

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*

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**

PART

1

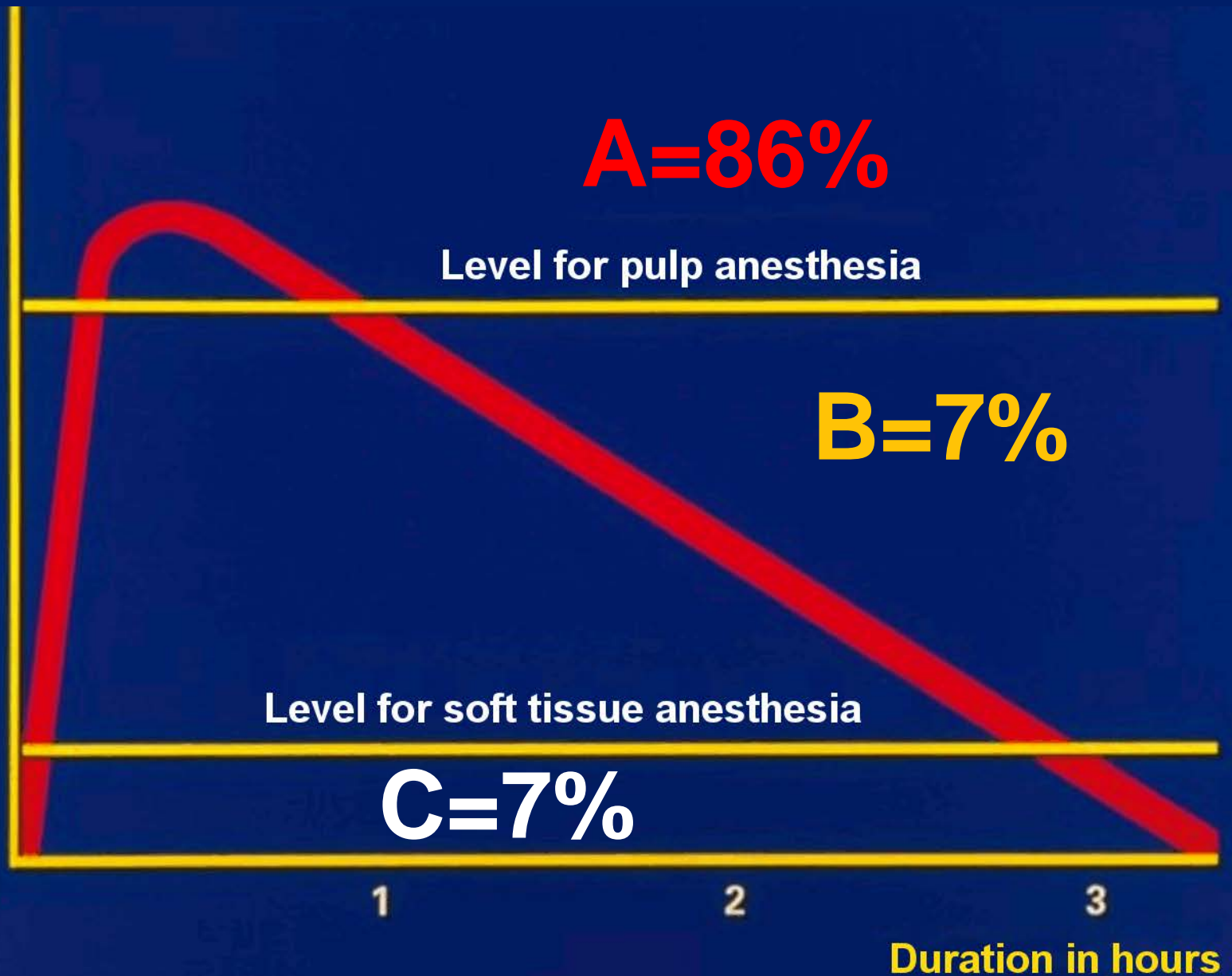
**ANATOMY, BLOCKS, ROAD
BLOCKS AND MORE BLOCKS**

**“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

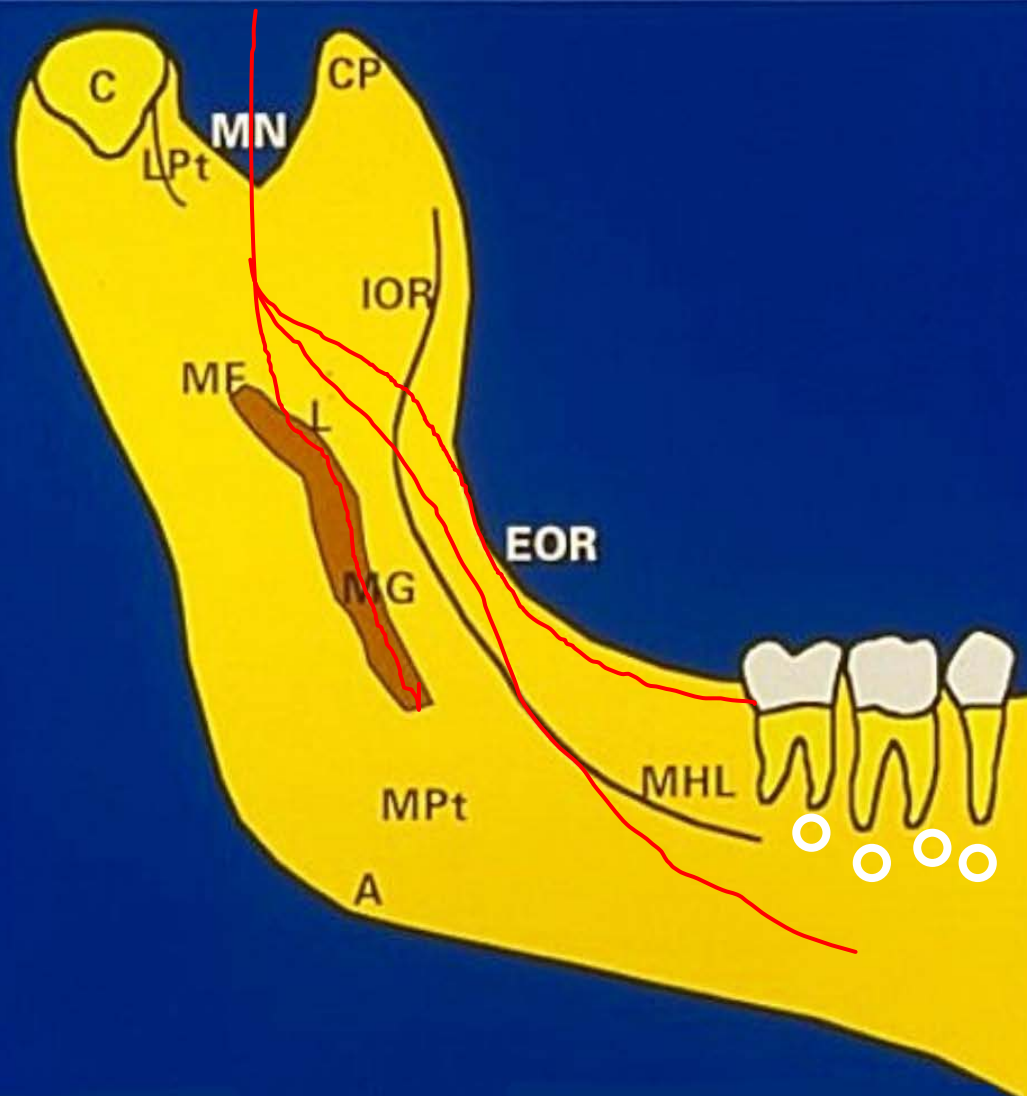
Reasons for Failure

Anatomical Variations:

- Hard tissue anatomy
- Connective tissue and Neurovascular anatomy

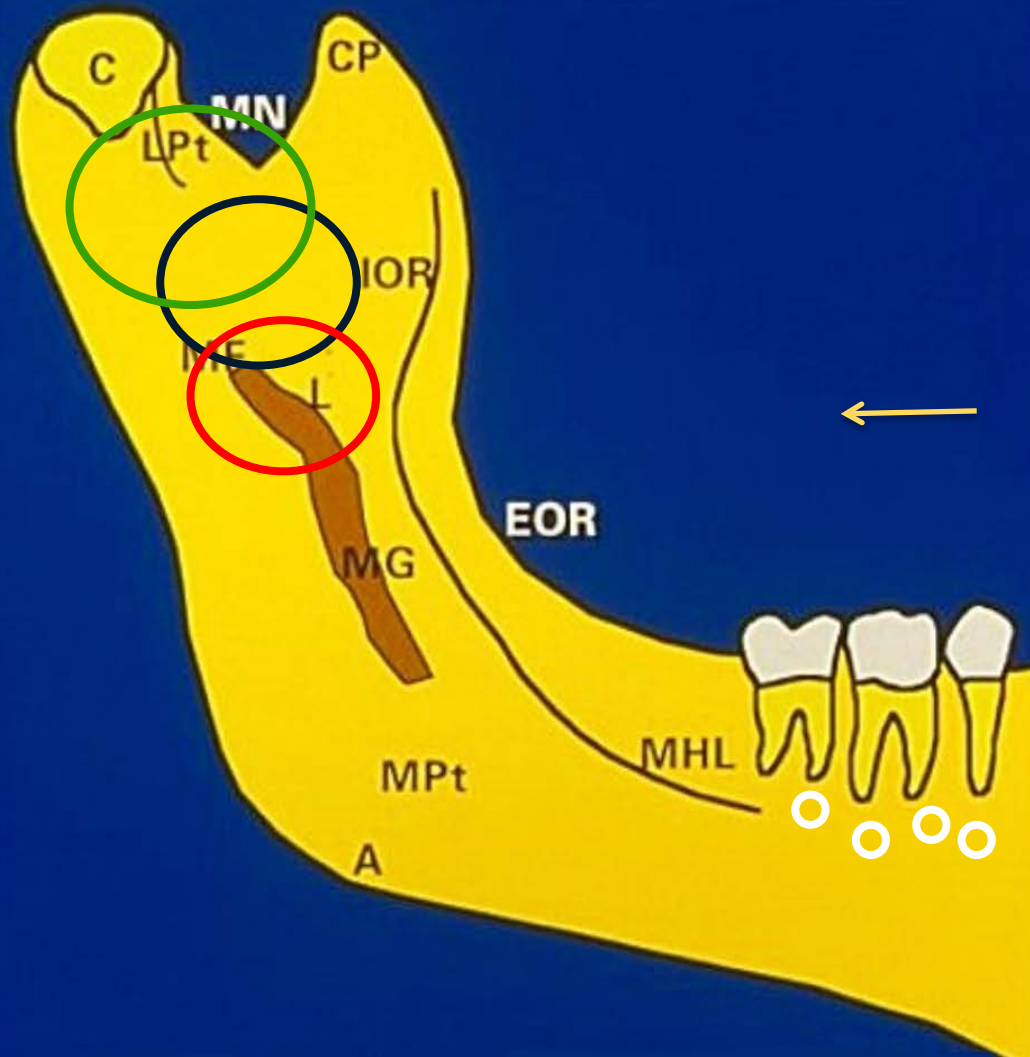
Anatomy of the Mandible

Hard Tissue



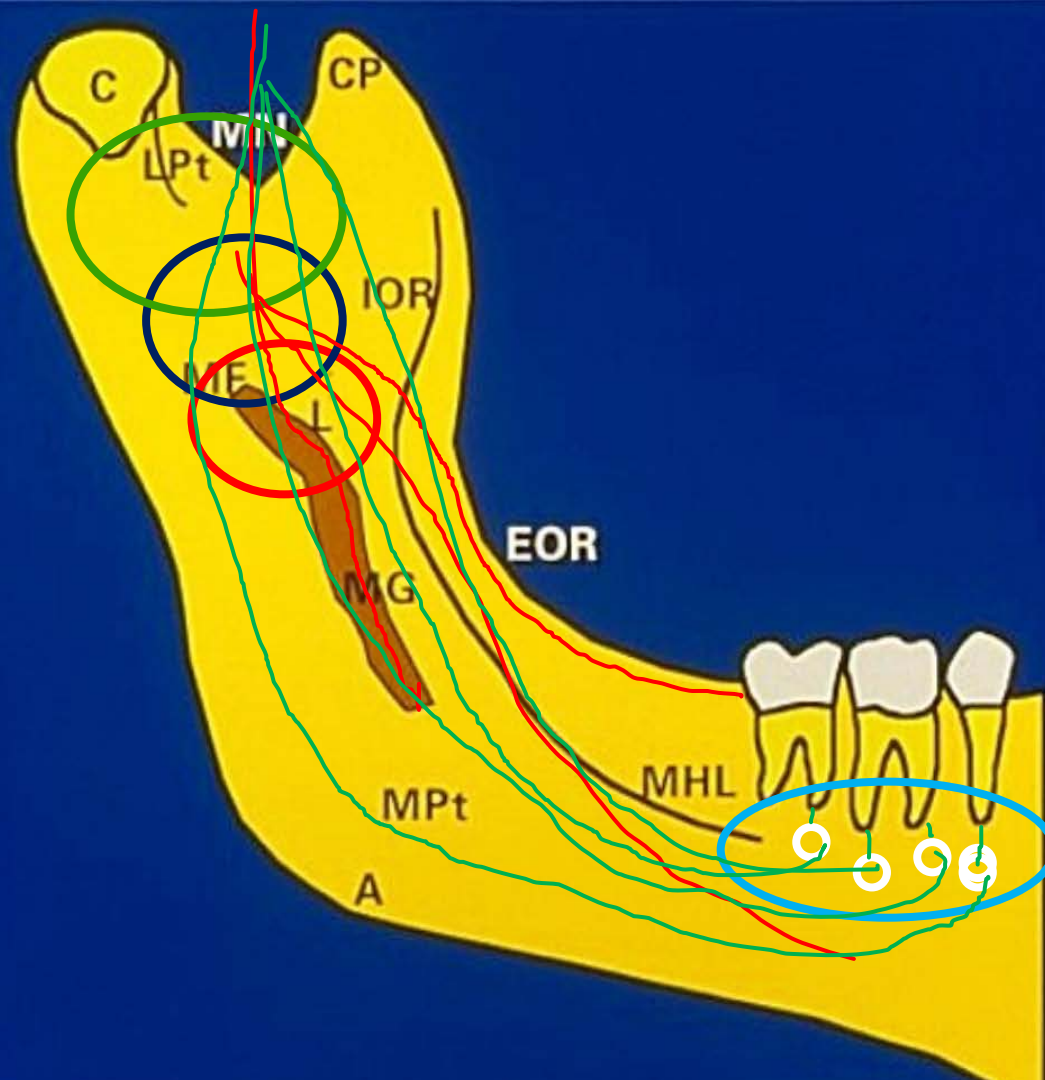
Anatomy of the Mandible

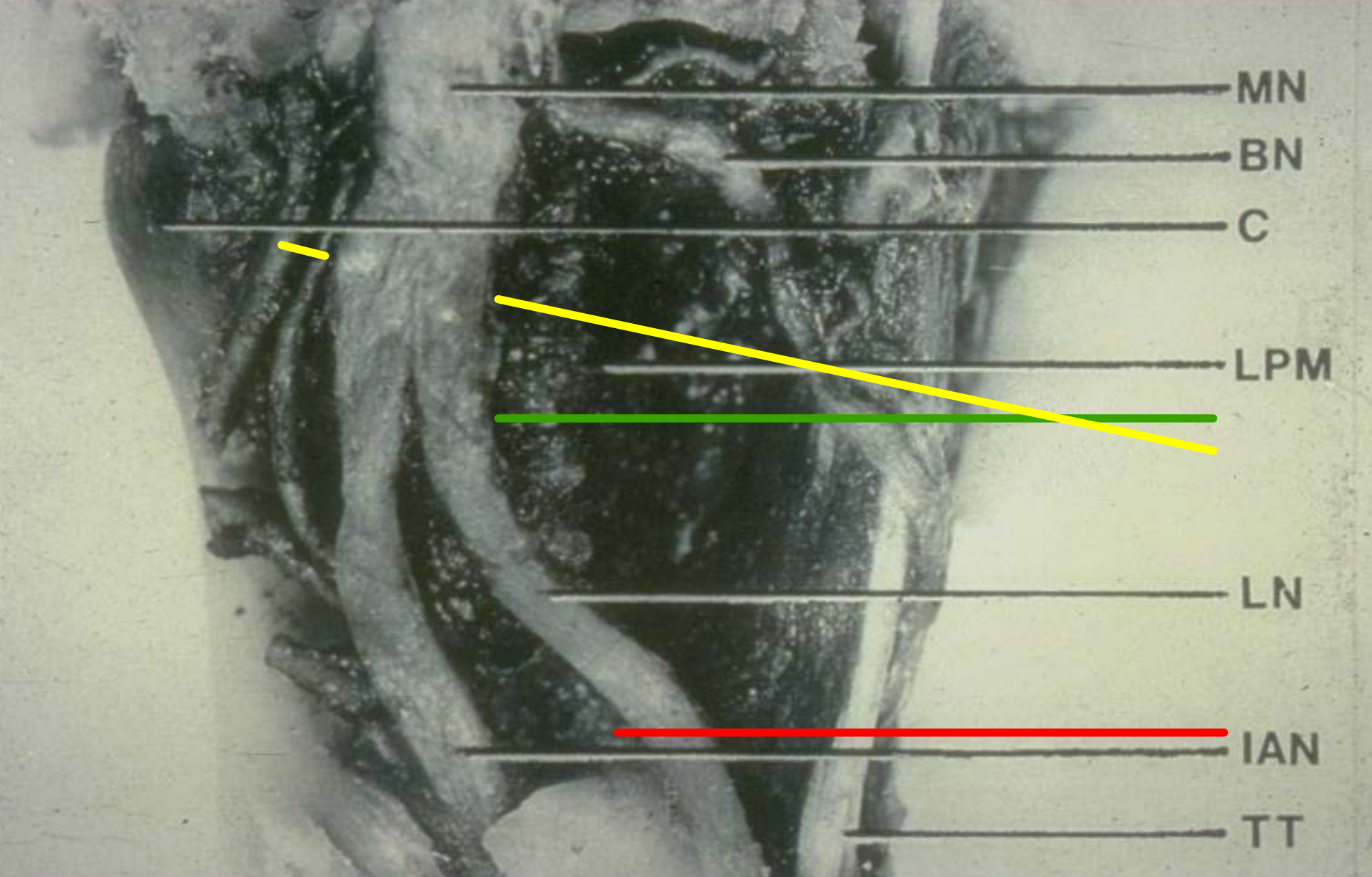
Hard Tissue



Anatomy of the Mandible

Hard Tissue

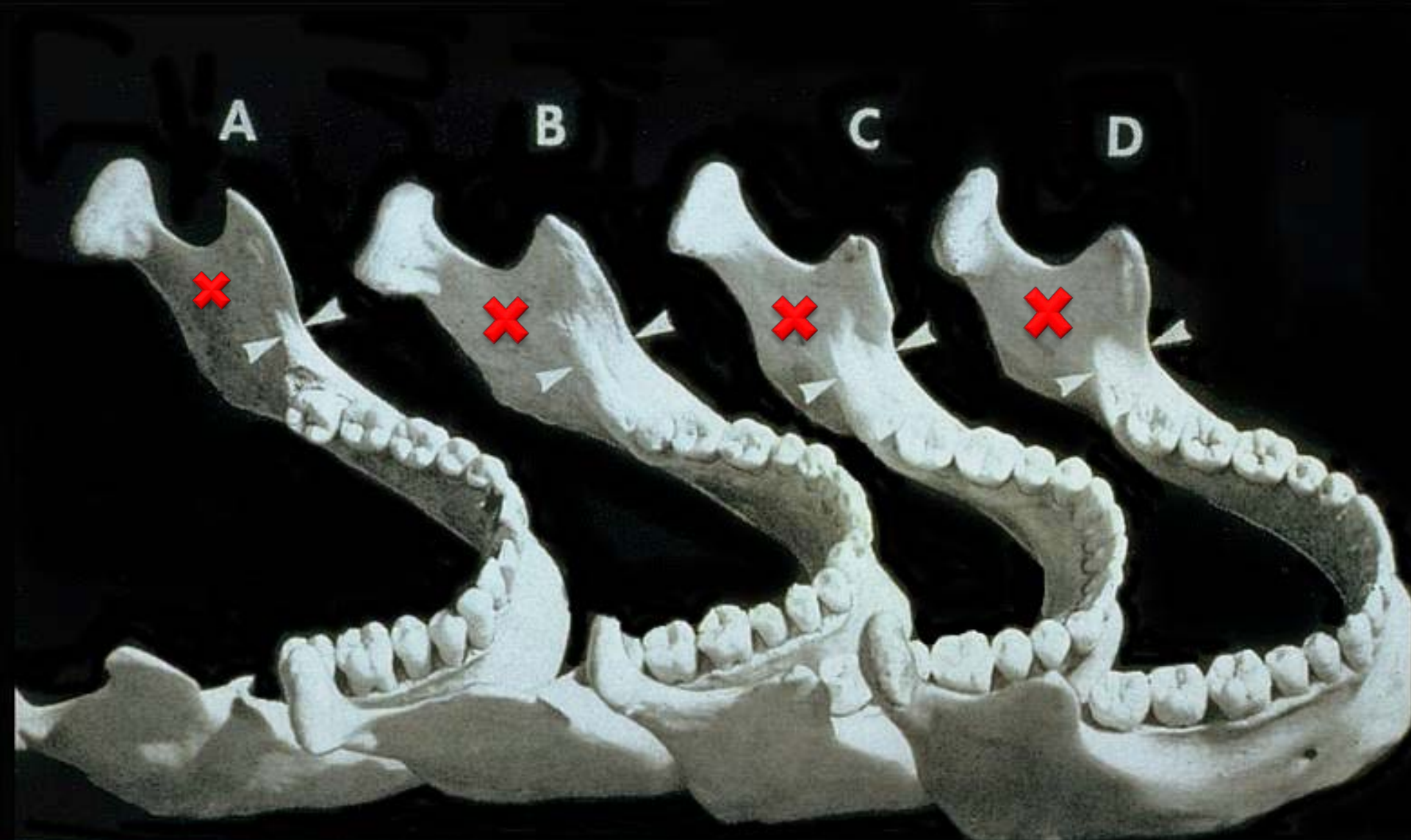




Dr. George Gow-Gates, Dr. J. Watson,
University of Sydney, Australia

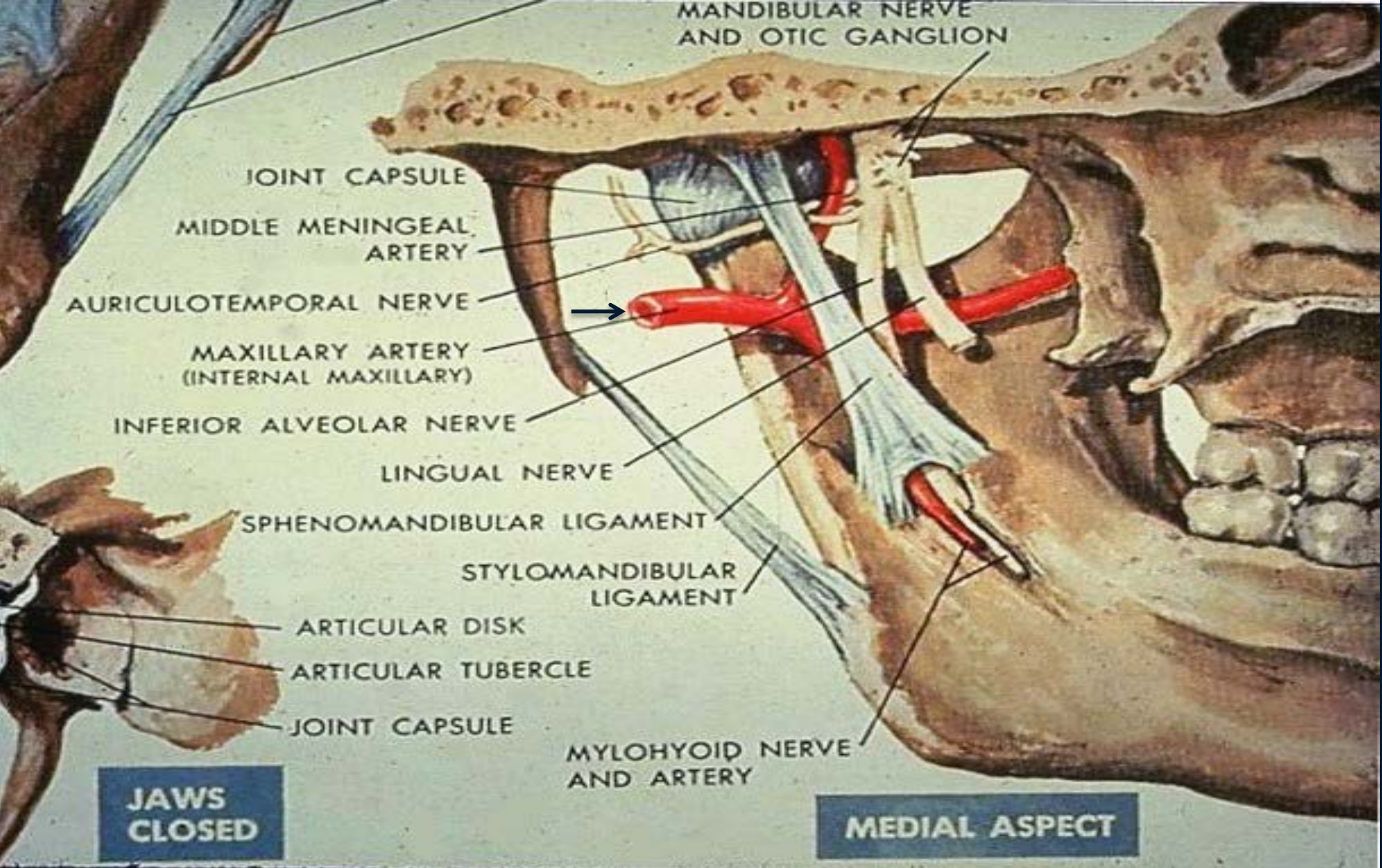
3 Major Factors:

- 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



Netter, Grant's Anatomy

Anatomical Influences:

The *maxillary* artery,
passes through the high
pterygomandibular
triangle region

The Question is:

What is the ***risk*** of an intraarterial injection?

Clinically Unlikely

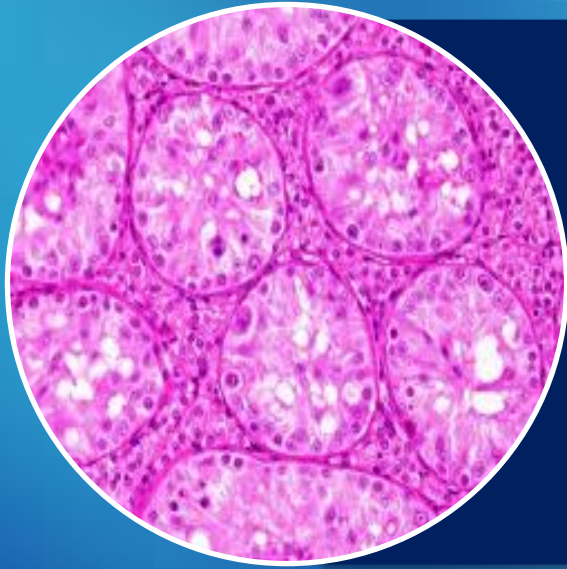
Internal Maxillary Artery

Characteristics:

- Thick smooth muscle wall
- Well innervated
- Constricts or arteriospasms, eliminates lumen
- Artery is mobile within the anatomical area
- Pulse pressure



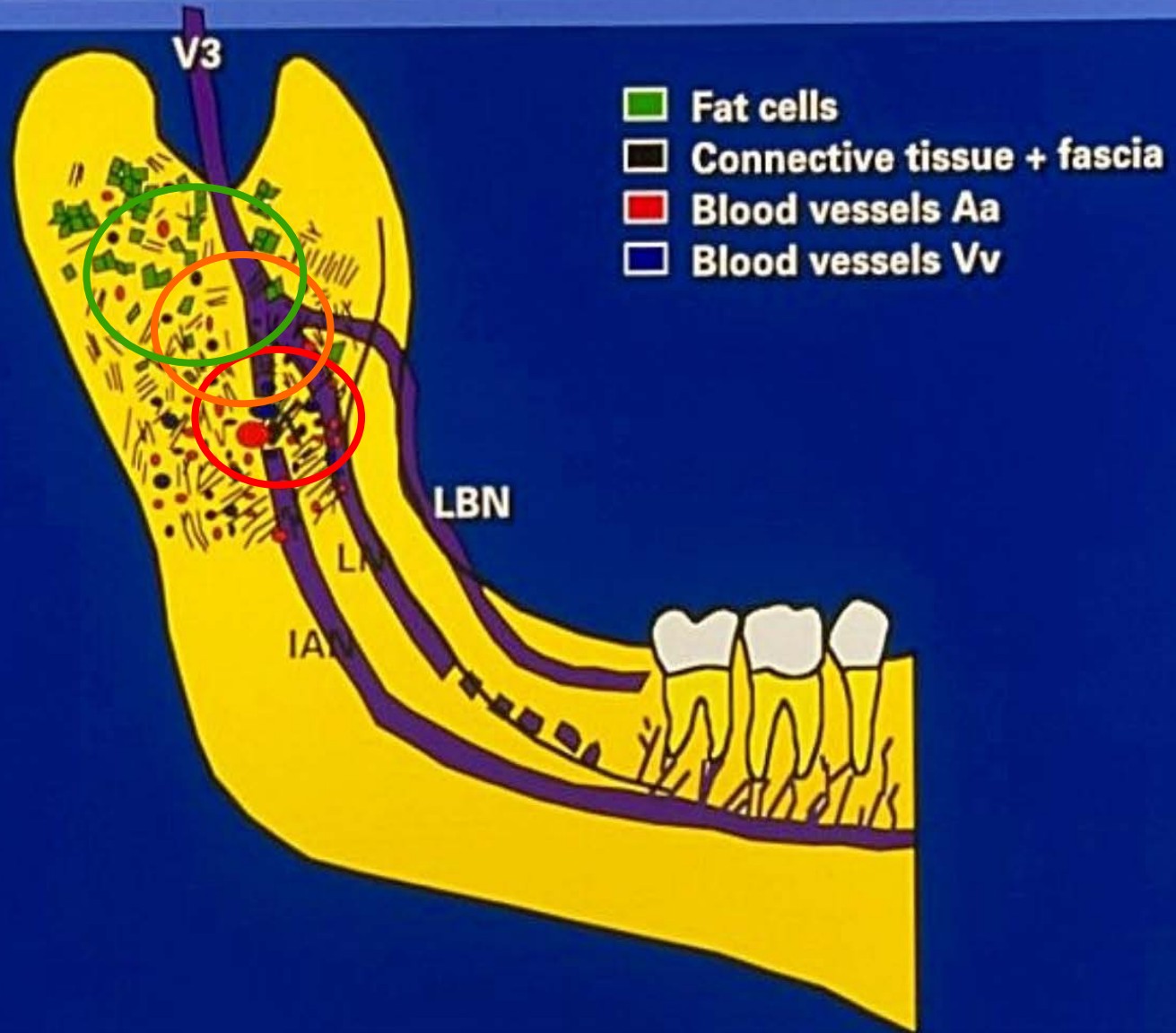
True Confessions



Histology

Pterygomandibular Triangle

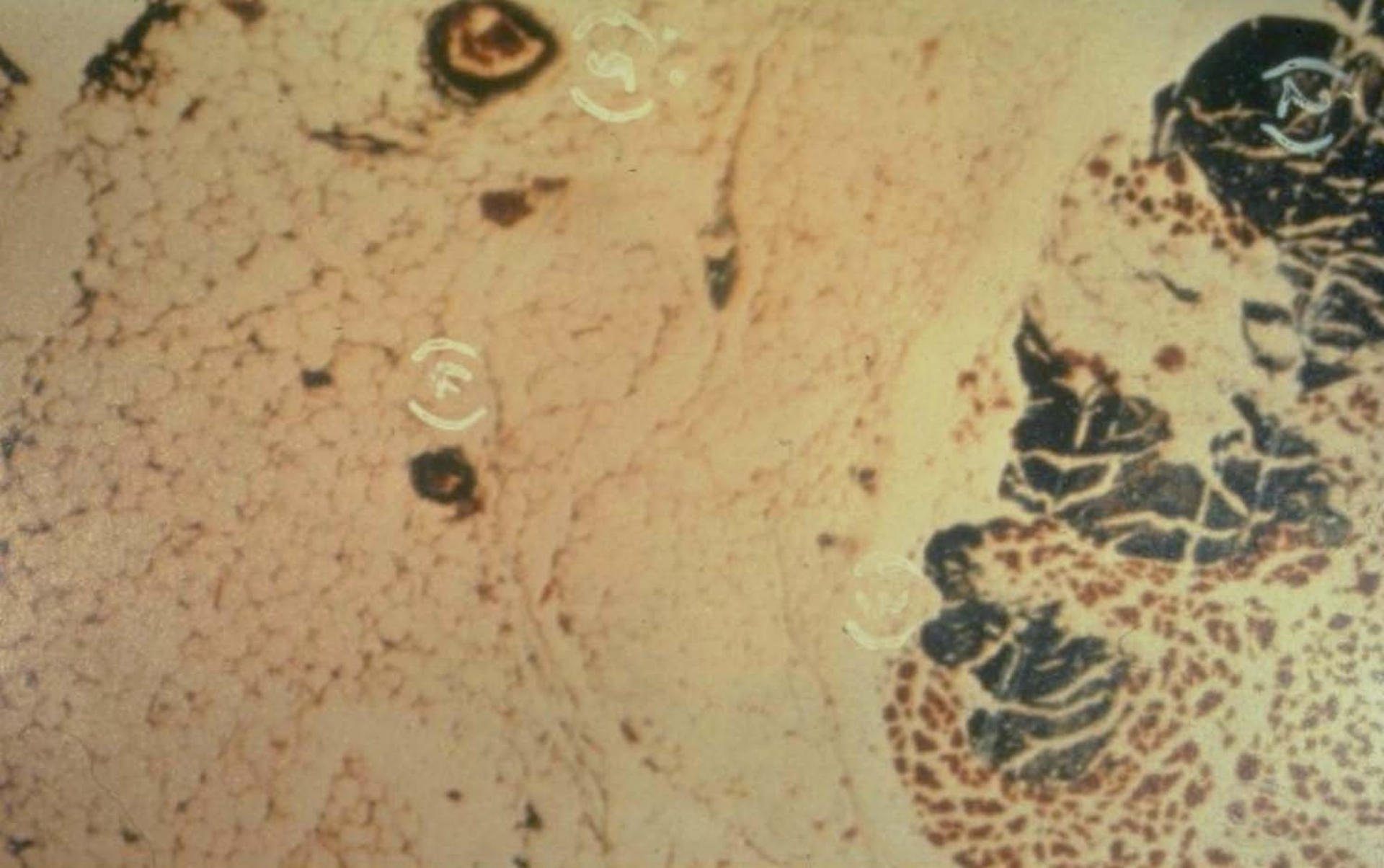
Histology





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 **↑ X2**
- (Long) buccal nerve “**block**”



Syndrome:

**“The Chin on the
Chest”**



R_x

Open the Airway



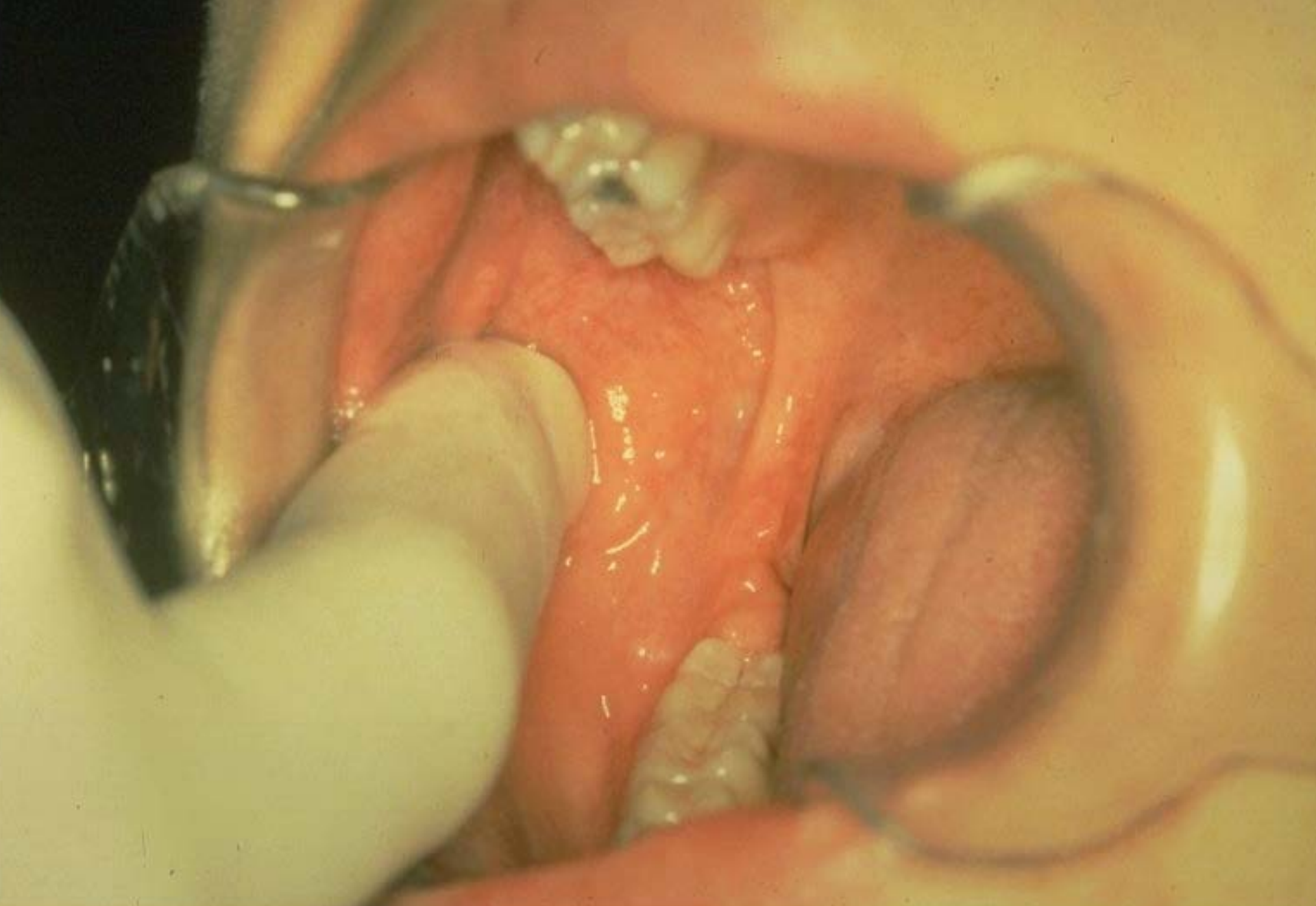


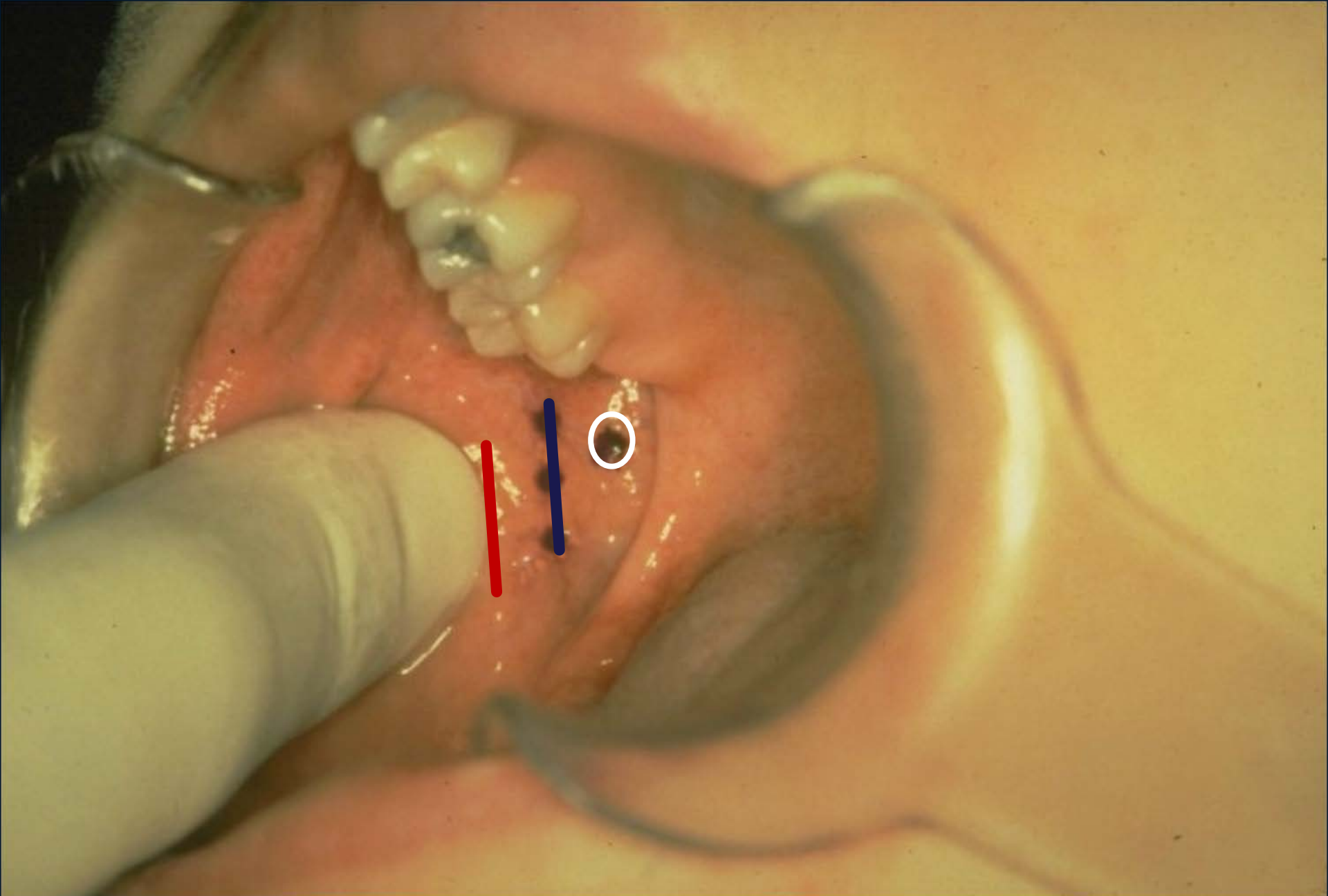
Coronoid Notch

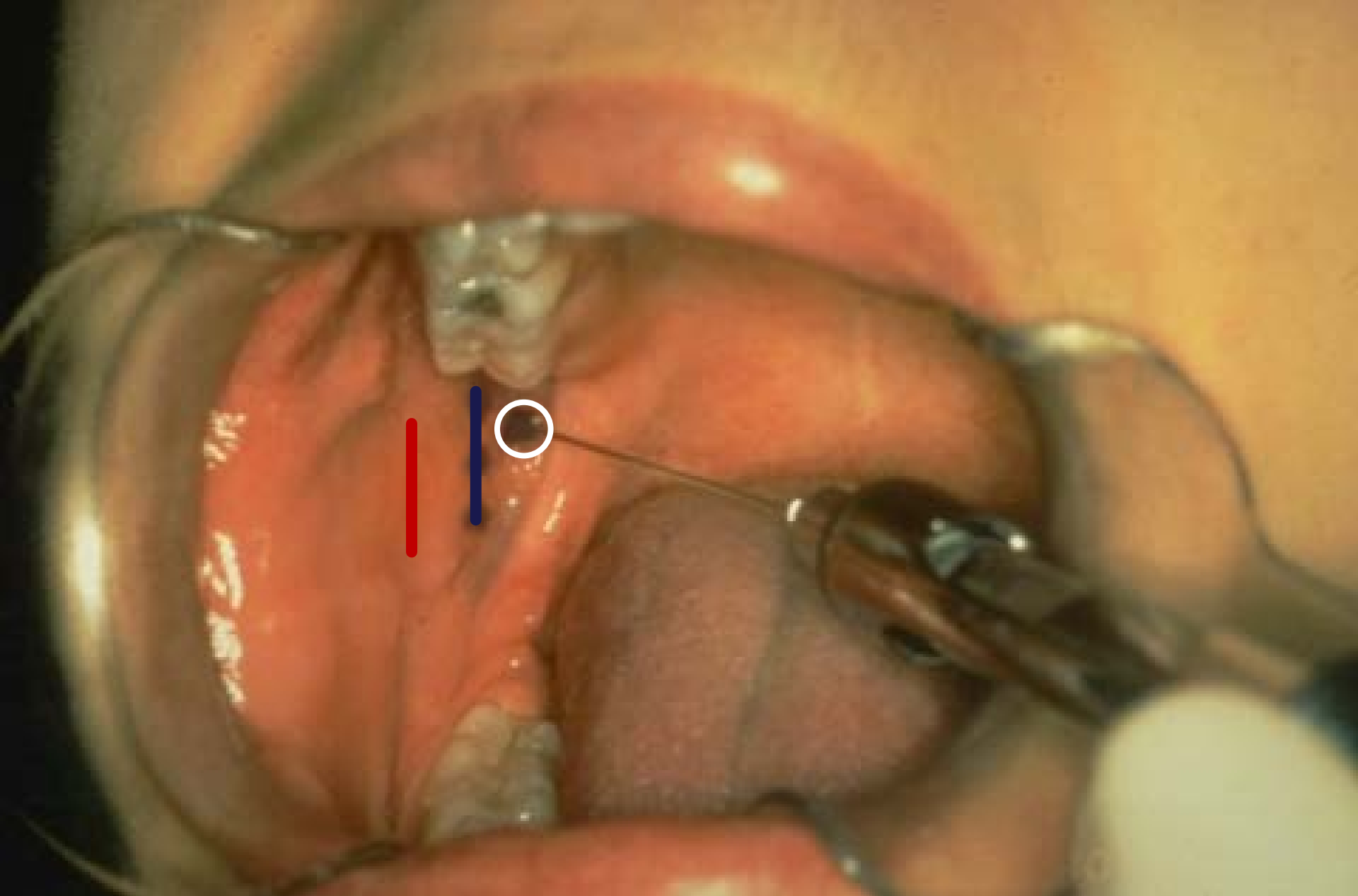
Definition:

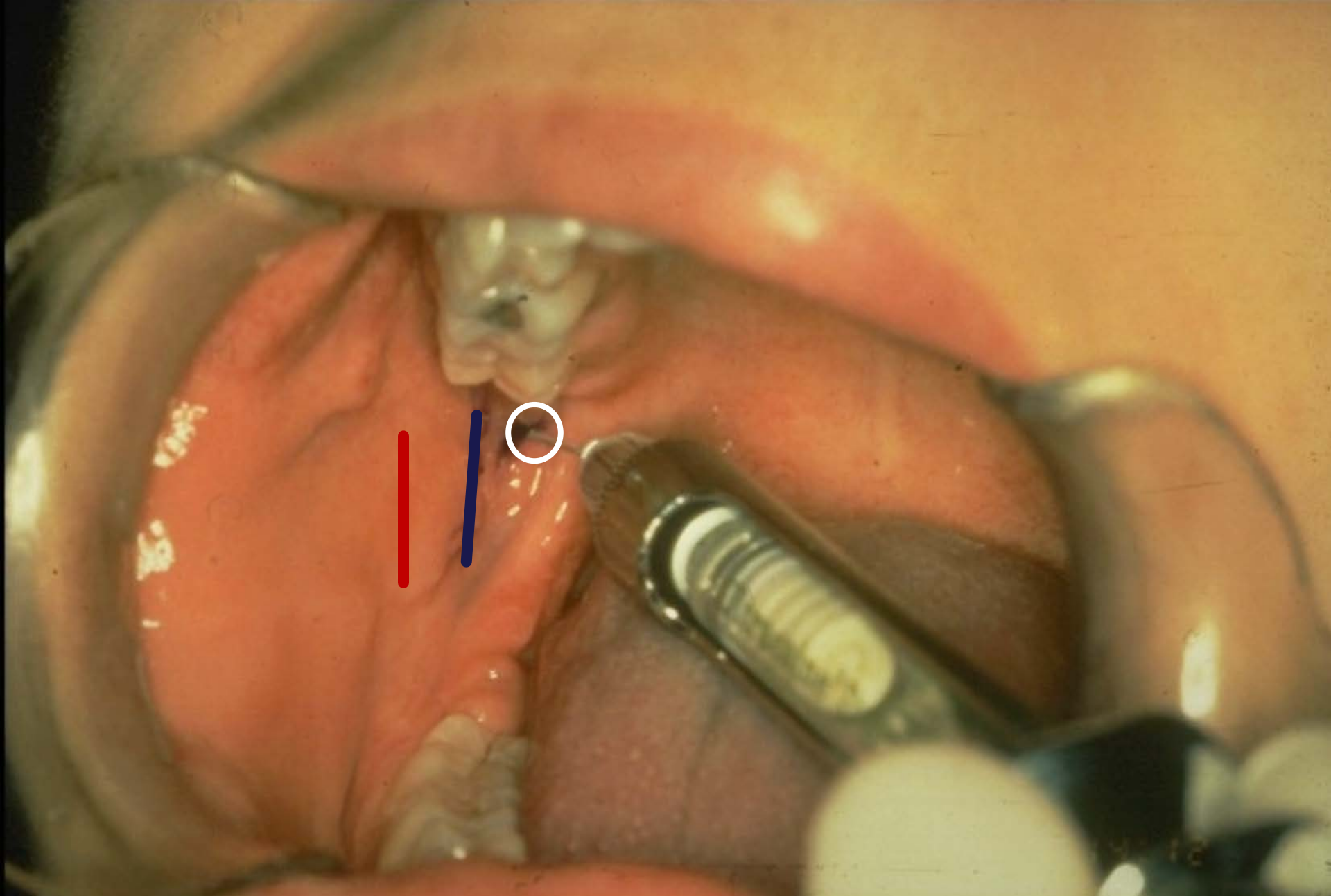
Greatest antero-postero

indentation depth on the
anterior border of the ramus



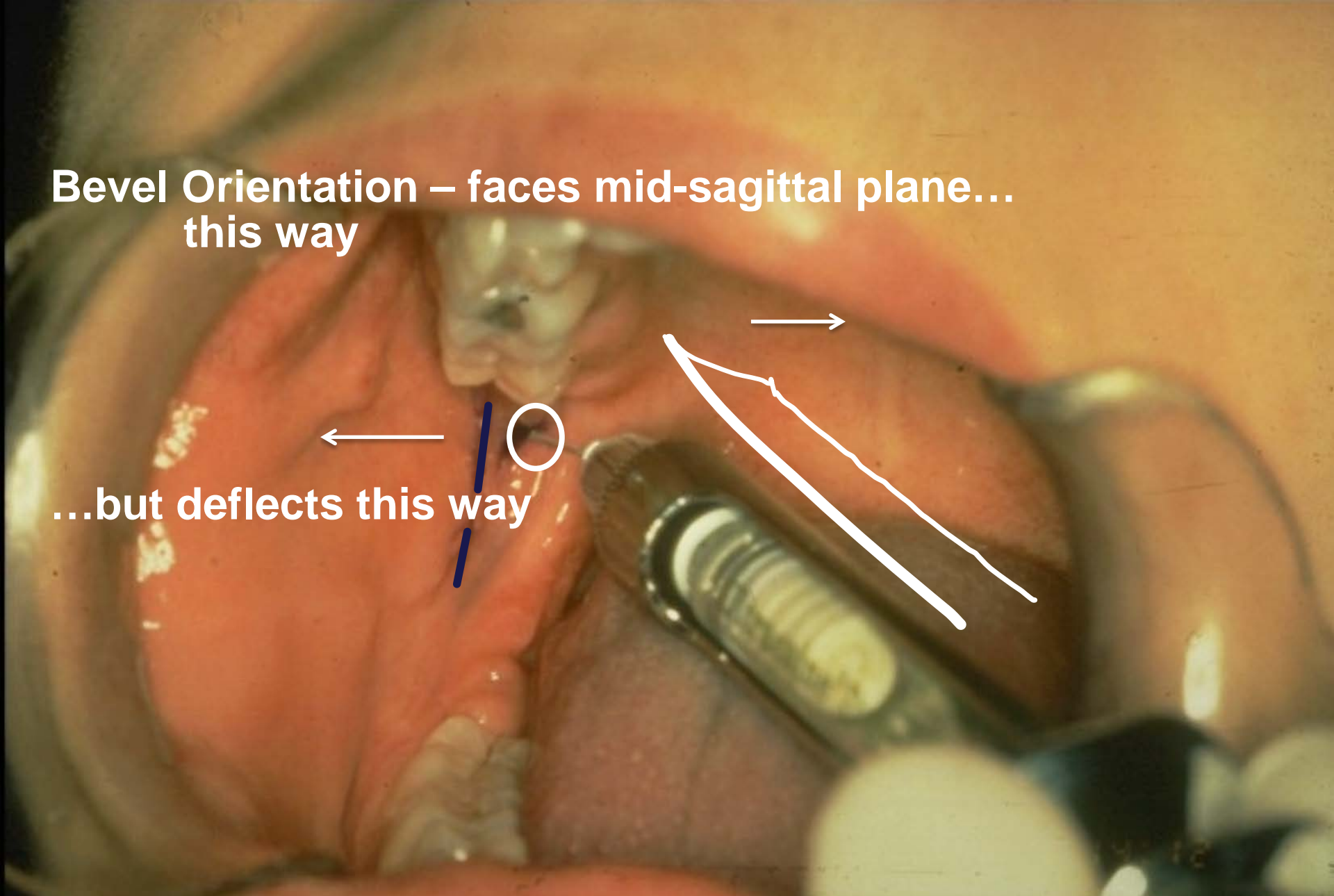






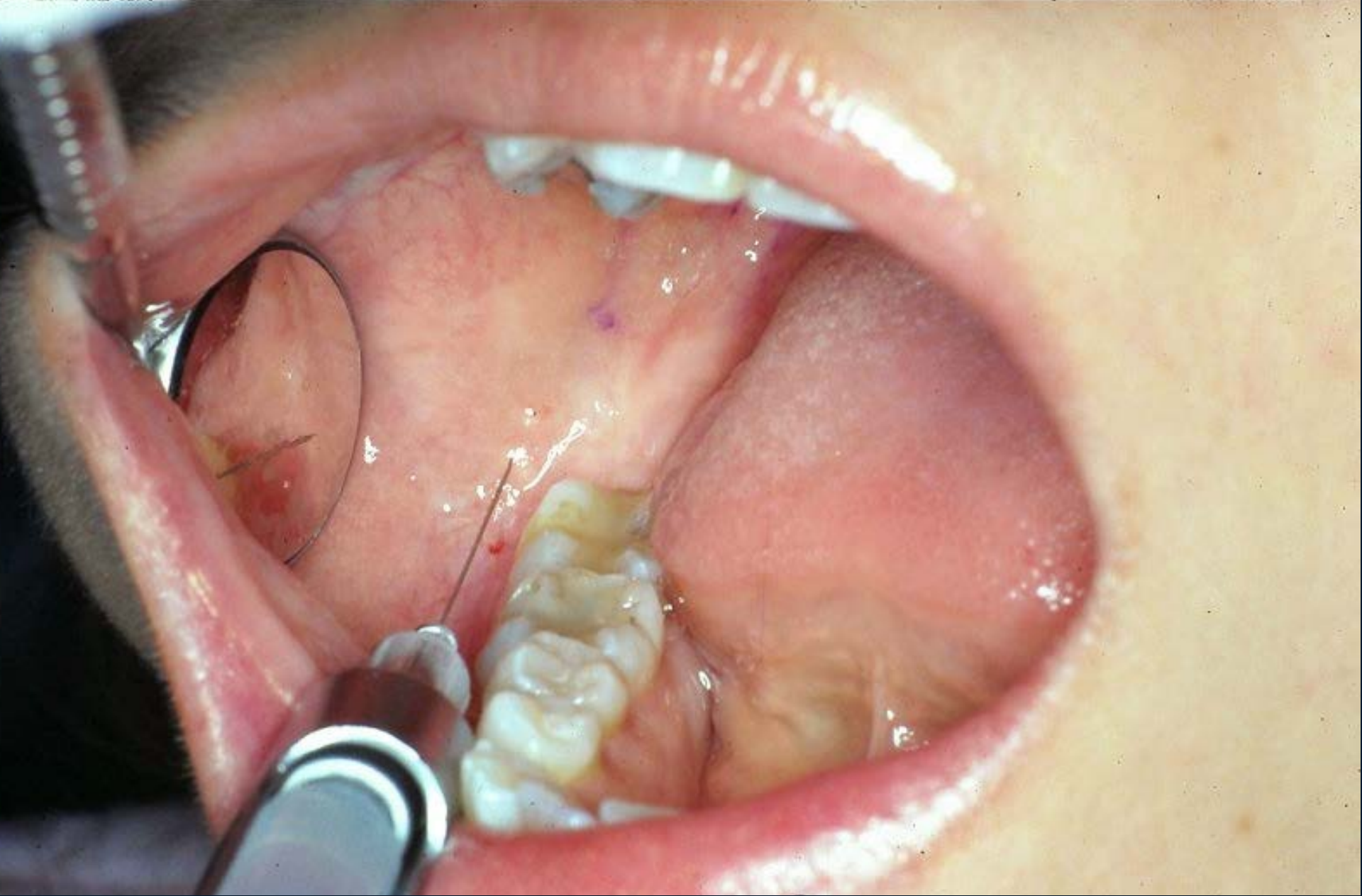
**Bevel Orientation – faces mid-sagittal plane...
this way**

...but deflects this way



Long Buccal Nerve:

Infiltration or “Block”



QUESTIONS?



PART

2

WHAT CAN GO **WRONG** AND
WHAT TO DO ABOUT IT?

Infiltration of Mandibular Molars

Buccal *and* lingual
approach

Lingual Infiltration

Advantages:

- **Thin** cortical plate
- Lingual foramina
- Patient **acceptance**
- Lingual nerve **blocked** already

Lingual Infiltration

Disadvantages:

- **Ballooning** of tissue
- Avoiding submandibular salivary gland
- **Vision**

Lingual Infiltration

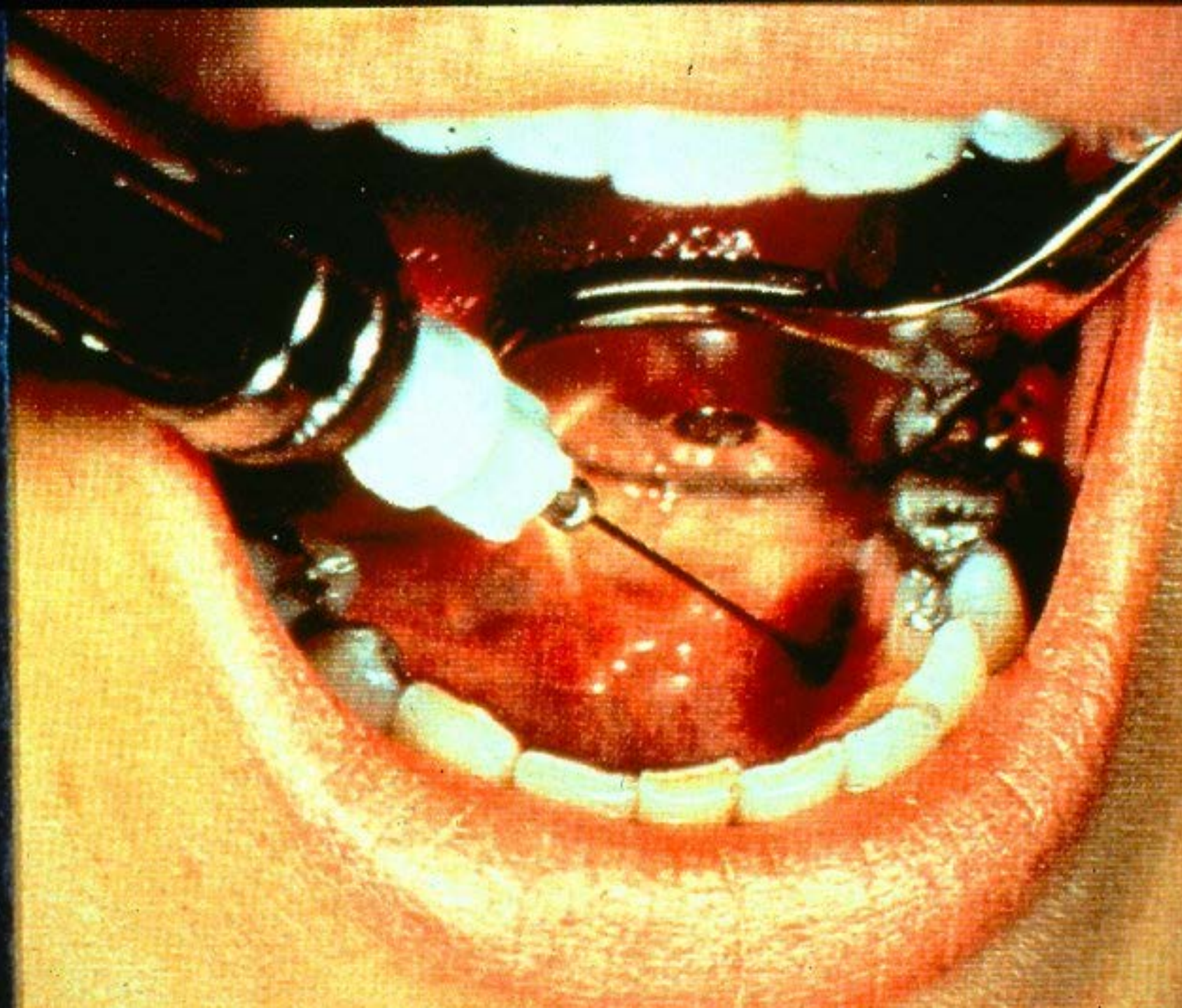
Patient selection criteria enhancement:

- **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?

1

Chin up to the ceiling
Head position
consistent every time!

1



- **Consistency**
- **Roll of gravity?**

2



**Scissors
Mouth
“Rester”**



Prop or
“rester”

Right side
goes with
right side
technique

3

Volume Considerations

- Amount given, then available time for diffusion
- Neuroanatomy (penetrable diameter)

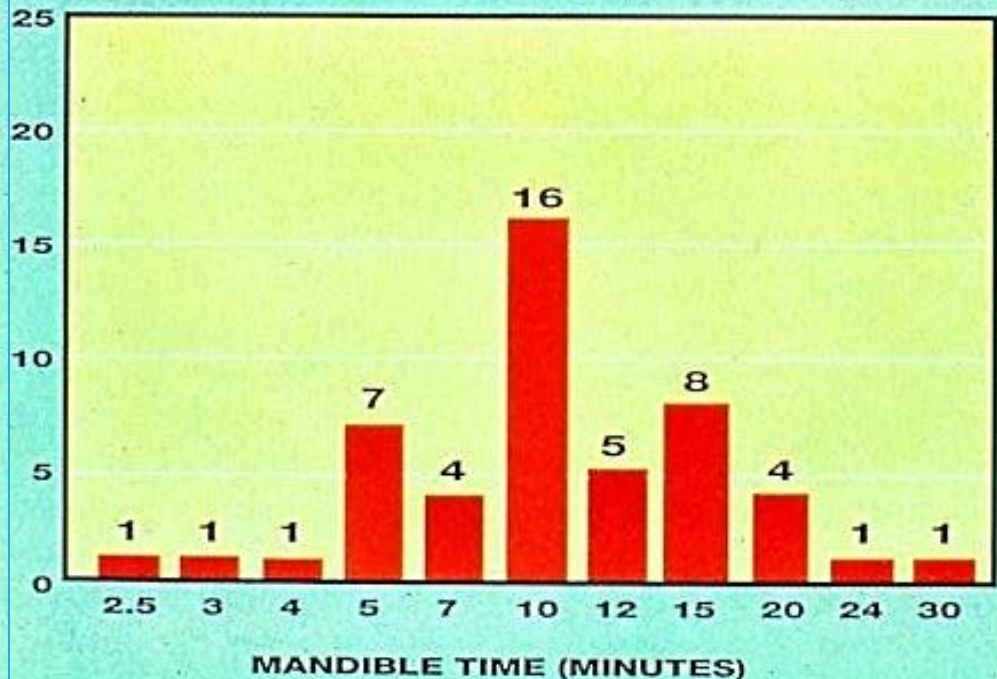
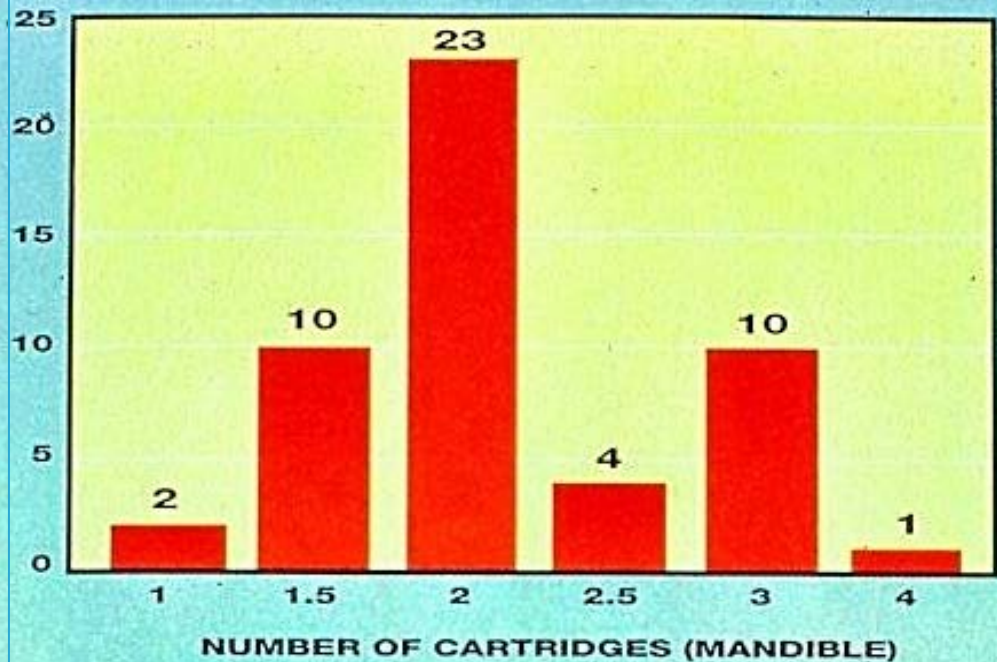
How many "carps"

are enough... 2 ?

are too much... 4 ?

for a block

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



4

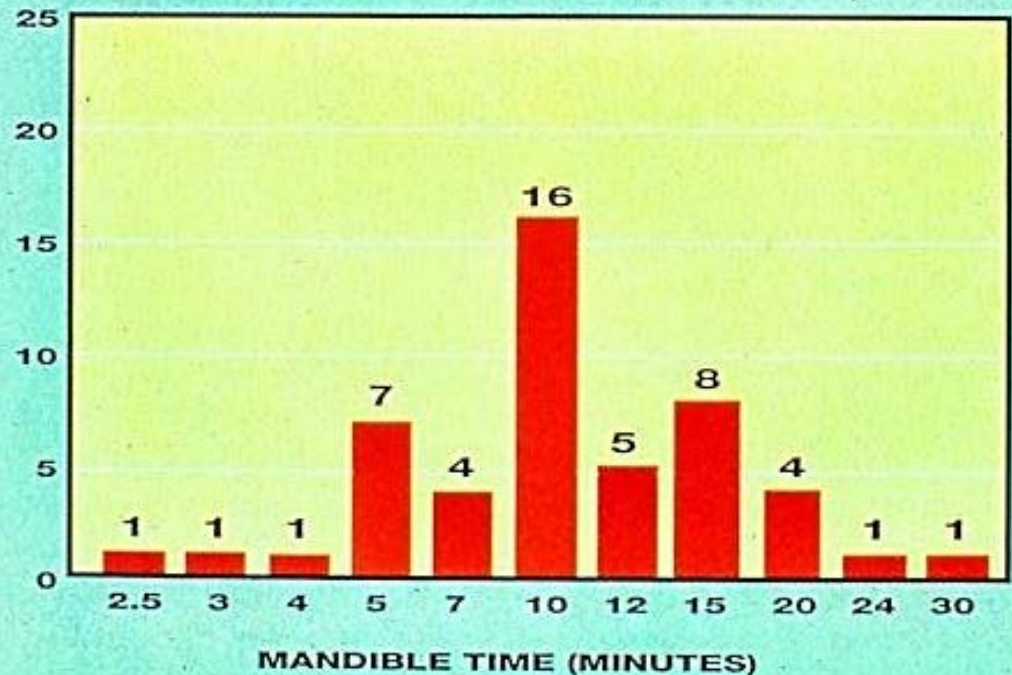
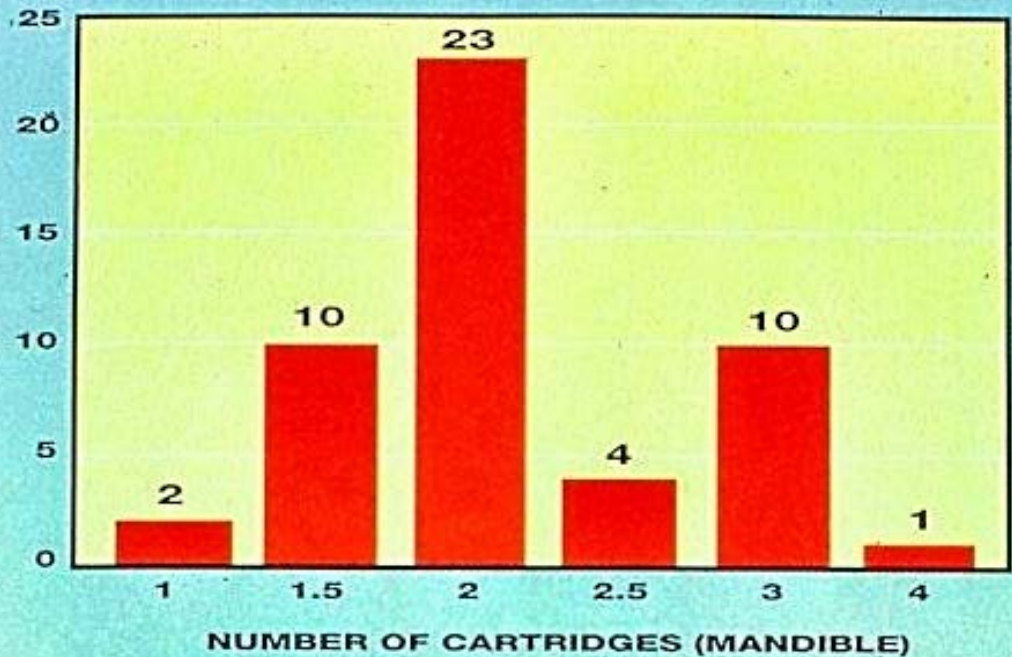
Onset

Time



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

Lip v. Pulpal
Anesthesia

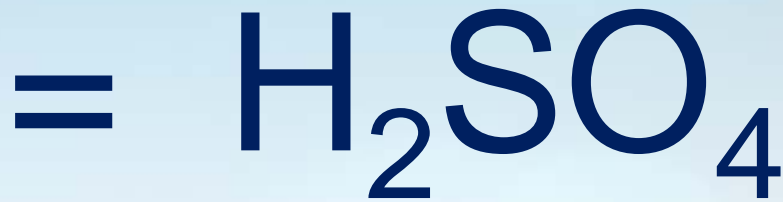


5

The Influence of SOLUTION pH

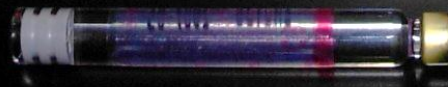
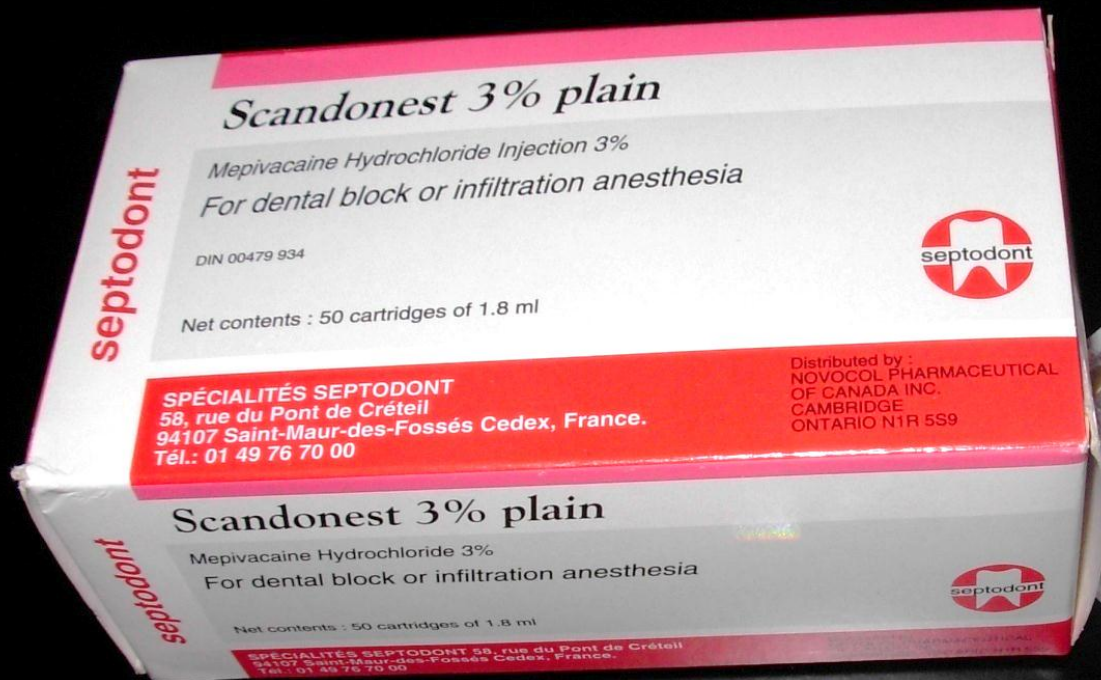
Primarily due to concentration of **HCl** the LA molecules are dissolved in.

Also proportional to **vasoconstrictor concentration** and it's antioxidant, NaHSO_3



The Influence of SOLUTION pH

generic name	epinephrine	pH
3% mepivacaine		~5.4
4% prilocaine		~5.4
4% articaine	1:200,000	~4.9
4% prilocaine	1:200,000	~4.9
2% lidocaine	1:100,000	~4.3
4% articaine	1:100,000	~4.3
2% lidocaine	1: 50,000	~3.9



pH of ~ 5.4 favorable “plain” local anesthetic



PART

3

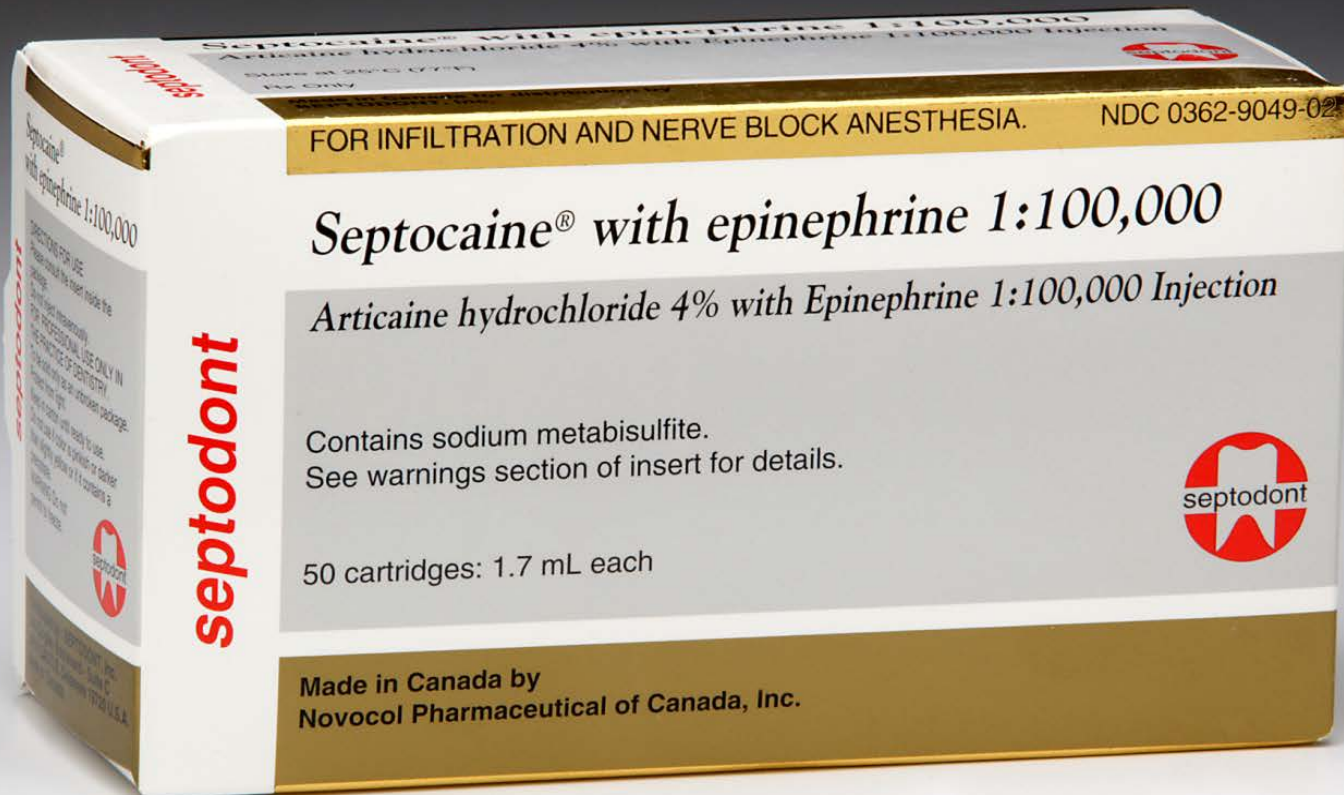
ARTICAINE STATUS, REVERSING, BUFFERING, INHALING LOCAL ANESTHESIA AND TOPICALS

1

LOCAL ANESTHESIA SOLUTIONS

EFFICACY

Articaine



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

The pulpal anesthetic efficacy of
articaine versus **lidocaine** in
dentistry:



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

Articaine



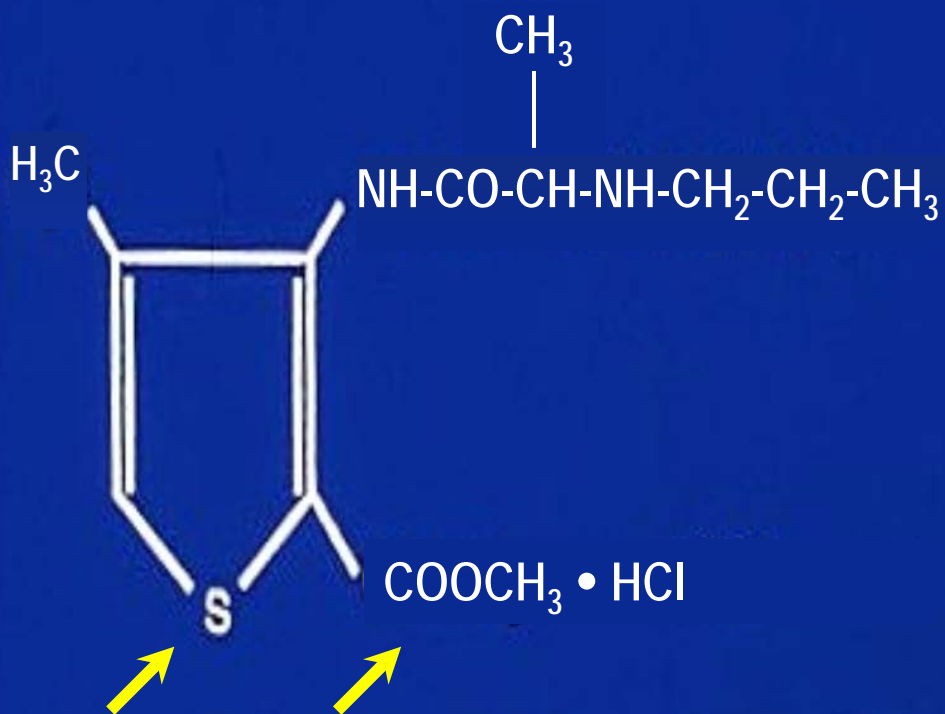
The pulpal anesthetic efficacy of **articaine** versus **lidocaine** in dentistry:

- **Weaker**, but still significant evidence of articaine's **superiority** for mandibular block anesthesia.
- No difference for **symptomatic** teeth (e.g. irreversible pulpitis)

Chemistry: Sulfur atom

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***.

Metabolism

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 $\frac{1}{2}$ life (**27 minutes**). This represents a systemic **safety phenomenon**.

Search: Safety

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.

Hawkins JM, Moore PA, **Local Anesthesia: Advances in Agents and Techniques**, *Dent Clin N Am* 46 2002 719-73

Search: Adverse Drug Reactions

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**.

Hawkins JM, Moore PA, **Local Anesthesia: Advances in Agents and Techniques**, Dent *Clin N Am* 46 2002 719-732

Search Results: ADR's

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 causative 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



Dr. George Gow-Gates, Dr. J. Watson,
University of Sydney, Australia

QUESTIONS?



2

OraVerse™

**Phentolamine Mesylate
Injection**

**“Reversing” Local
Anesthesia**

Phentolamine Mesylate

reverses *SOFT TISSUE*
ANESTHESIA ONLY

Phentolamine Mesylate is **NOT** a
LOCAL ANESTHETIC
reversal agent

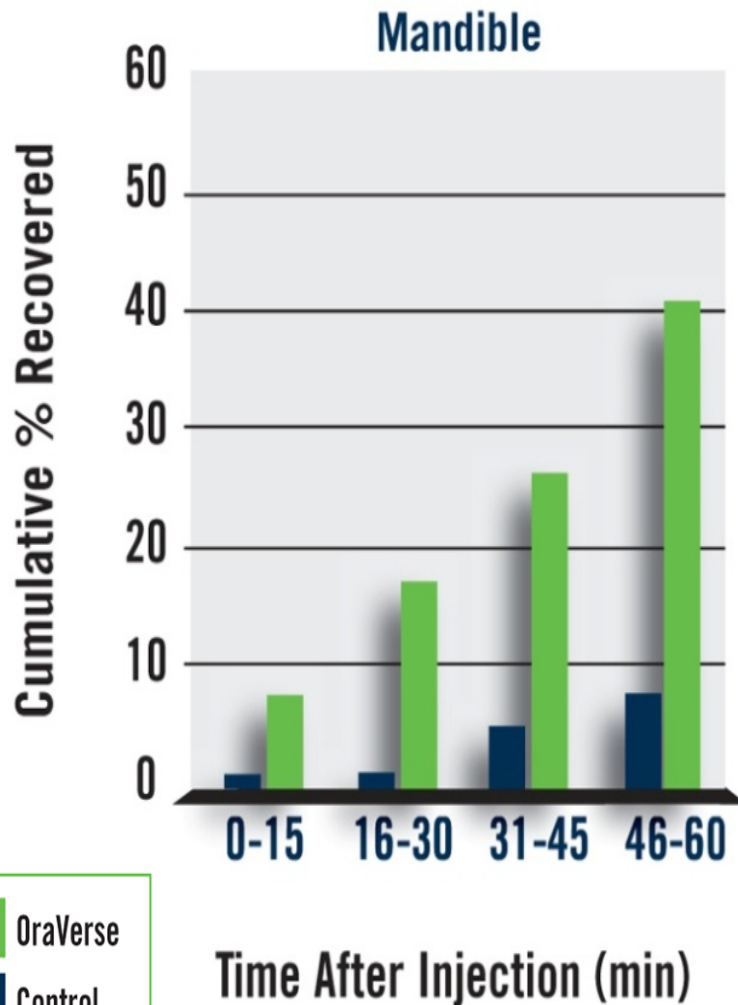
13% of pediatric patients receiving
IANB suffer post-treatment
traumatic **injury** to soft tissues.

College C, Feigal R,
Wandera A, Strange M.
Bilateral versus
unilateral mandibular
block anesthesia in a
pediatric population.
Pediatr Dent.
22(6):453-457, 2000.



Adults and Adolescents: 60 Minute Efficacy Data

Time to Recovery of Normal Lip Sensation

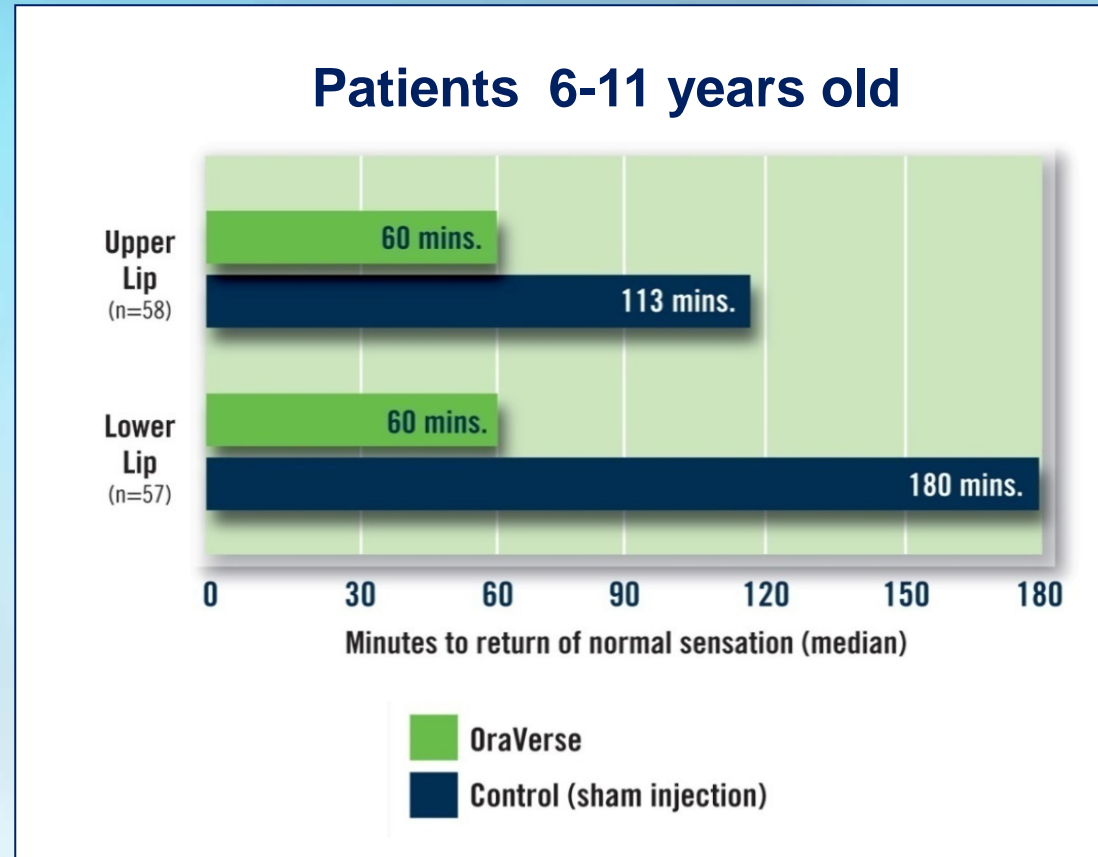


Mandible

- **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



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



OraVerse™

Now sold in
sleeves of
ten (10)



Phentolamine Mesylate

OraVerse™ Cost?

\$8/cartridge



3

Onset[®]

Buffering Local Anesthetic

Orapharma
Anutra

Performance Limitations of Current Anesthetics

- **Onset Time**

Time for body to buffer anesthetic

- **Analgesia**

Is No pain attainable? Always?

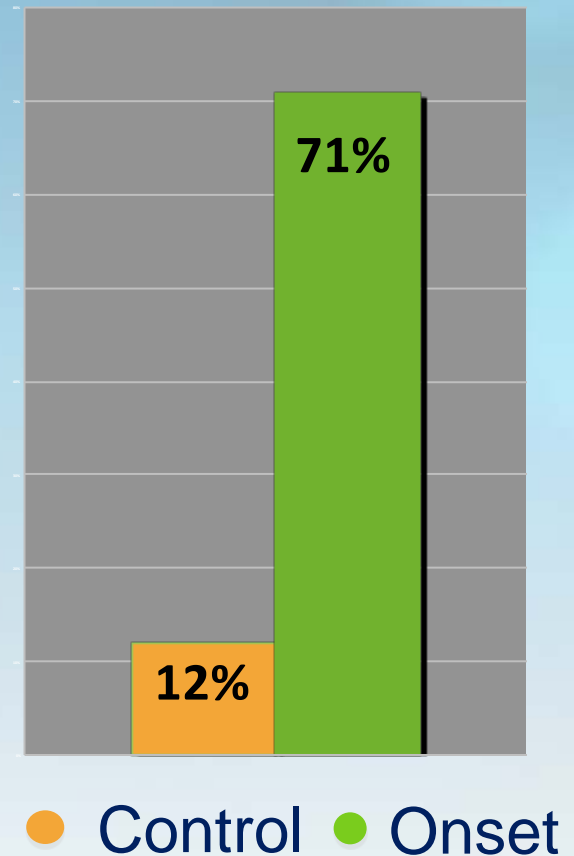
- **Injection Pain**

Stinging is a concern for patients


Clinical Study Data **Pulpal - IANB**


Percentage of Participants Profoundly Numb at 2 Minutes

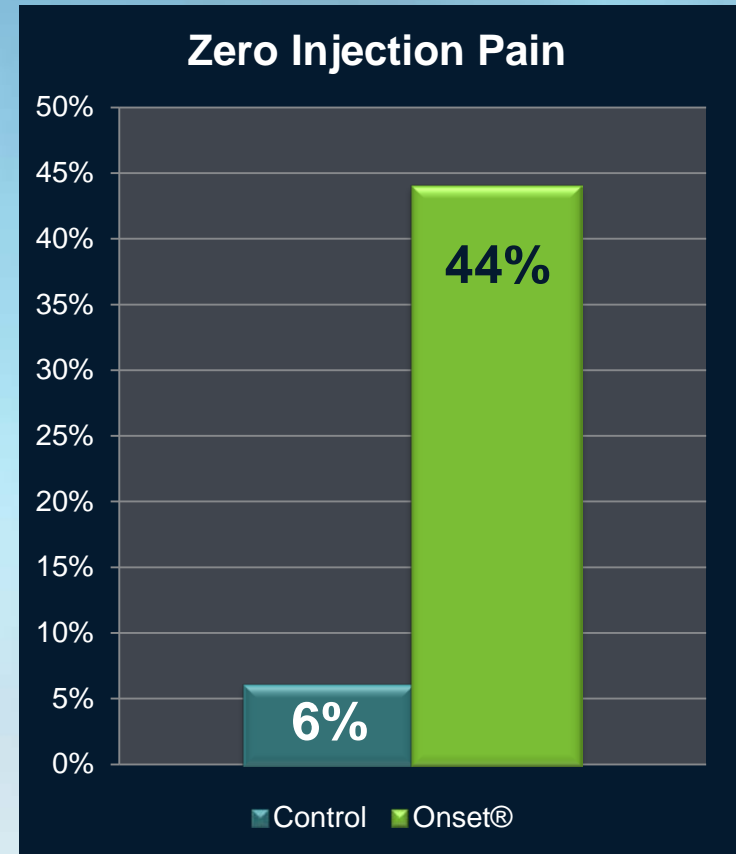
- **71%** of the participants receiving buffered anesthetic achieved pulpal anesthesia in under two minutes
- **12%** of the control participants achieved pulpal anesthesia in under two minutes



Clinical Data – Pain Free Injections

 **44%** of buffered anesthetic patients experienced zero injection pain

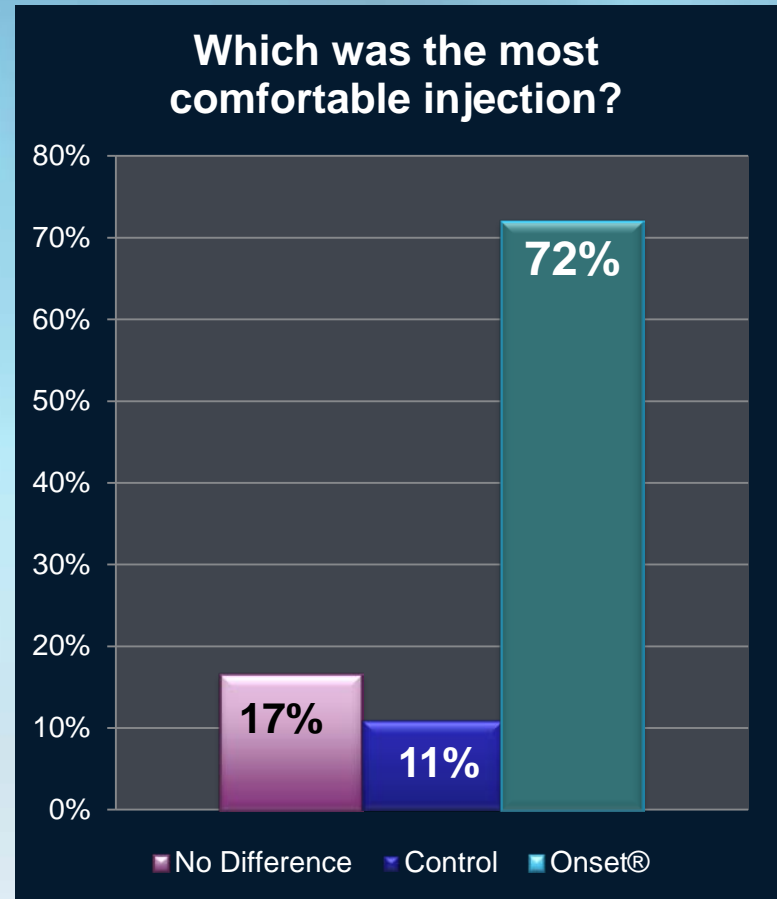
 **6%** of traditional anesthetic patients experienced zero injection pain



From: Malamed S, Falkel M, Decreasing anesthetic injection pain using an automated dental anesthetic buffering system: A prospective, randomized, double-blind, crossover study, Draft for Publication, 2011

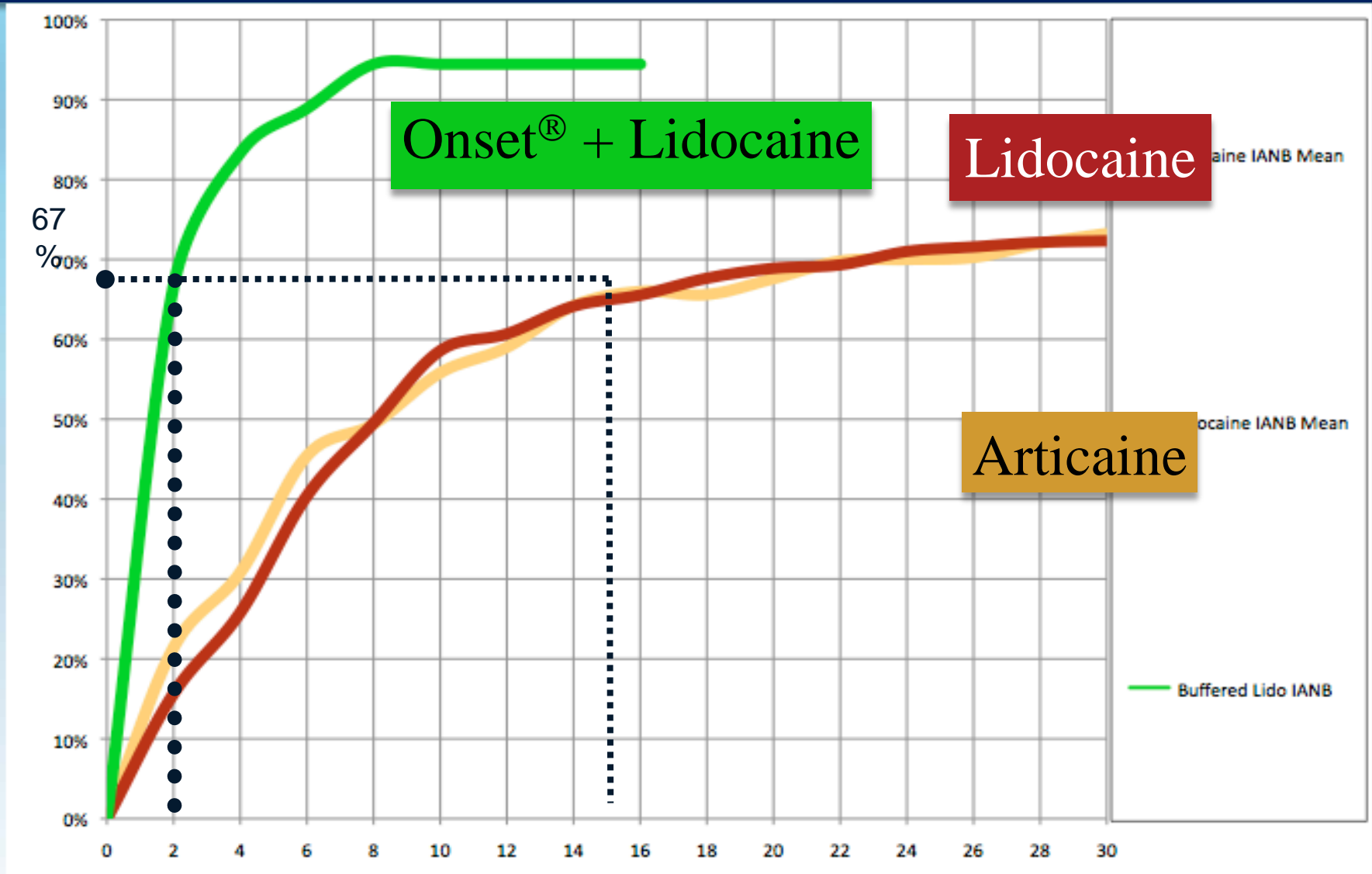
Clinical Data – Patient Preference

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



From: Malamed S, Falkel M, Decreasing anesthetic injection pain using an automated dental anesthetic buffering system: A prospective, randomized, double-blind, crossover study, Draft for Publication, 2011

30-Minute Time Course, Pulpal Analgesia, IANB



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

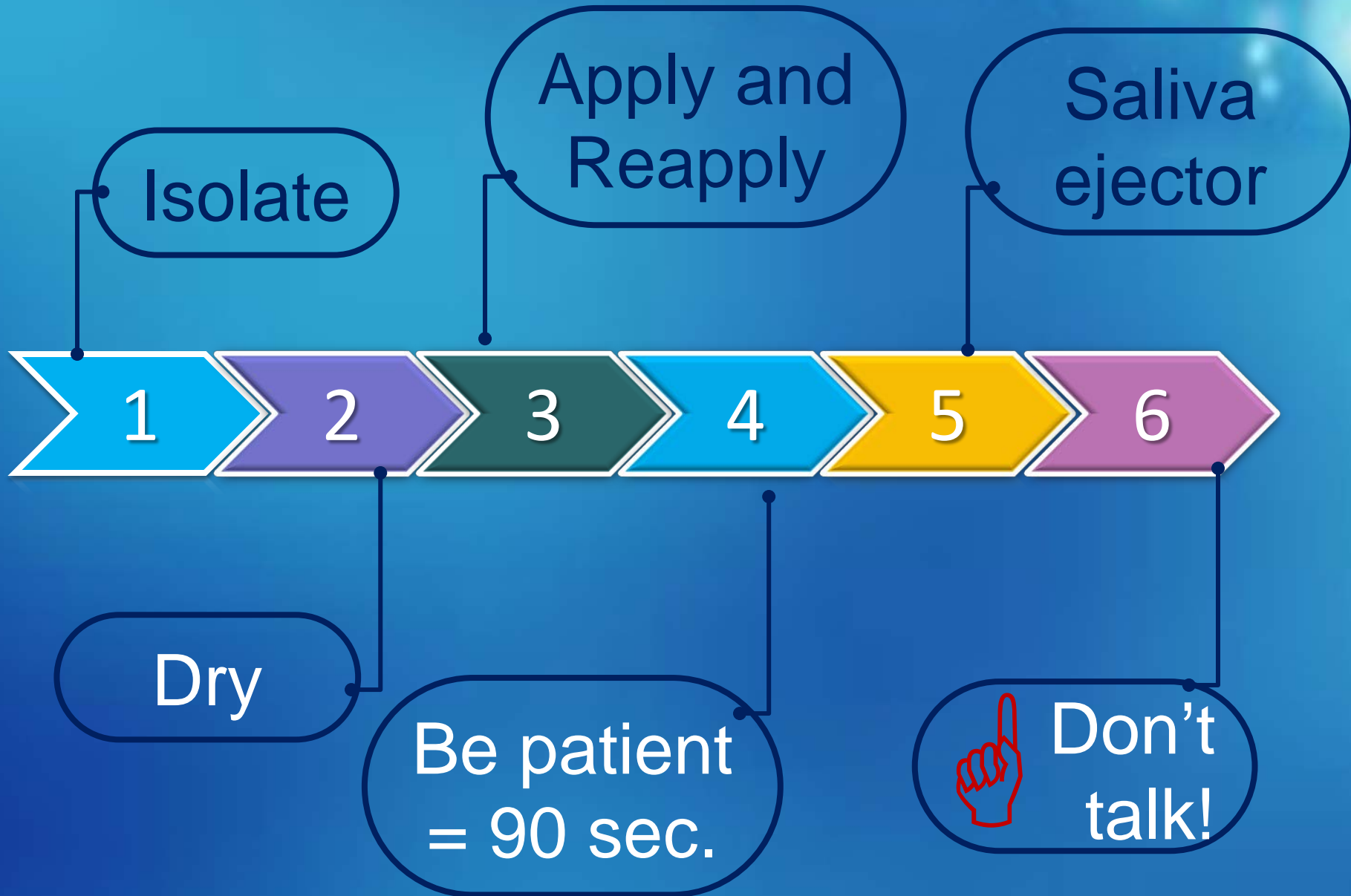
\$299.00
Not autoclavable

4

Topical Anesthetics

Product Analysis

Topical Anesthetic: Compromises



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.

4

Lidocaine Viscous
FDA announces
Box Warning
Required

Product Analysis: Lidocaine HCl

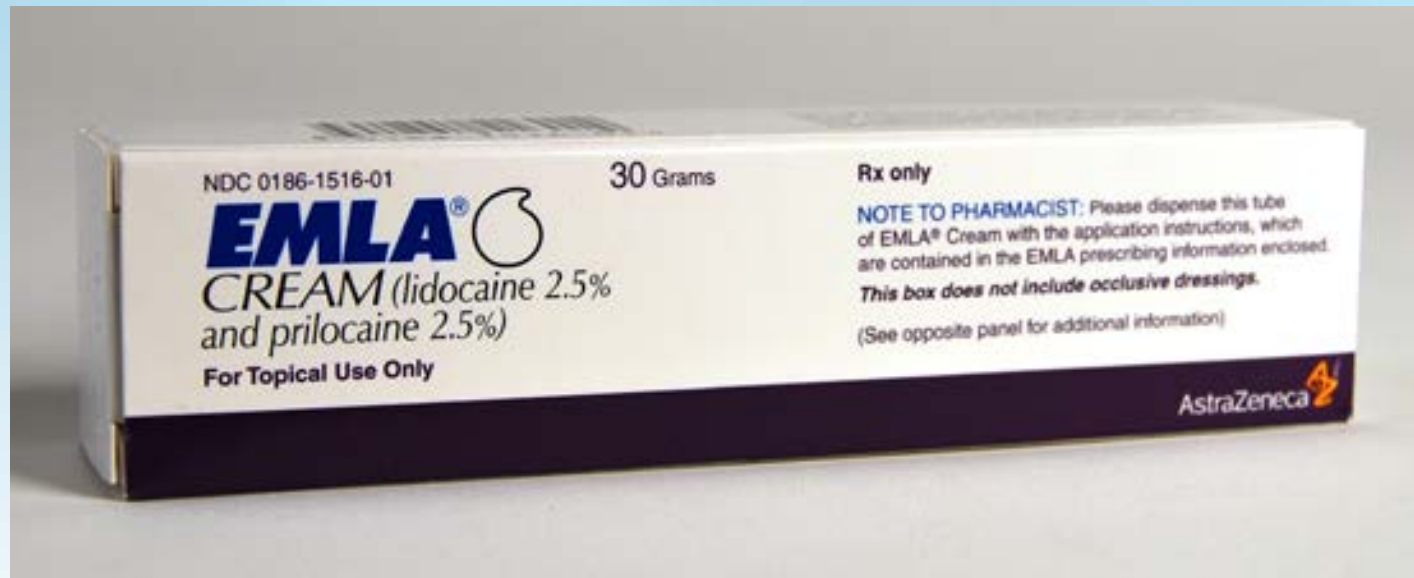


4

**“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



5

Cover Story:

JADA [®] *AUGUST 2015 JADA 146(8)*

**THE JOURNAL of the
AMERICAN DENTAL ASSOCIATION**

***Dental Treatment Safety
with Local Anesthetics
during Pregnancy 572***

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

Pregnancy: Safety- Local Anesthetics

**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
1st trimester)**

**vs. control group = 794 pregnancies
not exposed to teratogens**

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

Pregnancy: Safety- Local Anesthetics

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.



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

Pregnancy: Safety- Local Anesthetics

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.

Pregnancy: Safety- Local Anesthetics

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

Mepivacaine (1955), bupivacaine and articaine (2000) are assigned to **Category C**

Pregnancy: Safety- Local Anesthetics

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

Pregnancy: Safety- Local Anesthetics

Local anesthetics readily cross human placenta

Minutes after administration they reach the fetus, which has the ability to metabolize them.

Pregnancy: Safety- Local Anesthetics

Practical Implications:

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

Pregnancy: Safety- Local Anesthetics

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?



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

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THE 2015 ANNUAL CONFERENCE

Indianapolis, Indiana November 16th, 2015

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