Is the "Mandibular Block" Passé?
I have a relationship with the following companies that may be relevant to this presentation. I am a consultant to:

Septodont, Inc.
How Dentists Are Judged By Patients

2. Does not hurt
1. A painless injection

de St. Georges J. Dentistry Today 23(8): 96-99, August 2004

How can we PREVENT pain during dental treatment?

General Anesthesia

Local Anesthesia

General Anesthesia requires administration of CNS-depressant drugs until the patient loses consciousness. General anesthesia represents the controlled loss of consciousness.
LOCAL ANESTHETICS are the only drugs that actually PREVENT PAIN.

LOCAL ANESTHETICS are the SAFEST* and MOST EFFECTIVE drugs in medicine for the PREVENTION & MANAGEMENT of pain when used properly.

When a local anesthetic is deposited near a nerve it must diffuse across the nerve membrane INTO the nerve to block nerve conduction.

Local anesthetics
- Lidocaine
- Bupivacaine
- Articaine
- Mepivacaine
- Prilocaine

*when used properly
Annual LA usage - WORLDWIDE
Dentistry

Lidocaine - 1,000,000,000 (estimated)
Articaine - 600,000,000
Mepivacaine - 300,000,000
Prilocaine - 50,000,000
Bupivacaine - 10,000,000

1,960,000,000

Local Anesthetics by EXPECTED duration of PULPAL anesthesia

Short-duration (~30 minutes)
- Mepivacaine 3%, Prilocaine 4%

Intermediate-duration (~60 minutes)
- Articaine 4%, Lidocaine 2%, Mepivacaine 2%, Prilocaine 3% or 4% (all with vasoconstrictor)

Long-duration (>90 minutes)
- Bupivacaine 0.5% (with vasoconstrictor)

Deposit a Local Anesthetic Close to a Nerve and It WILL Produce Pain Control
How often do you encounter inefficiency of local anesthesia, both infiltration and conduction, during manipulation of various tooth groups?

<table>
<thead>
<tr>
<th>Tooth group</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Very Rarely</th>
<th>Never</th>
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</thead>
<tbody>
<tr>
<td>Maxillary Incisors</td>
<td>1</td>
<td>3</td>
<td>17</td>
<td>37</td>
<td>3</td>
</tr>
<tr>
<td>Maxillary Canines</td>
<td>1</td>
<td>2</td>
<td>23</td>
<td>42</td>
<td>53</td>
</tr>
<tr>
<td>Maxillary Premolars</td>
<td>1</td>
<td>8</td>
<td>29</td>
<td>40</td>
<td>43</td>
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<tr>
<td>Maxillary Molars</td>
<td>1</td>
<td>19</td>
<td>31</td>
<td>41</td>
<td>29</td>
</tr>
<tr>
<td>Mandibular Incisors</td>
<td>4</td>
<td>6</td>
<td>17</td>
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<td>55</td>
</tr>
<tr>
<td>Mandibular Canines</td>
<td>4</td>
<td>10</td>
<td>23</td>
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<td>45</td>
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<tr>
<td>Mandibular Premolars</td>
<td>8</td>
<td>29</td>
<td>18</td>
<td>41</td>
<td>25</td>
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<tr>
<td>Mandibular Molars</td>
<td>20</td>
<td>47</td>
<td>32</td>
<td>21</td>
<td>1</td>
</tr>
</tbody>
</table>

Why is there a discrepancy in success between the maxillary & mandibular arches?

Maxillary bone = thin = INFLTRATION
Mandibular bone = thick = NERVE BLOCK
Anesthesia of Mandibular Premolars, Canine, and Incisors, can be (usually) easily accomplished.
**Incisive NB**

**Needle:** 27 gauge short

**Insertion:** MB fold at or anterior to mental foramen

**Target:** Mental nerve as it exits mental foramen

**Volume:** 0.6 mL

**Aspiration:** 5.7%

---

**Incisive NB**

Insert needle in buccal fold and advance towards mental foramen

**Aspirate**

Deposit 0.6 mL outside foramen

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**Incisive NB**

Apply finger pressure for 2 minutes

**VERY IMPORTANT**

**VAS = 0-2**

---

**Visual Analog Scale**

**VAS**

0: No pain

1-2: Mild pain

3-4: Moderate pain

5-6: Severe pain

7-9: Possible pain

9-10: Severe pain
The traditional ‘Mandibular Block’ has amongst the **LOWEST** success rates of all major nerve blocks in the human body.

A dentist will administer approximately 30,000 IANBs in the course of a 20-year career.

A second problem with mandibular anesthesia, in the adult, is the lack of consistent landmarks.
A basic truism regarding INJECTIONS:

Once a needle penetrates the skin or mucous membrane, every injection is BLIND

The traditional . . . .

Inferior Alveolar NB

“Inferior Dental Block

The ‘HALSTED Approach’

William Stewart Halsted
1852-1922

Inferior Alveolar Nerve Block

“Mandibular NB”
Inferior Dental Block

**Needle:** 25- or 27- gauge long

**Insertion:** Soft tissue on medial border of mandibular ramus

**Target:** IA nerve on lingual aspect of ramus prior to entering mandibular foramen

**Volume:** 1.5 - 1.8 mL

**Aspiration:** 10% - 15%

VAS = 1 - 5
Immediately following completion of IANB . . .

to obtain
“COMPLETE ANESTHESIA”
of the quadrant

Buccal NB
“Long” Buccal

Needle: 25- or 27-gauge long
Insertion: mucus membrane distal and buccal to last mandibular molar
Target: buccal nerve passing over border of ramus
Volume: 0.2 - 0.3 mL
Aspiration: 0.7%

VAS = 5 - 8

Following completion of IANB & Buccal NBs . . .

Seat patient comfortably upright
Speeds onset of anesthesia

FAINTING
(syncope)
is the most common medical emergency in dentistry
FAINTING (syncope) most often occurs DURING or immediately AFTER the injection of local anesthetic.

FAINTING (syncope) is treated by increasing blood flow to the brain.

Inferior Alveolar Nerve Block
“Mandibular NB” Inferior Dental Block
The experienced dentist administered the IANB by 'feel'
Needle is advanced towards lingual aspect of body of mandible until bone is contacted.
Dr. 'feels' or 'senses' that the needle has contacted bone at the appropriate depth (based on years of clinical experience)

Inferior Alveolar Nerve Block
“Mandibular NB” Inferior Dental Block
The most common reason for missing the IANB is depositing LA solution too low. (BELOW the mandibular foramen)
The 'nerve' is gone! A little higher is a little better
The Importance of Aspirating Before and During ALL injections

Inferior Alveolar Nerve Block
"Mandibular NB" Inferior Dental Block

**Needle:** 25- or 27-gauge long
**Insertion:** Soft tissue on medial border of mandibular ramus
**Target:** IA nerve on lingual aspect of ramus prior to entering mandibular foramen
**Volume:** 1.5 - 1.8 mL
**Aspiration:** 10% - 15%

What happens if a needle touches an ARTERY?
The importance of contacting bone in the inferior alveolar nerve block

Facial (VII cranial nerve) nerve paralysis

Cause:
- Introduction of local anesthetic into capsule of parotid gland during inferior alveolar nerve block

Depositing LA anywhere along the IA nerve will produce pain control
So the question is:

Can we improve the success rate of mandibular anesthesia?

Possible Alternatives to the IANB

- Gow-Gates Mandibular Nerve Block
- Vazirani - Akinosi (closed mouth) Mandibular Nerve Block
- Periodontal ligament injection (intraligamentary)
- Intracranial anesthesia
- Articaine HCl via buccal infiltration
- Buffering local anesthetics

The GOW-GATES Mandibular Nerve Block

Mandibular conduction anesthesia: A new technique using extrarossal landmarks

1973

Oral Surgery, Oral Medicine, Oral Pathology

Volume 59, Issue 3, September 1973, Pages 327–328

Gow-Gates Mandibular Nerve Block
Depositing LA anywhere along the IA nerve will produce pain control.

If a little higher is a little better, a lot higher is a lot better.

The GOW-GATES MANDIBULAR NERVE BLOCK is the only true mandibular (3rd division, V₃) nerve block.

Anesthesia
- Mandibular teeth to midline
- Buccal soft tissues to midline
- Anterior 2/3 of tongue and floor of oral cavity
- Lingual soft tissues and periosteum
- Body of mandible, inferior portion of ramus
- Skin over zygoma, posterior portion of cheek, and temporal region.
Needle: 25 gauge long
Insertion: At height of ML cusp of maxillary 2nd molar, just distal to 2nd molar
Target: Lateral aspect of condylar neck
Volume: 2.2 to 3.0 mL
Aspiration: < 2% as per Dr. Gow-Gates

A LOW Gow-Gates is still a HIGH IANB

Depositing LA anywhere along the IA nerve will produce pain control

The Vazirani-Akinosi (closed mouth) Mandibular Nerve Block
Depositing LA anywhere along the IA nerve will produce pain control.
Periodontal Ligament Injection (PDL, ILI)

- 27 gauge short needle
- Place interproximally
- **SLOWLY** deposit 0.2 mL per root

In presence of **PERIAPICAL** infection:
PDL is not contraindicated, but may not be effective

Contraindication
1980's ... Intraosseous Anesthesia (IO)

The Stabident System of intraosseous anesthesia


Anesthetic efficacy of the supplemental intraosseous injection of 2% lidocaine with 1/100,000 epinephrine in irreversible pulpitis.

88% successful mandibular molars

Parente SA, Anderson RW, Herman WW, Kimbrough WE, Weller RN.
Anesthetic efficacy of the supplemental intraosseous injection for teeth with irreversible pulpitis.
Endodont 24(4):856-858. 1998

91% successful mandibular molars
The guide sleeve remains in place until you are sure you have adequate anesthesia.

Intraosseous Anesthesia (IO)

**ADVANTAGES**
- Relatively comfortable
- Single / multiple tooth anesthesia
- No lip / tongue

**DISADVANTAGES**
- Highly vascular region
- LA OD
- Vasopressor “shakes” or tremor
  - use 1:200k or plain
- Can’t locate hole with needle

1980’s . . .

Intraseptal Anesthesia
Intraseptal (Crestal) Anesthesia

Application of Crestal Anesthesia for Treatment of Class I Caries in Posterior Mandibular Teeth
Korouch Taberi Talesh 1 and Shiva Solahiye Kahramouli 2.*


Crestal
IANB
Onset
7.00
3.30
+/- 0.71
+/- 0.67
<0.001

Duration
23.10
32.10
+/- 2.13
+/- 2.02
<0.05

Pain
1.54
3.44
+/- 0.18
+/- 0.22
<0.001

Volume
0.4 mL
1.99 mL
+/- 0.07
+/- 0.22

1. **Articaine 4% with epinephrine**
   - Synthesized in Germany 1969
   - Introduced Germany 1976
   - Canada 1985
   - USA 2000
   - Australia 2005

   1st & only Local anesthetic designed for dentistry

2. **Articaine 4% Epinephrine**
   - Duration of pulpal anesthesia (infiltration) = 60 minutes
   - Duration of pulpal anesthesia (nerve block) = 60 minutes
   - Duration of soft tissue anesthesia = 3 - 5 hours

3. **Articaine infiltration**
   - as a **sole** injection
   - for mandibular anesthesia

4. **Results**
   - **Pulp test every 3 min**
   - **SUCCESS**: 10/10 on 2 consecutive tests

<table>
<thead>
<tr>
<th></th>
<th>Articaine</th>
<th>Lidocaine</th>
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</thead>
<tbody>
<tr>
<td>Mandibular 2nd Molar</td>
<td>75%</td>
<td>45%</td>
</tr>
<tr>
<td>Mandibular 1st Molar</td>
<td>87%</td>
<td>57%</td>
</tr>
<tr>
<td>Mandibular 2nd Premolar</td>
<td>92%</td>
<td>67%</td>
</tr>
<tr>
<td>Mandibular 1st Premolar</td>
<td>86%</td>
<td>61%</td>
</tr>
</tbody>
</table>

   p value for all: > .0001

2007**
Meechan JG, Ledvinka JI.
Pulpal anaesthesia for mandibular central incisor teeth: a comparison of infiltration and intraligamentary injections.
Int Endod J 35:629-634, 2002

Results: 1.
Infiltration **buccal** fold by lateral incisor
- **94%** articaine; **70%** lidocaine

Infiltration **buccal & lingual** by lateral incisor
- **97%** articaine; **88%** lidocaine
**Advantages**
1. Profound pulpal anesthesia
2. 30 to 40 minute duration of pulpal anesthesia
3. Minimal accessory soft tissue anesthesia
   - Tongue

**Disadvantage**
Just like maxillary infiltration, I can’t think of any, unless it doesn’t work!

**Articaine infiltration as a supplement to IANB**

Kanas JM, Whitworth JM, Corbett IP, Meechan JG
Articaine buccal infiltration enhances the effectiveness of lidocaine inferior alveolar nerve block.
1st Premolar
Articaine infiltration as a supplement to IANB

1st Molar
Articaine infiltration as a supplement to IANB

Buffered Local Anesthetics

Can we speed the onset of anesthesia . . .
by buffering the LA solution?
by changing the pH of the LA solution?
pH of Local Anesthetics

- 'Plain' LA solution = ~6.5
- Vasoconstrictor LA solution = ~3.5
- Articaine + épi = 5.2
- Lemon juice concentrate = 3.3

30-Minute Time Course for Pulpal Analgesia - Lidocaine IANBs
Average for 28 PRP Studies - 1078 Subjects (1991 - 2008) with Lidocaine IANB Mean

Most doctors wait ~10 minutes

At 10 minutes: 60% pulpal anesthesia

Six-Hour Time Course for Pulpal Analgesia (EPT) IANB Second Premolar

95% of patients will eventually get numb if given a 45-minute waiting period

IANB: Lidocaine + epinephrine

% clinically effective pulpal anesthesia
- 25% at 4 minutes
- 40% at 6 minutes
- 60% at 10 minutes
- 67% at 15 minutes
- 95% at 45 minutes
Buffered Local Anesthetics

When buffering is done properly the following advantages can be expected from the increase in pH:

1. More comfortable injection for patient
   - pH of anesthetic ~7.6
2. More rapid onset on pulpal anesthesia
3. More profound anesthesia
4. Less post-injection soreness
5. No effect on duration of action
6. No increase in LA blood level (safety)

Buffered LA
Mandibular anesthesia - IANB

1. Administer buffered LA IANB
2. DO NOT LEAVE THE PATIENT !!!
3. You know if your block is successful in 2 minutes
4. Check for pulpal anesthesia:
   - EPT or Endo-Ice
5. In 2 minutes following IANB either begin tooth preparation or readminister LA

So...

Is the “MANDIBULAR NERVE BLOCK” Passé?

Options:
- Incisive (mental) nerve block
- Gow-Gates mandibular nerve block
- Akinosi-Vazirani nerve block
- PDL, Intraosseous, Intraseptal
- Articaine by mandibular infiltration
- Buffered local anesthetic

Recommendation
Premolars and Canine and Incisors

Incisive (mental) NB
- (Buffered) lidocaine, articaine, mepivacaine, prilocaine
- 0.6 - 0.9 mL
Infiltration of buffered articaine
• 0.6 - 0.9 mL buccal fold for ~10 minute treatment

Infiltration of buffered articaine
• 0.6 - 0.9 mL buccal AND lingual for 15 - 30 minute treatment, or...

Infiltration of buffered articaine
• 0.6 mL buccal fold and REPEAT if needed

Recommendation
Canine or Incisor

Recommendation
Posterior teeth

IANB or GGMNB utilizing
• (Buffered) lidocaine, articaine, mepivacaine, followed by
• (Buffered) articaine buccal infiltration at apex of tooth
• 0.6 - 0.9 mL

So... Is the “MANDIBULAR NERVE BLOCK” Passé?