr>
<tr>
<td>2% Lidocaine 1:100,000 Epinephrine</td>
<td></td>
</tr>
<tr>
<td>2% Lidocaine 1:50,000 Epinephrine</td>
<td></td>
</tr>
<tr>
<td>4% Articaine 1:100,000 Epinephrine</td>
<td></td>
</tr>
<tr>
<td>4% Articaine 1:200,000 Epinephrine</td>
<td></td>
</tr>
<tr>
<td>3% Mepivacaine</td>
<td></td>
</tr>
<tr>
<td>4% Prilocaine</td>
<td></td>
</tr>
<tr>
<td>4% Prilocaine 1:200,000 Epinephrine</td>
<td></td>
</tr>
</tbody>
</table>

Falkel M & Goeltz J, Buffering, it’s not just for lidocaine anymore, Dentistry Today, Nov. 2015
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

$55.00 / day based on X9 use

$299.00
Not autoclavable
Buffering of Local Anesthetics

- Released February 2015
- An anesthetic buffering device and a multi-dose delivery syringe
- Uses medical multi-dose anesthetic vials
- Contain preservative methylparaben: increased potential for allergic reaction?

Larson CE, Methylparaben – an overlooked cause of local anesthetic hypersensitivity, Anesth Prog, 1977
Cashman AL & Warshaw EM, Parabens: a review of epidemiology, structure, allergenicity, and hormonal properties, Dermatitis, 2005
Local Anesthetic News:

Topical Anesthetics
Topical Anesthetics

Product Analysis
Topical Anesthetic: Compromises

1. Isolate
2. Apply and Reapply
3. Saliva ejector
4. Dry
5. Be patient = 90 sec.
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?
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: Oraqix®
A FEW TIPS & TRICKS BY TRIAL AND FAILURE!

CONVENTIONAL MANDIBULAR ANESTHESIA
Conventional mandibular anesthesia

Chin on the Chest Syndrome
Poor opening
Open the airway
Chin toward the ceiling
Head position - consistent
Patient supine and
Roll of gravity?
Scissors prop or Mouth rester
Prop or "rester"

Right side goes with right side
WARNING: Do not bend, break or stress needles. Serious injuries to you and/or your patient can occur.
Bevel Orientation – faces mid-sagittal plane this way

but deflects this way
Volume Considerations

- Amount given / amount available
- Time for diffusion
- Neuroanatomy (penetrable diameter)
How many ‘carps’?
How many ‘carps’

- Enough: $> 1$?
- Better/Best: $= 2$?
- Too many: $< 4$?

for a block
Mean Number of Carps

Leonard M, Local Anesthesia Volume and Success Rates JADA Vol. 126(833)
Onset Time

6
Leonard M, Local Anesthesia Volume and Success Rates, JADA Vol. 126(833)

Latency time
The Influence of SOLUTION pH

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

Also proportional to \textit{vasoconstrictor concentration} and the antioxidant, $\text{NaHSO}_3$
### 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>1:200,000</td>
<td>~4.9</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>

Cook-Waite / Sterling Research Laboratories
Local anesthetic ages on the shelf
pH goes \( \downarrow \) i.e. it becomes more acidic
Stings more
**WARNING:**
Do not bend, break or stress needles. Serious injuries to you and/or your patient can occur

Septodont Inc. Box Warning Label
Add and/or administer a true mandibular block

**WARNING**
Do not bend, break or stress needles. Serious injuries to you and/or your patient can occur.

Septodont Inc. Box Warning Label
Prognathic Mandible

Foramen “moves” higher and deeper
The relative position of the mandibular foramen will vary with the width of the ascending ramus, as shown by the arrows.

Bisection Injection-deeper after anterior bone growth.
Assess ramus flare extraorally first
Can you contact the ramus?

CN VII →

Lingual n →

Parotid gland which contains branches of facial nerve

Medial pterygoid muscle

Inferior dental nerve and artery

23
6 - 9 y.o.
At or below occlusal plane

Inferior dental block. Position of syringe in the adult (A) and in the child (B).
Foramen Ovale to mandibular sulcus

ADULT
Intranasal Local Anesthesia

The Future of Pain Control in Dentistry?
FDA has now approved:
NASAL SPRAY DENTAL ANESTHETIC

KOVANAZE™
(tetracaine HCl and oxymetazoline HCl)
What is it?

- Intranasal Spray of **3% tetracaine**, 
- An ester **formally marketed** as 4% Ravocaine®
- With **0.05% oxymetazoline**
  which is an α - adrenergic agonist
Utilizes the BD ACCUSPRAY® technology currently delivered with the Flumist® nasal product

Produces regional anesthesia for restorative procedures on teeth # 4-13 and A-J in patients weighing over 88 lbs
Articaine

PANACEA or PROBLEM?
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.

Not as pronounced but still statistically significant, articaine performed superiorly for blocks too.
Articaine Brands: “100” / “200” epinephrine

Septocaine®
Orabloc®
Articadent®
Zorcaine®
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”
Articaine

Structural formula and physical - chemical data for articaine
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:

- The metabolite from the ester linkage inactivation is \textbf{NOT} \textit{para-amino benzoic acid (PABA)}, a known allergen.
- The \textbf{FAST action} results in a short \(\frac{1}{2}\) life (\textbf{27 minutes}). This represents a systemic \textbf{safety} phenomenon.
These authors could not find a single mortality linked to articaine, in any age group, in its 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 they are:

- Not being reported
- Not occurring
- Accepted as an occasional event in dentistry
- No lawyers in Europe!

Hawkins JM, Moore PA
Is a 4% solution neurotoxic?

Paresthesia Research is Unavailable
There is **no** scientific or research based data to conclude that

4% **prilocaine** or
4% **articaine**

is directly causative of dental paresthesia and/or hypesthesia

...**HOWEVER**...
### Paresthesia Product Profile

<table>
<thead>
<tr>
<th>Anesthetic</th>
<th>Incidence %(#)</th>
<th># Cartridges</th>
<th>Incidence %(#)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articaine</td>
<td>33.6 (50)</td>
<td>4,398,970</td>
<td>71.4 (10)</td>
</tr>
<tr>
<td>Prilocaine</td>
<td>28.9 (43)</td>
<td>2,353,615</td>
<td>28.6 (4)</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>3.4 (5)</td>
<td>3,062,613</td>
<td>0</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>2.7 (4)</td>
<td>1,569,037</td>
<td>0</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>0</td>
<td>241,679</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>31.5 (41)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

143 Non-Surgical Paresthesia Tongue (92), Lip (42), Both (9)
Articaine Risk – Benefit Conclusions

“All local anesthetics can produce toxicity to nerves if they achieve sufficiently high intraneural concentrations.

The concentrations of formulated local anesthetic solutions are neurotoxic per se and that their dilution, in situ or in tissue, is essential for safe use.”

Miller’s 7th Edition, 2009

Use articaine for IAN only when others fail!

Effects of Lidocaine and Articaine on Neuronal Survival and Recovery

Albalawi, F, Hersh, EV, Effects of Lidocaine and Articaine on Neuronal Survival and Recovery, Anesth Prog 65:82-88 2018
Survey and Anecdotal Reports, 1983 - present

Given that there are reports, although infrequent, of neurotoxicity of 4% articaine, this study was designed to compare the neurotoxicity and functional impairment of these two formulations by screening cultured, neural SH-SY5Y cells.
Results

4% articaine had no effect on the survival of neural SH-SY5Y cells
Conclusion

4% articaine does not damage neural cells more than 2% lidocaine

This study concludes that articaine is no more neurotoxic, at least in the in vitro setting
THINK of what this could mean

In this in vitro study, since 4% articaine does not damage neural cells and therefore is no more neurotoxic than 2% lidocaine could one

1. Conclude to no longer subject articaine to suggestions that it not be used for IAN and lingual blocks?

2. Reverse the legal settlements involving compensation for paresthesias, at least when the paresthesia is associated with articaine?

THE JURY is STILL OUT.
THINK of what this could mean

In this in vitro study, since 4% articaine does not damage neural cells and therefore is no more neurotoxic than 2% lidocaine could one, furthermore:

3. Dismiss the validity of paresthesia survey results?

4. Receive a new product insert which would not need to warn the dentist against using articaine for traditional blocks?

THIS STUDY HAS NOT as YET BEEN PRESENTED at DEPOSITION or in COURT, TO MY KNOWLEDGE
What are **YOUR** choices?

- Don’t use it for IAN / lingual nerve blocks.
- Do higher Gow-Gates blocks, where V3 is huge?
- Mix, match, dilute with 3% mepivacaine plain - pH 5.4 (Scandanest®, Carbocaine®), administered prior to 4% articaine – pH 4.3 cartridge

Speaker suggests do NOT use on lawyers, news anchor women, any media, family, alleged friends OR at 4:00 PM Thursday OR Friday afternoons.
LOCAL ANESTHESIA

“30+ YEARS OF HITS, MISSES AND NEAR MISSES”

The New Hampshire Dental Society
Concord, New Hampshire
November 9th, 2018