Endodontic Emergencies

"It's all about the pain and swelling"

Dr Dan Farmer
BDS. MDS(Endo). FRACDS. FADI. FICD. FPFA.

Emergency Care Protocol

All emergency appointments result from <u>acute</u> cases of *inflammation* or *infection*

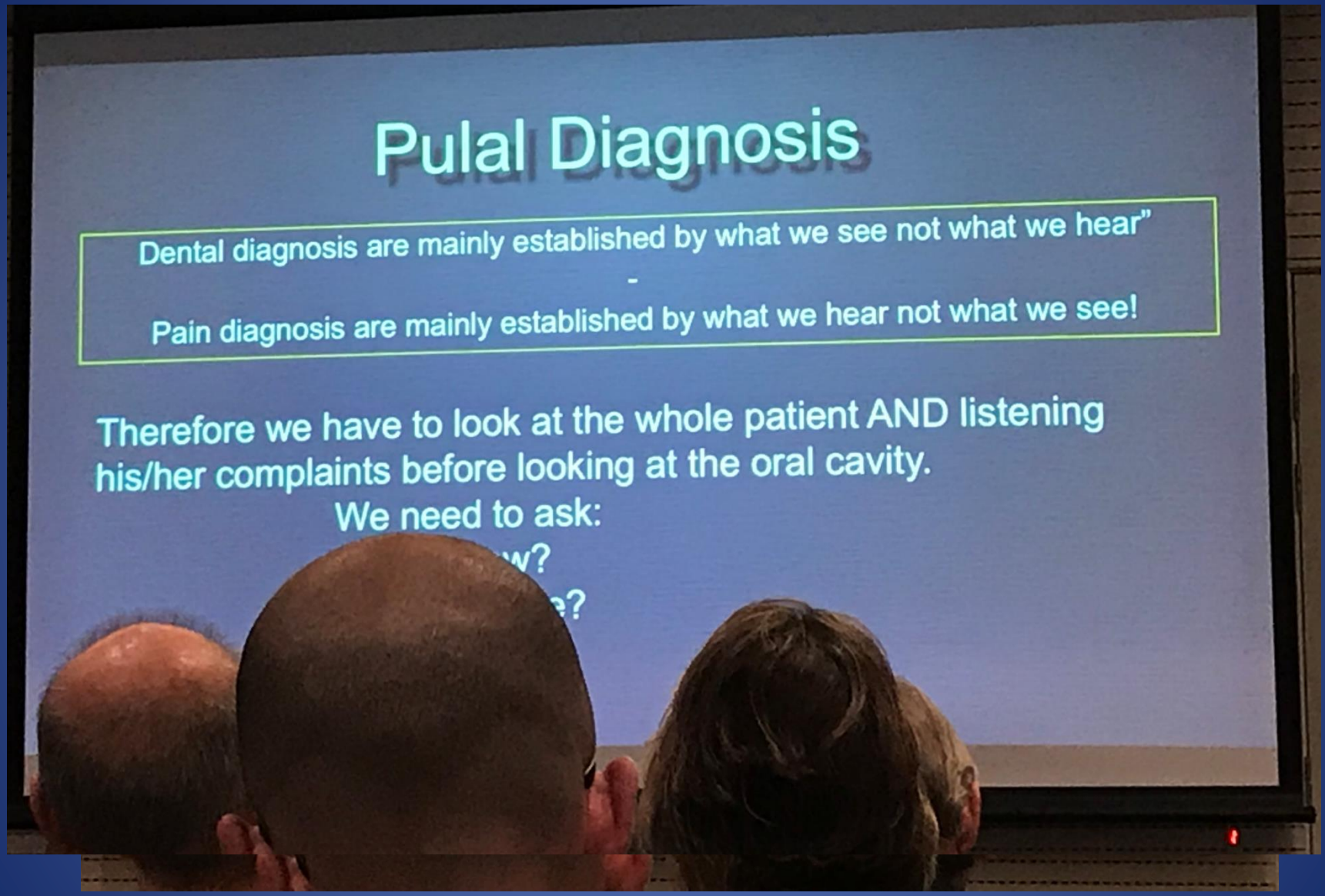
<u>Basic principles to be followed</u>:

- ***Correct diagnosis*** **Nociceptive Pain -vs -Neuropathic Pain**
- ***Treatment of the Causative Agent***
- ***Medication - Local*: Intra-canal medication**
  - *Systemic*: Analgesics
  Anti-inflammatory - NSAID & Selective COX-2
  Antibiotics - Oral vs. IM / IV
- ***Drainage -*** **Through the tooth / soft tissue / bone**
- ***Rest -*** **General / /Occlusal**

Dr John McNamara

“***People have a story to tell. Let them tell it”***

Prof. Asgeir Sigurdssen


Pulal Diagnosis
Dental diagnosis are mainly established by what we see not what we hear"
-
Pain diagnosis are mainly established by what we hear not what we see!
Therefore we have to look at the whole patient AND listening his/her complaints before looking at the oral cavity.
We need to ask:

Dr Oliver Pope

For more complex scenarios

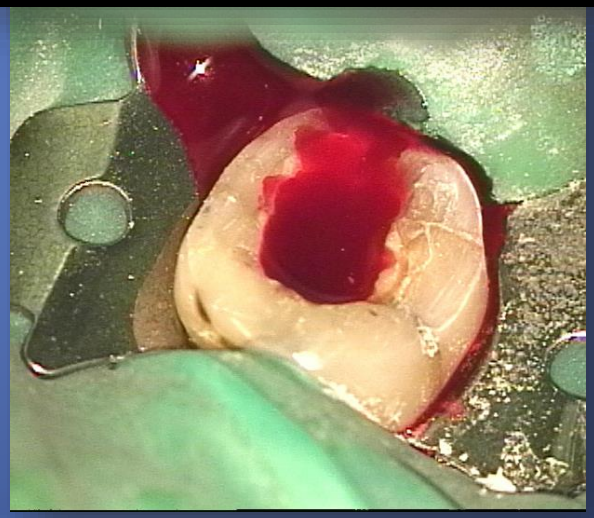
S	Site	Where is it? Can you point to the problem?
O	Onset	When did the symptoms first occur?
C	Character	Can you describe the pain?
R	Radiation	Does the pain spread?
A	Alleviation	What reduces the pain?
T	Time	How long does it last?
E	Exacerbation	What initiates it or makes it worse?
S	Severity	Scale 1 to 10?

Emergency management of Inflammation

Irreversible Pulpitis
Acute Apical Periodontitis

Two challenges:

- *Diagnosing the tooth*
  - Chief Complaint
  - Relevant history
  - Emergency examination
- *Adequate anaesthesia*



Hypotheses for LA failure

Effect of inflammation on local tissue

→ "tissue acidosis" → "ion trapping"

Effect of inflammation on blood flow

→ localized vaso-dilation

Effect of Inflammation on Nociceptors

1. **Prostaglandins**
2. **Inflammatory Growth Factors**

Anatomical Causes

→ erratic distribution of LA within pterygomandibular space

→ accessory innervation

V nerve - **Sensory Root**

Three branches which supply the skin of the entire face and the mucosa of the oral cavity.

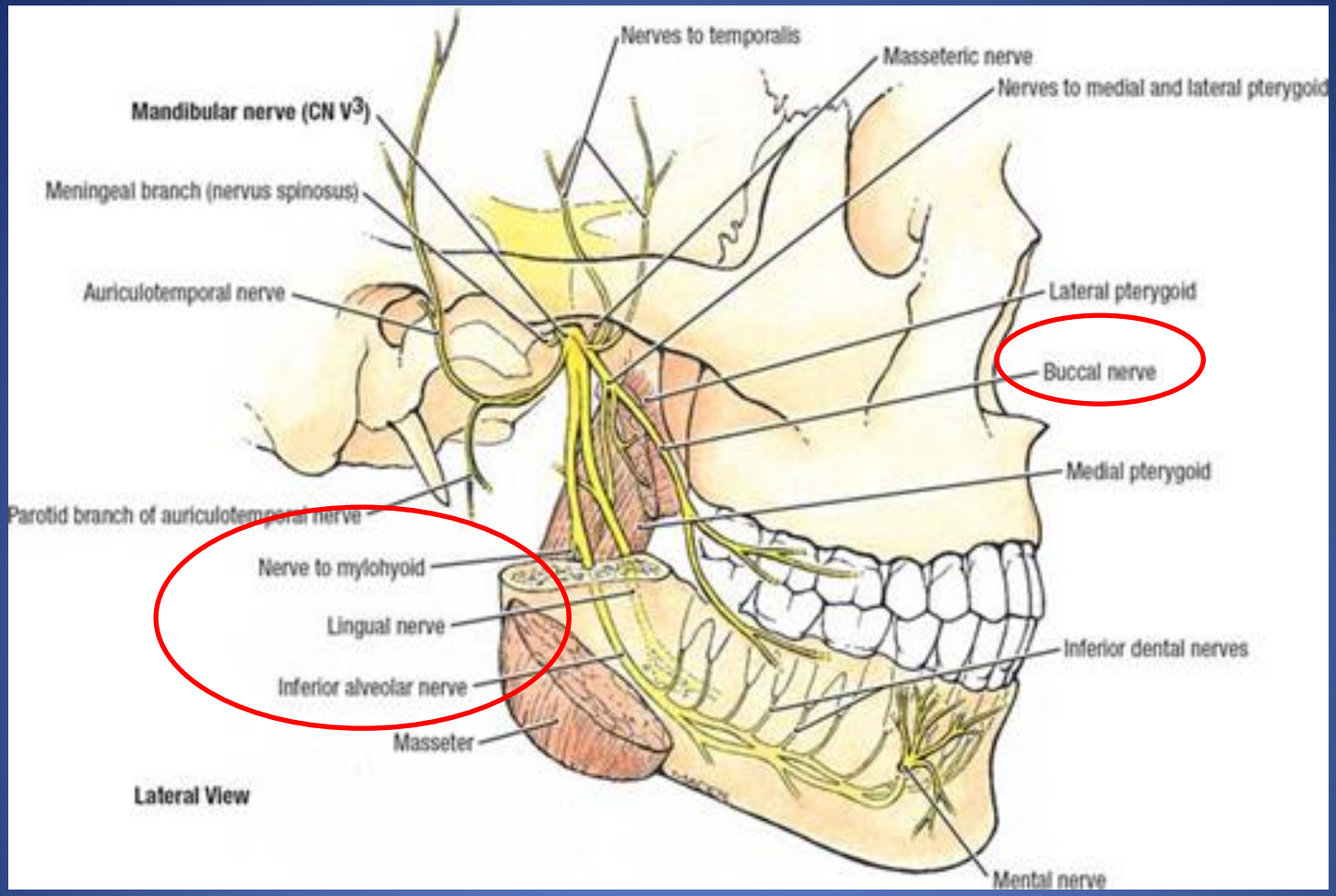
1) ***Opthalmic Div*.** – exits through the superior orbital fissure into the orbit

2) ***Maxillary Div*.** – exits through Foramen Rotundum into the pterygopalatine fossa and emerges onto the surface of the face through the infraorbital foramen.

- Post. Sup.Alv. n. divides in the pterygopalatine fossa
- Mid. & Ant. Sup. Alv nerves divide in the infraorbital canal

3) ***Mandibular Div*.** – Anterior division – motor and sensory (buccal nerve distribution). Branches at the level of the lateral pterygoid m.

- Posterior division – sensory and motor (to mylohyoid m.)



Mandibular Div. – **Anterior division** – motor and sensory (buccal nerve distribution). Branches at the level of the lateral pterygoid m.

- **Posterior division** – sensory and motor (to mylohyoid m.)

Local Anaesthesia Techniques

- Local infiltration
- Inferior Alveolar Nerve block
- Gow Gates Block
- Akinosi Technique
- Periodontal ligament injection
- Intrapulpal injection
- Intraosseus injection

Gow Gates Nerve Block

Advantages:

- Very high success rate (upward of 95%)
- Low incidence of positive aspiration
- Low incidence of accessory innervation being an issue

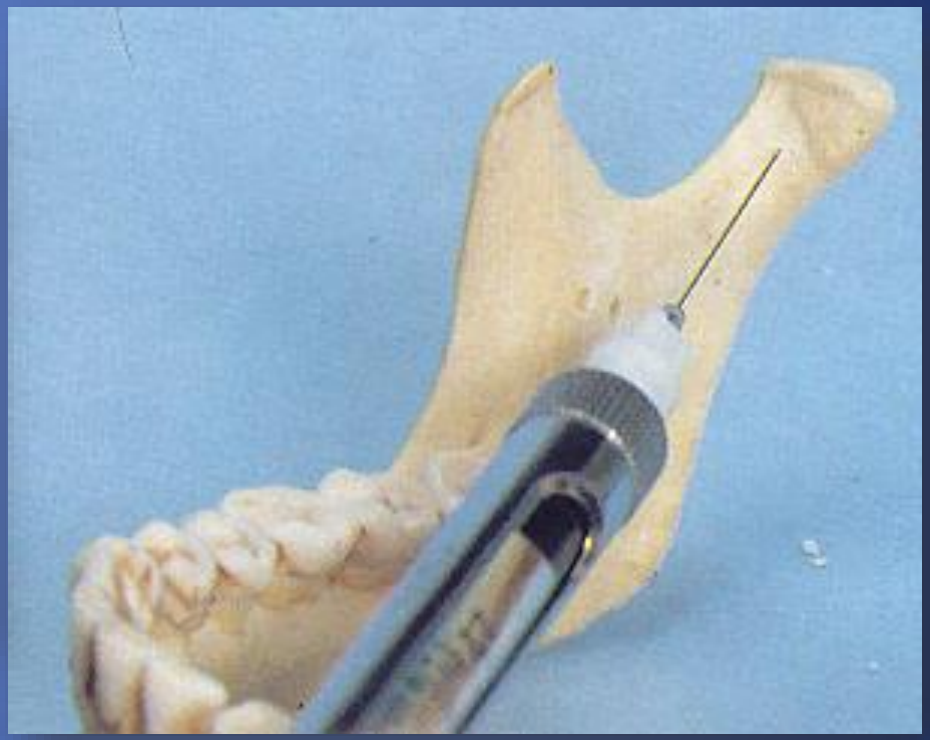
***Disadvantages*:**

- Time of onset is longer due to size of nerve trunk being anaesthetised
- Learning curve is longer

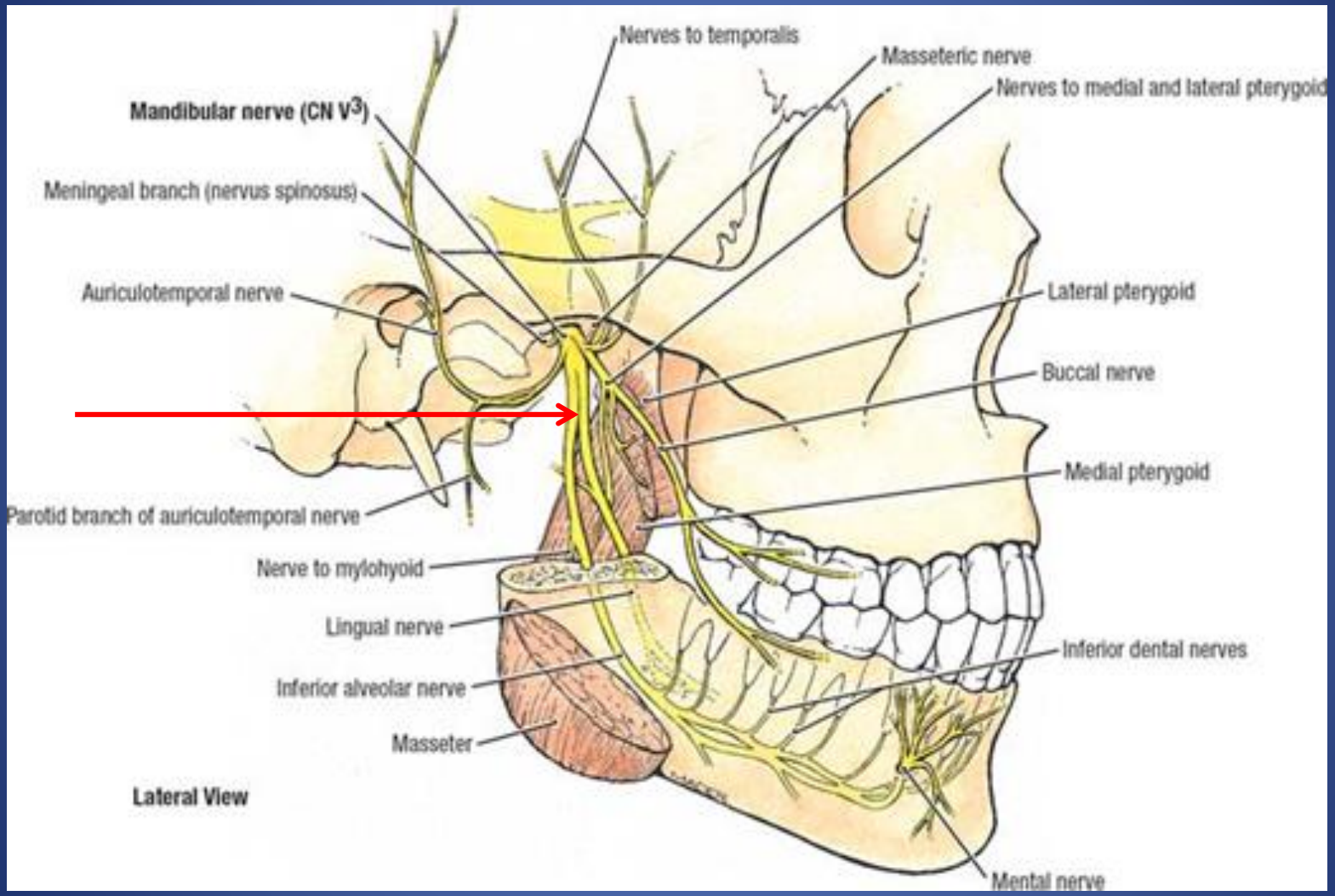
Gow Gates nerve block

Target area - the neck of the condyle

IAN Block



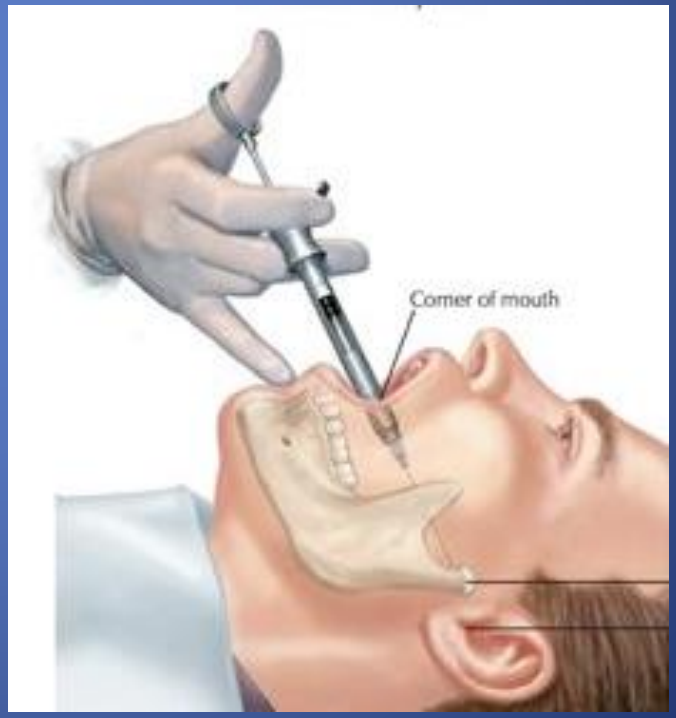
GG Block


Nerves to temporalis
Masseteric nerve
Nerves to medial and lateral pterygoid
Mandibular nerve (CN V3)
Meningeal branch (nervus spinosus)
Auriculotemporal nerve
Lateral pterygoid
Buccal nerve
Medial pterygoid
Parotid branch of auriculotemporal nerve
Nerve to mylohyoid
Lingual nerve
Inferior dental nerves
Inferior alveolar nerve
Masseter
Lateral View
Mental nerve

Gow Gates Nerve Block

Extra Oral:

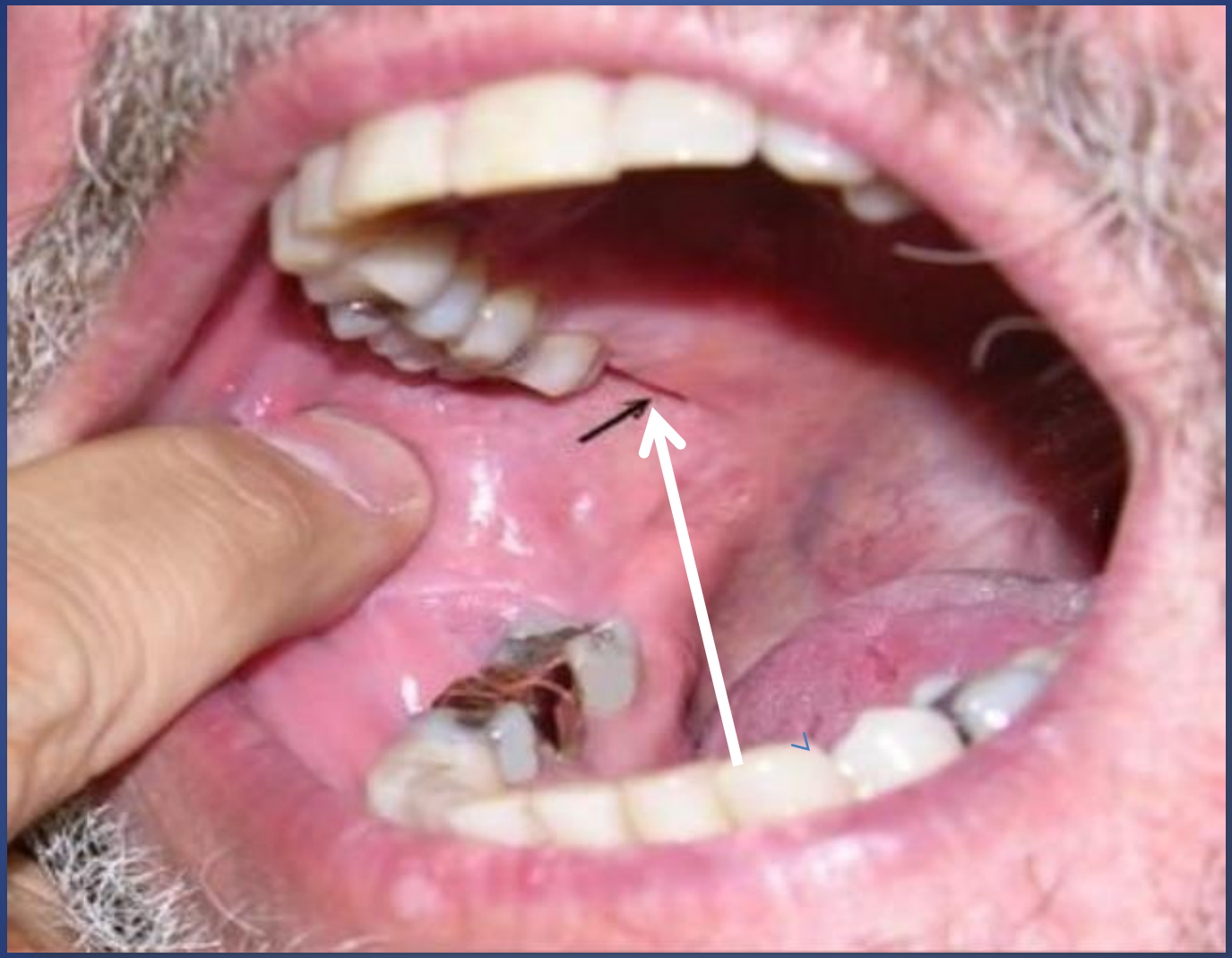
Align the needle with the plane extending from the corner of the mouth to the intertragic notch on the side of the injection



Gow Gates Nerve Block

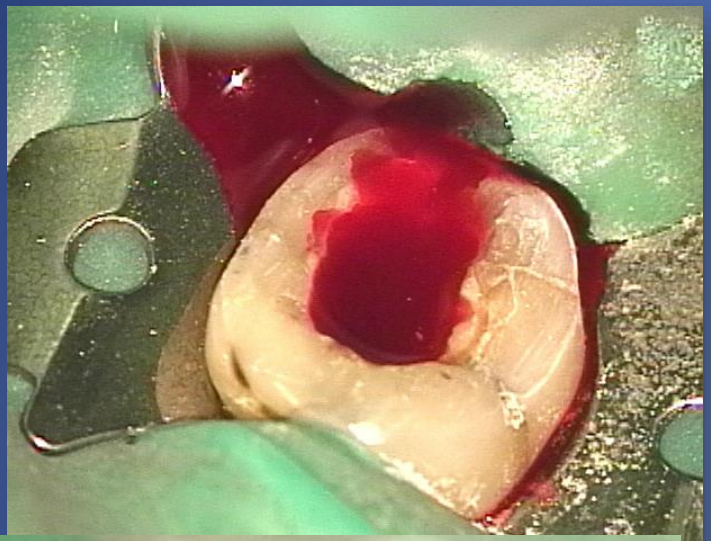
Intra-Oral

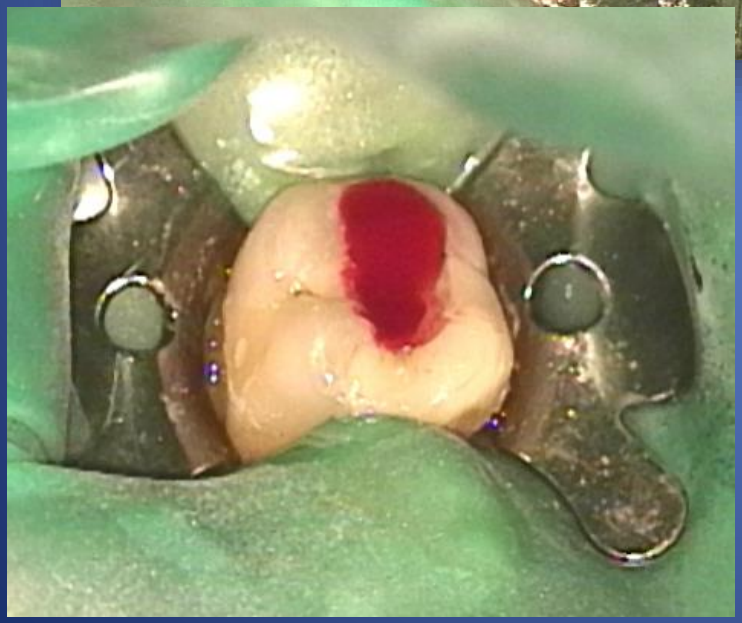
- Palpate the coronoid process or the anterior border of the ramus as high as possible.
- Aim just distal to the palatal cusp of the upper second molar
- Insert the needle slowly and advance until bone is contacted (average depth = 25mm).
- Withdraw the needle 1mm and aspirate
- Deposit the LA solution
- Ask the patient to remain open for approximately 20 secs.

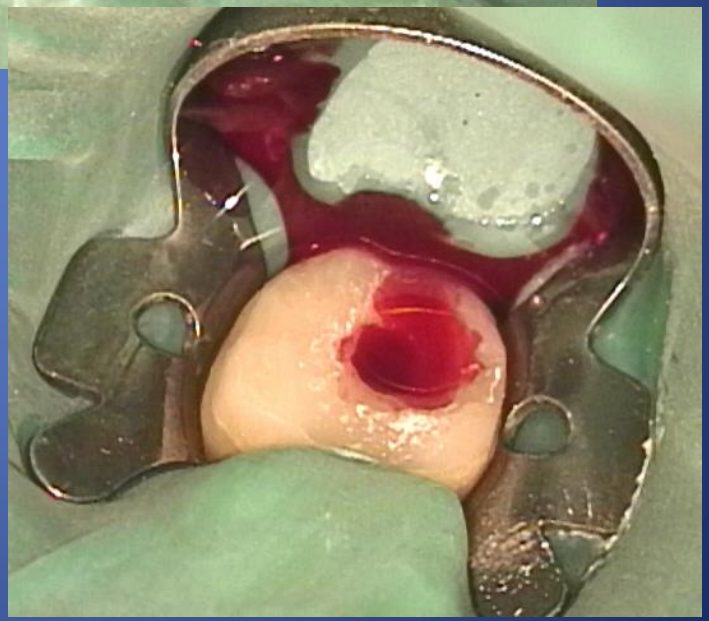


https://www.youtube.com/watch?v=1mH8GEMvvdw

How much is enough??







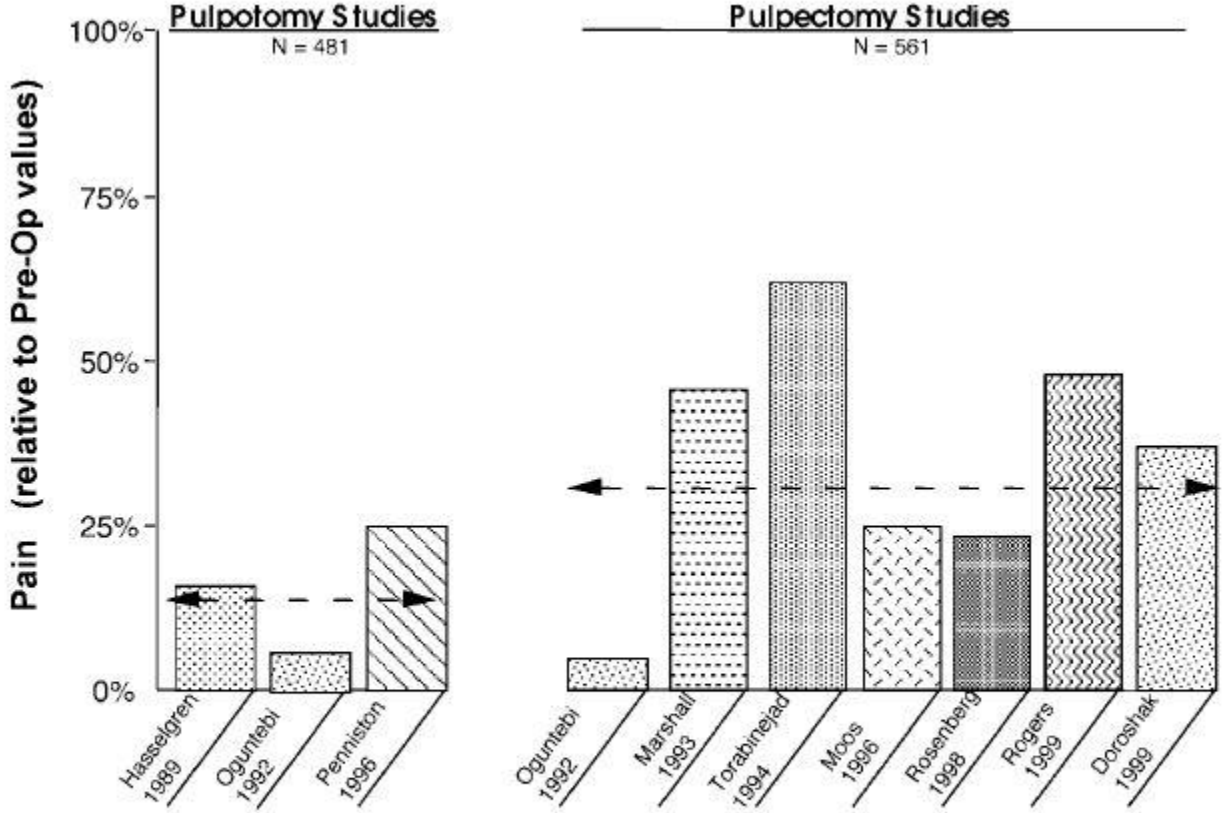


Fig. 5. Effects of pulpotomy or pulpectomy on endodontic-related pain. Pre-operative pain values are normalized to 100%. The two horizontal bars for pulpotomy and pulpectomy groups represent the sample size weighted mean reduction in pain. From: Hargreaves & Baumgartner, Endodontic Therapeutics. In: Walton R, Torabinejad M, eds. *Principles and practice of endodontics*, Ch 30, 3rd edn. Philadelphia: Saunders, 2002: 533–544.

Use of Intra-canal Medicaments

Odontopaste / Ledermix Paste

Mode of Action:

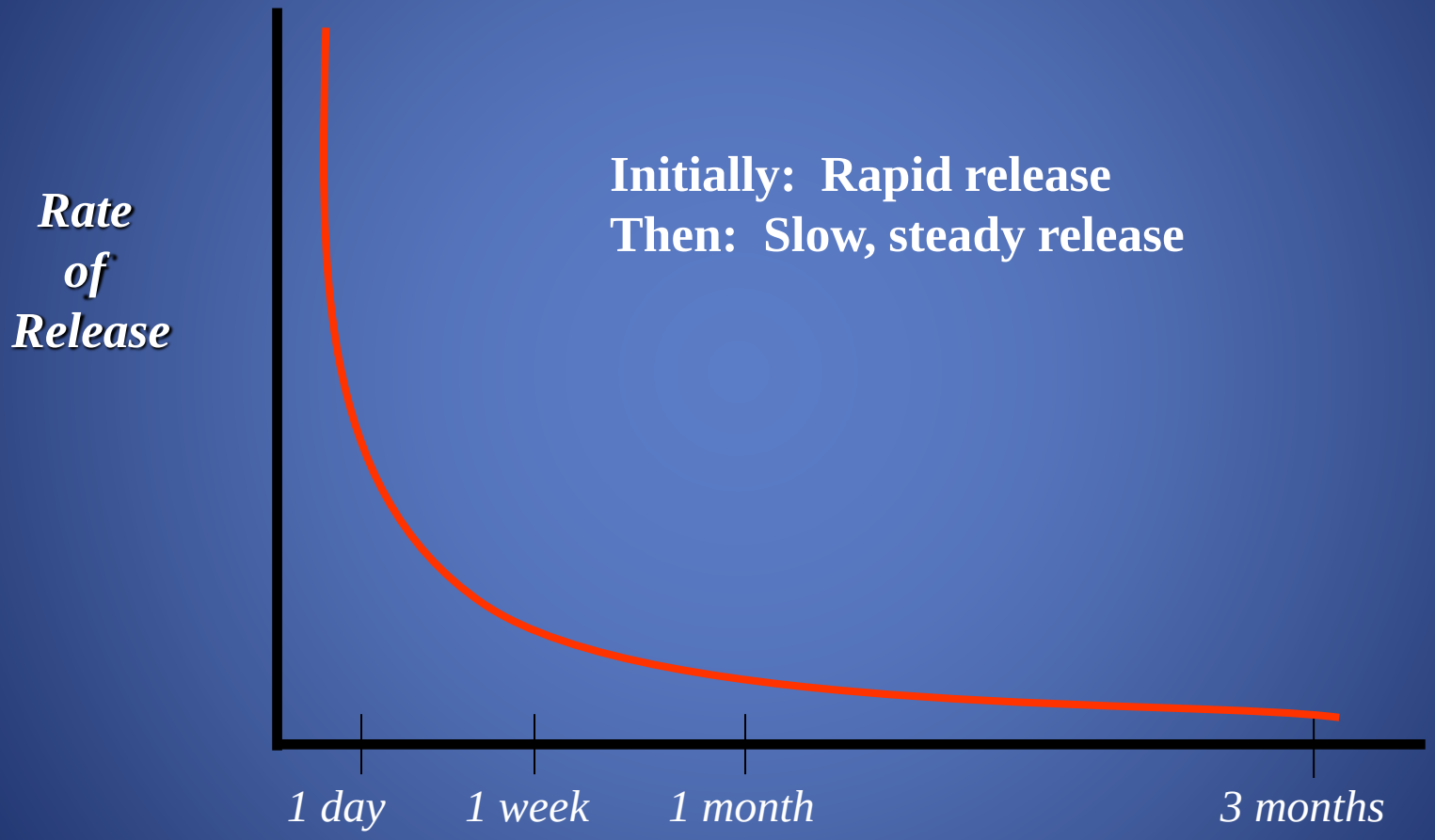
1) ***Anti-inflammatory*** - **only effective for post operative pain in cases involving vital tissue. Ineffective in cases of chronic infection or necrosis**

- capable of decreasing periapical inflammation

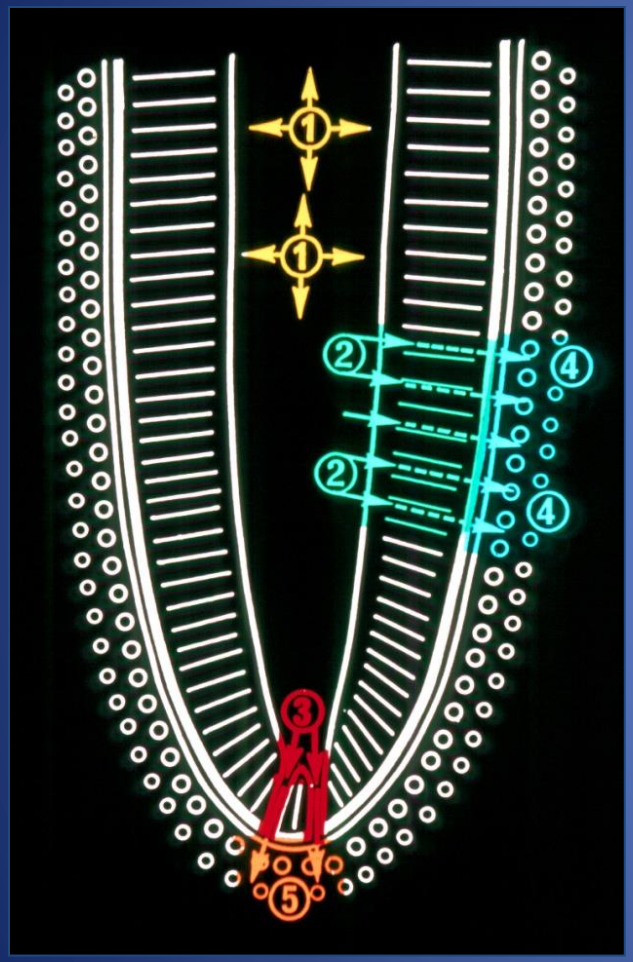
Barker BCW. & Lockett BC. (1971)

Ledermix paste - Diffusion:

Abbott P et al EndodDentTraumatol. 1988, 1989



Ledermix paste - Diffusion:



Triamcinolone

Measured peri-radicular and apical concentration
Detected in nanomolar range
Sufficient for anti-inflammatory action
Abbott et al EDT 1988, 1989

Measured concentration outside the tooth
- too low to have any systemic effect
Abbott P. IEJ 1992

Post operative pain Medication

- NSAIDS

Incl. - COX-2 inhibitors

- Paracetomol

- Opioids
- Synthetic opioids

Mild analgesic, anti-inflammatory and anti-pyretic effects

Standard dose: 500 – 1000mg 6 hourly

Mode of action is unclear – some theories:

- Central inhibition of PG synthesis
- Inhibition of the new isoform COX 3 or COX 2
- Binding to other receptors or ion channels – inhibits descending serotonergic pathways, opiate receptors

Max daily dose = 4g / day for those with body weight 67kg or greater

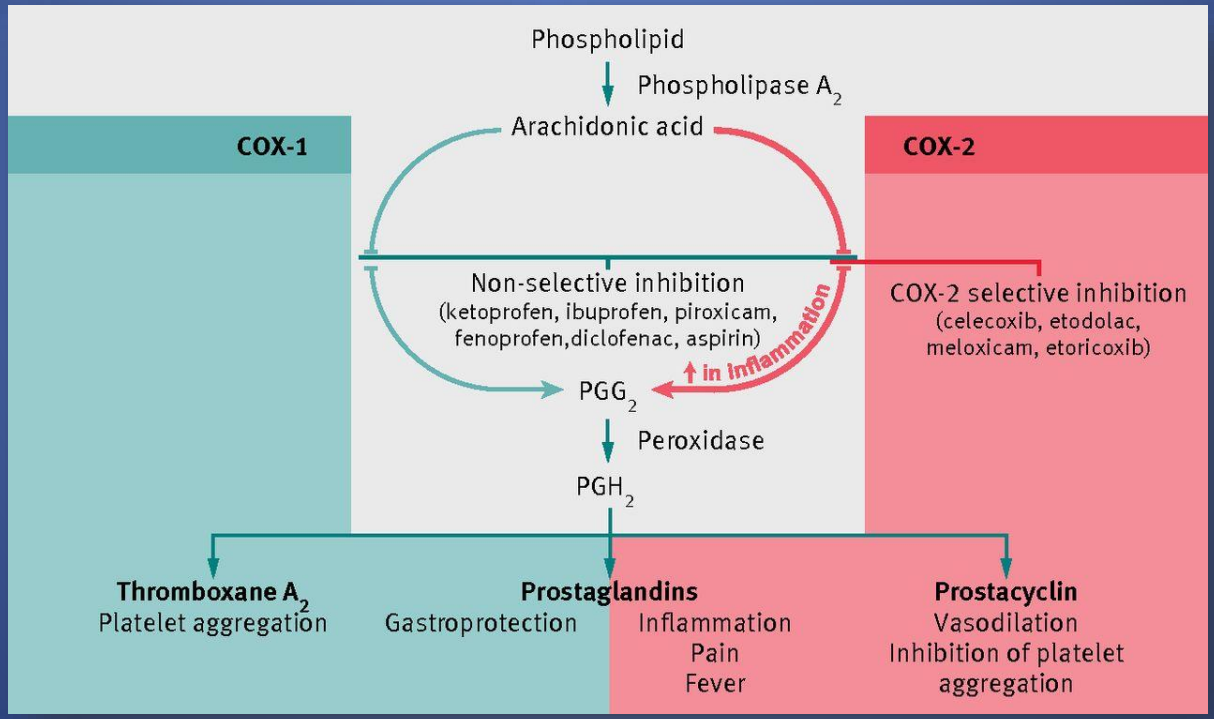
Under weight / children: total daily dose = 60mg / kg / day (ie 15mg / kg 6 hourly)

Reduce dose to max of 3g / day in frail older pts, pts with liver disease, malnourished of fasting, low body weight

Toxicity - Single adult dose of >10g. Children 200mg / kg


NOVARTIS
Voltaren
100 diclofenac. natr.
For adults


NUROFEN
Tablets
TARGETED RELIEF FROM PAIN


Phospholipid
Phospholipase A2
Arachidonic acid
COX-1
COX-2
Non-selective inhibition
(ketoprofen, ibuprofen, piroxicam, fenoprofen,diclofenac, aspirin)
COX-2 selective inhibition
(celecoxib, etodolac, meloxicam, etoricoxib)
↑ in inflammation
PGG2
Peroxidase
PGH2
Thromboxane A2
Platelet aggregation
Prostaglandins
Gastroprotection
Inflammation
Pain
Fever
Prostacyclin
Vasodilation
Inhibition of platelet aggregation

NSAIDS

Contra-indications

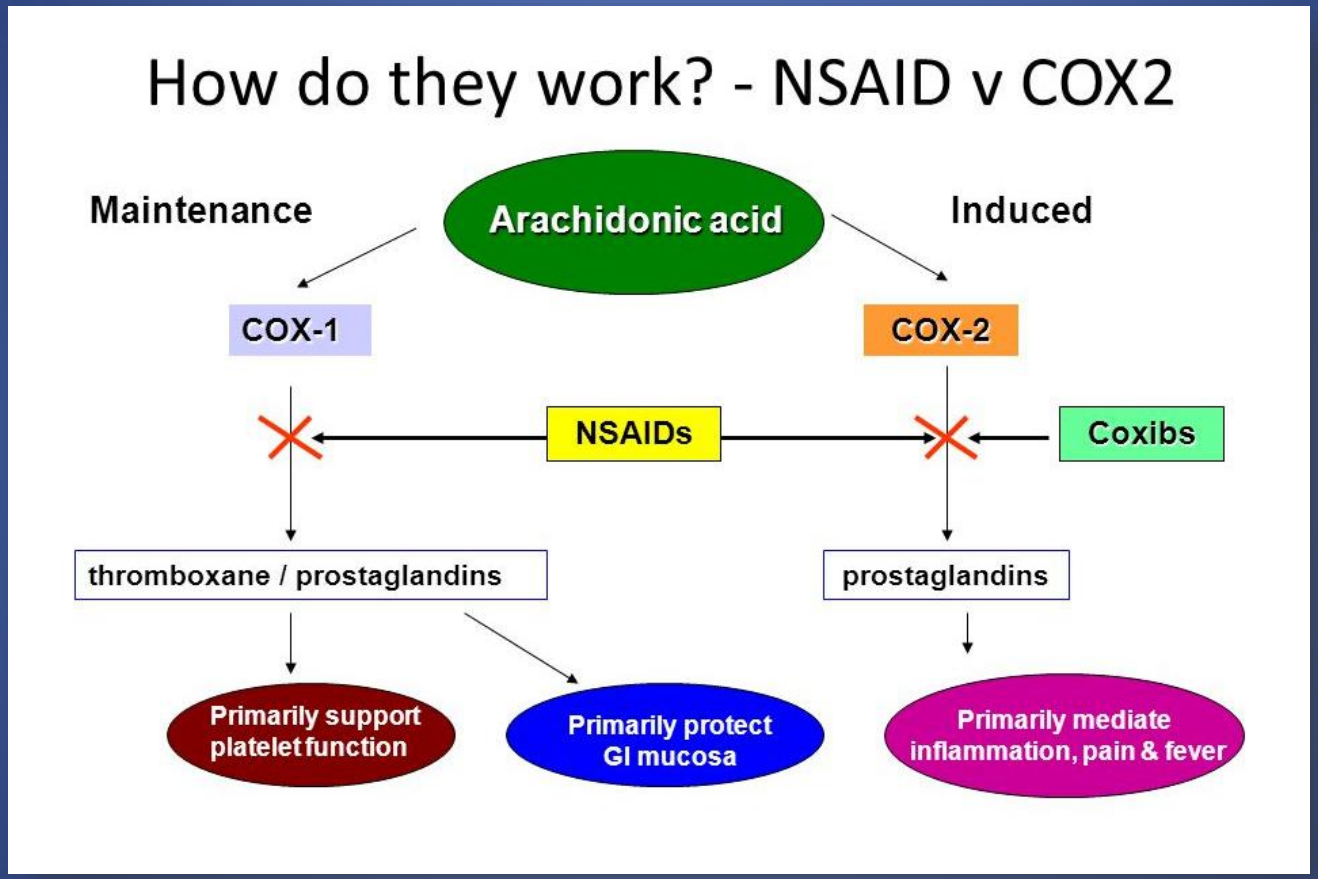
- **History of kidney disorders**
- **GI erosive or ulcerative conditions**
- **Anti-coagulant therapy**
- **Haemorrhagic disorders**
- **Intolerance / allergy to NSAIDS**
- **Pregnancy 1st trimester – interferes with developing blood supply of baby**
- **Pregnancy 3rd trimester – during parturition (separation of baby from mother) – it can impair this**

NSAIDS and CV risk

- At any dose for 1 week or greater is associated with an increased risk of MI
- Very high doses (2 / more the daily dose equivalents) of diclofenac, indomethacin piroxicam, ... Doubled the risk of admission for MI
- Increased risk for medium doses (0.9 – 1.2 daily doses) of indomethacin and etoricoxib

BMJ 2016;354:i4857

Selective COX – 2 Inhibitors



(Mobic) Meloxicam 7.5 – 15mg daily
(Celebrex) Celecoxib : 200mg daily

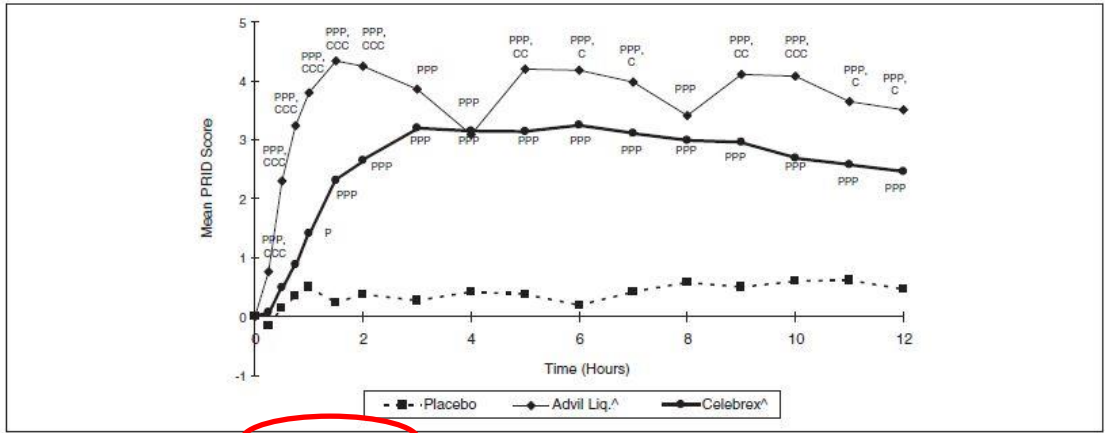


Figure 1. Time-effect curves for mean pain relief plus pain intensity difference (PRID) scores: evaluable patients. PPP = significantly better than placebo at the 0.001 level, P at the 0.05 level; CCC = significantly better than Celebrex^ at the 0.001 level, CC at the 0.01 level, C at the 0.05 level. ^ = Advil Liqui-Gels 400 mg tid and Celebrex 200 mg qd.

NONPRESCRIPTION IBUPROFEN VERSUS CELECOXIB

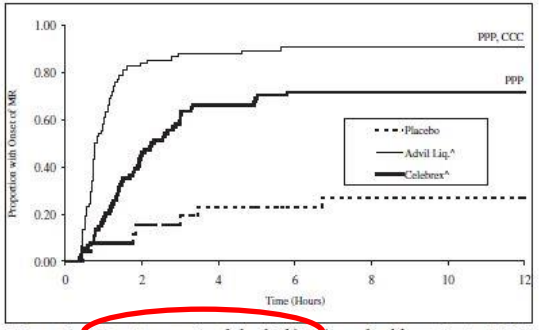


Figure 3. Time to meaningful relief (MR): evaluable patients. PPP = significantly better than placebo at the 0.001 level; CCC = significantly better than Celebrex^ at the 0.001 level. ^ = Advil Liqui-Gels 400 mg tid and Celebrex 200 mg qd.

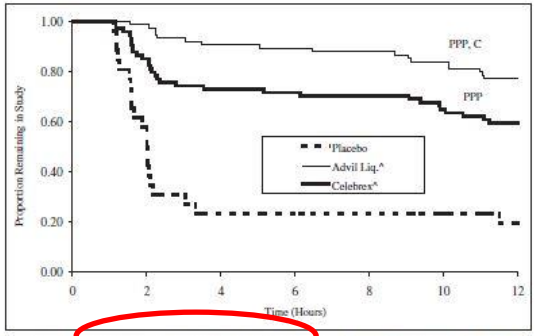


Figure 4. Duration of relief (time to rescue medication): evaluable patients. PPP = significantly better than placebo at the 0.001 level; C = significantly better than Celebrex^ at the 0.05 level. ^ = Advil Liqui-Gels 400 mg tid and Celebrex 200 mg qd.

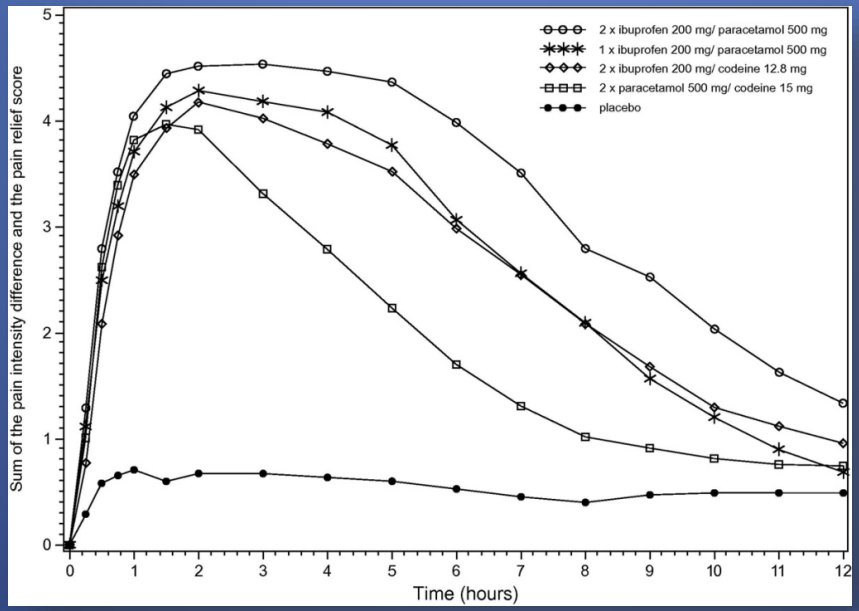
Efficacy and Tolerability of Nonprescription Ibuprofen versus Celecoxib for Dental Pain

Doyle G, Jayawardena S, Ashraf ,E Cooper SA.

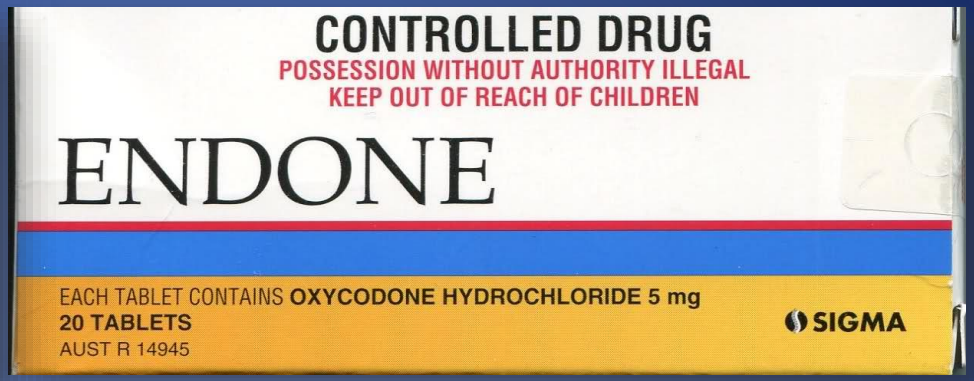
J Clin Pharmacol 2002;42:912-919

Ibuprofen + paracetamol

"Stronger for Longer"

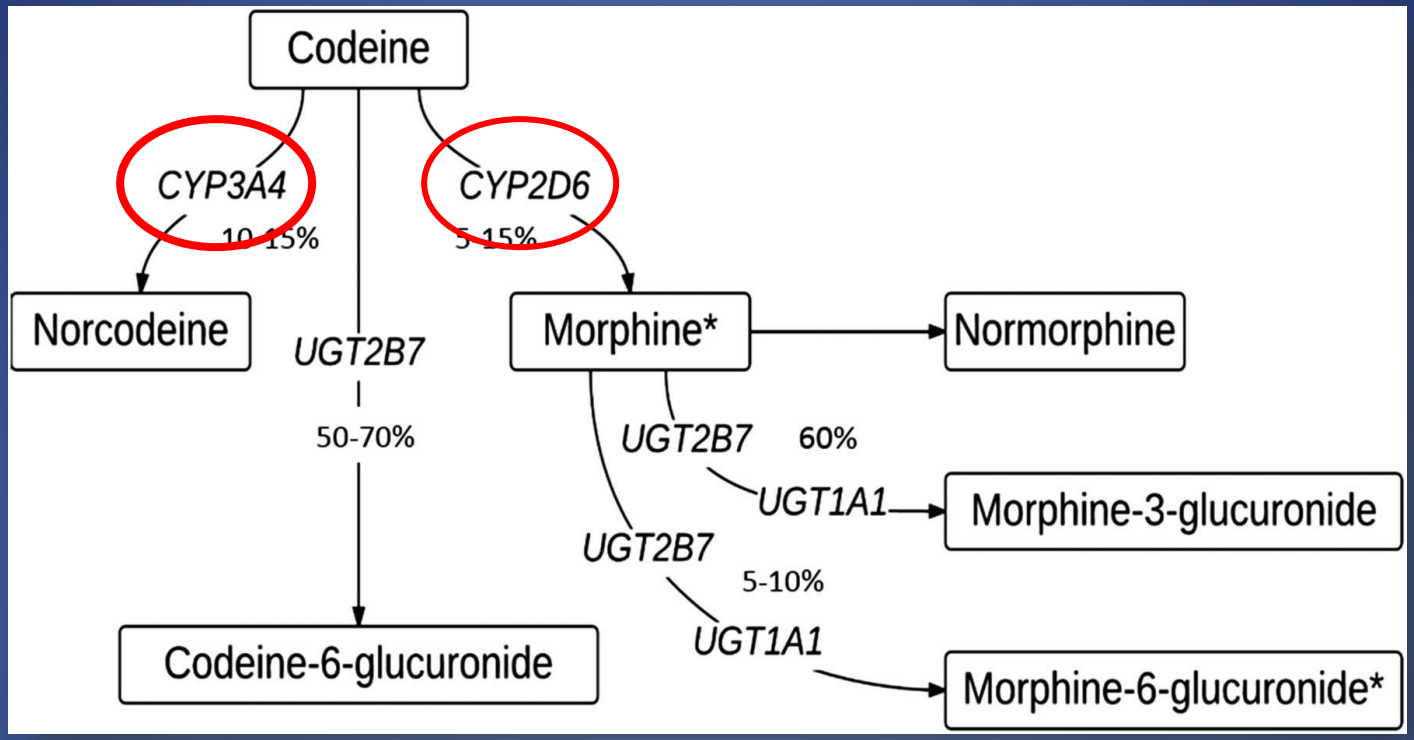


Daniels SE,et al. Pain 2011;152:632-42

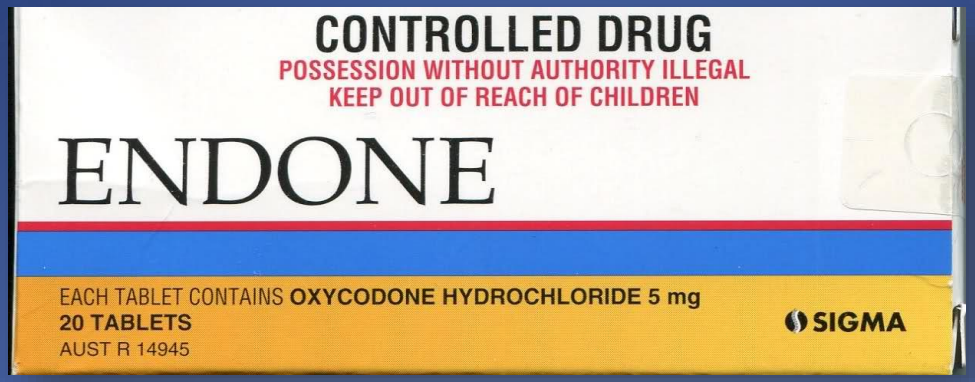


60mg = 5mg

- **Opioids:** any drug that binds to the opioid receptor
- **Potency** : strength of the drug to bind to the mu opioid receptor
- **Dose – Response Relationship**



- **Rapid metabolizers** – most people
- **Ultra-Rapid metabolizers** - increased CYP2DS activity → increased morphine production.
  - African / Ethiopian = 29%
  - Caucasian = 5-10%
  - Asian = 2%
- **Slow metabolizers** - 5-10% of the population, limited CYP2DS enzyme activity
  - the amount of morphine produced is very small.



- **Oxycodone (OxyContin, Endone)**
- a semi-synthetic opioid
- Metabolised to – noroxycodone (inactive)
  – oxymorphone (active)
- Not a pro-drug therefore less inter-individual variability and a closer dose – response relationship

- Schedule 8 medication :
  "The condition must be unresponsive to non opioid medications"
  "Greater risk of addiction / dependence"

- **Tramadol** is a 'synthetic analogue' of **codeine.** First marketed in Australia in late 1998
- Considered an **opioid** medication because bind to and activate the mu **opioid** receptor.. The affinity 10 fold less than codeine and 6000 fold less than morphine.
- Also a NSRI inhibitor.

***Dosage*:**
Rx: Tramadol 50-100mg 6 hourly

Oral tramadol **100 mg** = paracetamol and codeine **1000 mg/60 mg.**
- no significant effect of respiratory depression or constipation

Combination of tramadol and Paracetomol work synergistically
Edwards JE et al. J Pain Symptom Manage 2002;23(2):121-30.

Analgesic ladder

Tramadol 50 -100mg.

Oxycodone 5mg q.i.d.

Codeine 60mg 4 hourly

Selective Cox-2 Inhibitors

Combination Analgesia q.i.d.

Ibuprofen 400mg 4 hourly

Paracetamol 500-1000 mg q.i.d.

"Low & Slow"

Emergency management of Infection

Acute peri-apical abscess / Cellulitis / Space Infections

Emergency management of the Acute Apical Abscess

→ Caused by infected root canal system

Procedure:

- Adequate LA
- Endodontic therapy. If possible establish lengths and debride canals to at least size 25 file
- If tooth is draining – let it drain!
- Dry canals
- Dress tooth with $CaOH_2$
- Temporise.
- Reappoint 3-4 weeks

N.B. Often the tooth requires draining again. Do not leave the tooth open – this will not prevent the need to redrain!

Use of Intra-canal Medicaments

Calcium Hydroxide

***Mode of Action*: 1) As an antibacterial (OH^- ions)**

→ Damage to the bacterial cytoplasmic cell membrane

→ Protein denaturation

→ Damage to the DNA

2) As a stimulator of hard tissue formation (Ca^{2+} ions)

→ High pH → activation of alkaline phosphatase

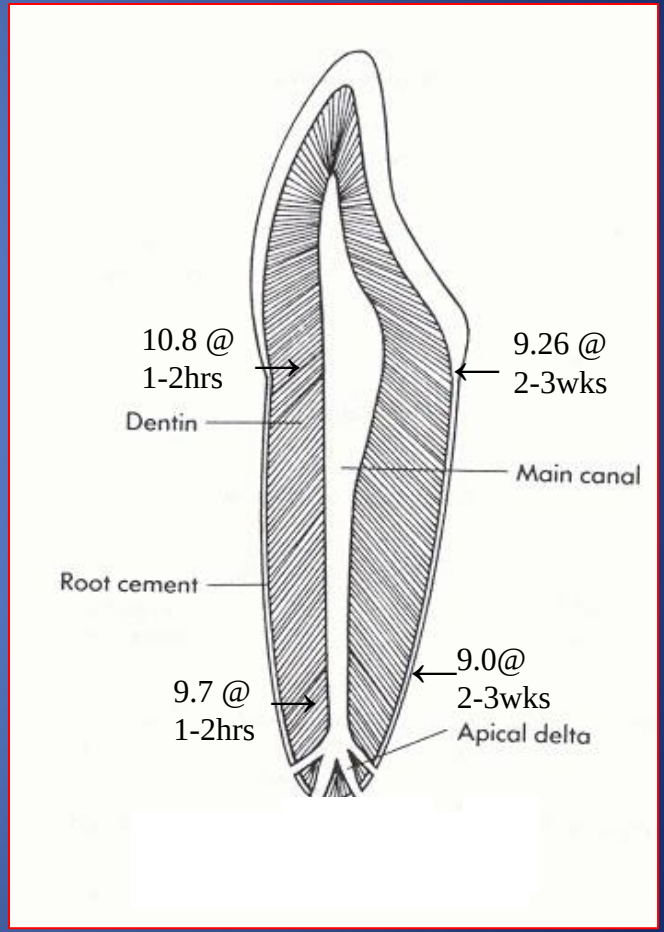
→ inhibition of acid phosphatase

→Ca^{2+} ions → directly stimulate activation of ATP required for hard tissue formation

Diffusion properties

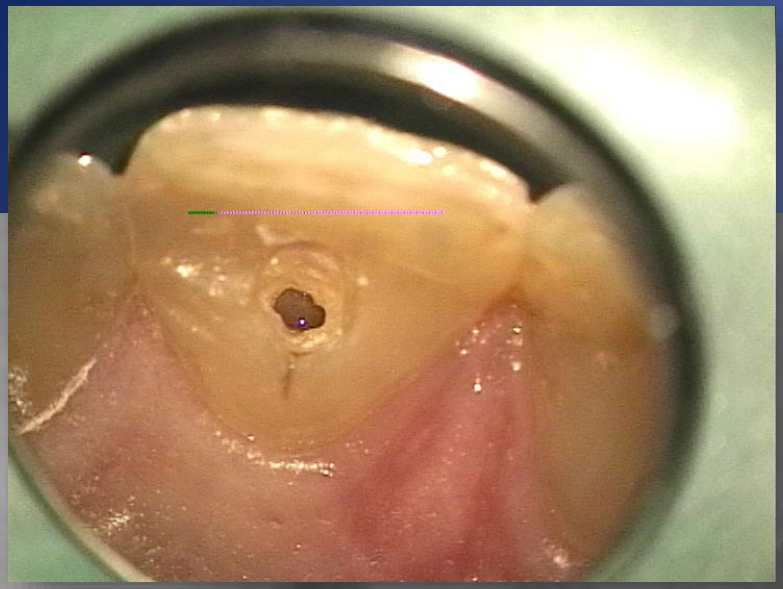
- Hydroxyl ions are able to diffuse through radicular dentine
- Limit by - buffering capacity of dentine
  - diameter of dentine tubules
  - cementum
- Most bacteria killed @pH = 9.0 – 9.5
- One week for $Ca(OH)_2$ to reach outer surface
- 2-3 weeks for $Ca(OH)_2$ to reach peak conc. on outer surface
- More rapid in coronal one third

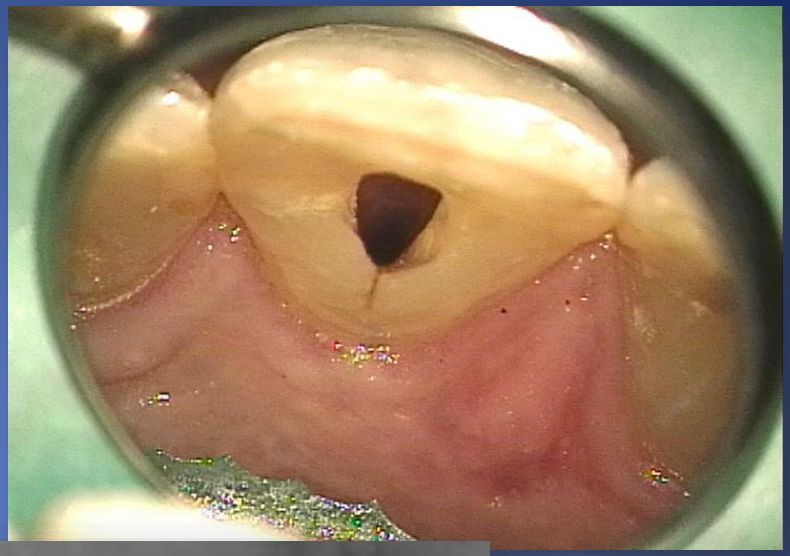
Nerwich *et al.* JOE 1993; 19:302-6

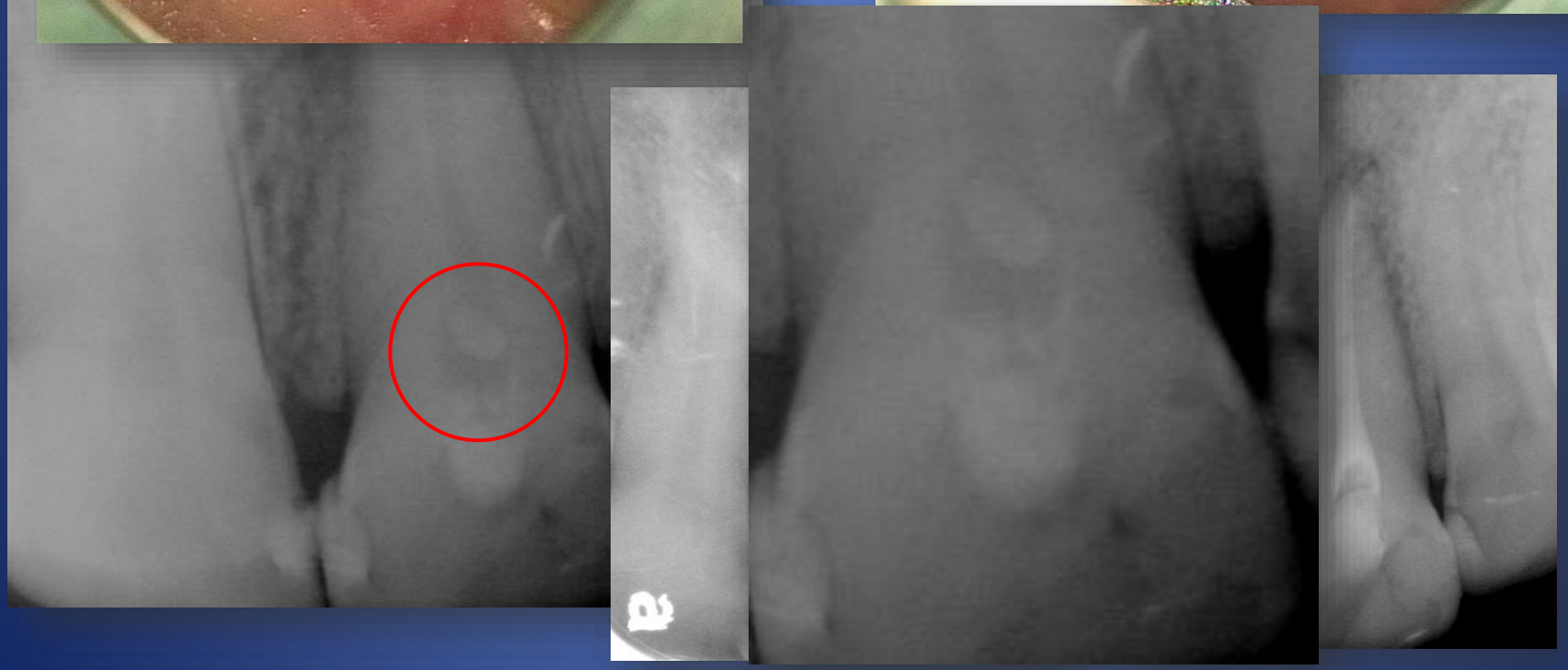


Case Study

- **22 year old male.**
- **Wine maker from Barossa Valley**
- **Presented to dentist in acute pain and swelling in labial sulcus adjacent upper anterior teeth**
- **Dx: Acute apical abscess, Tooth 21**
- **RCT commenced**
- **Referred when pain and swelling was not resolving four days later**







Antibiotic Therapy

– used to supplement not to replace.

Indications:

- correct type of infection
- signs of the infection spreading
- systemic involvement
  (e.g. malaise, fever, lymphadenopathy, swelling)
- immuno-compromised / immuno-suppressed

Contraindications:

- no systemic involvement
- chronic alveolar infections
- inflammatory pulp conditions
- acute infections with adequate drainage

Recommended regimens for antibiotic therapy

Injection of antibiotics (IM):

Benzyl Penicillin (Pen G) 600mg 4hrly

Oral Administration:

Phenoxymethyl Penicillin (Pen V)
1g stat. & 500mg qid
Clindamycin 300mg stat & 150mg tds
Metronidazole 400mg tds

N.B. Amoxycillin - used routinely (500mg tds)
- has a very broad spectrum with increased potential for resistance
- better compliance

Use of medications in pregnancy

Analgesics:

- Paracetomol
- Codeine

Antibiotics:

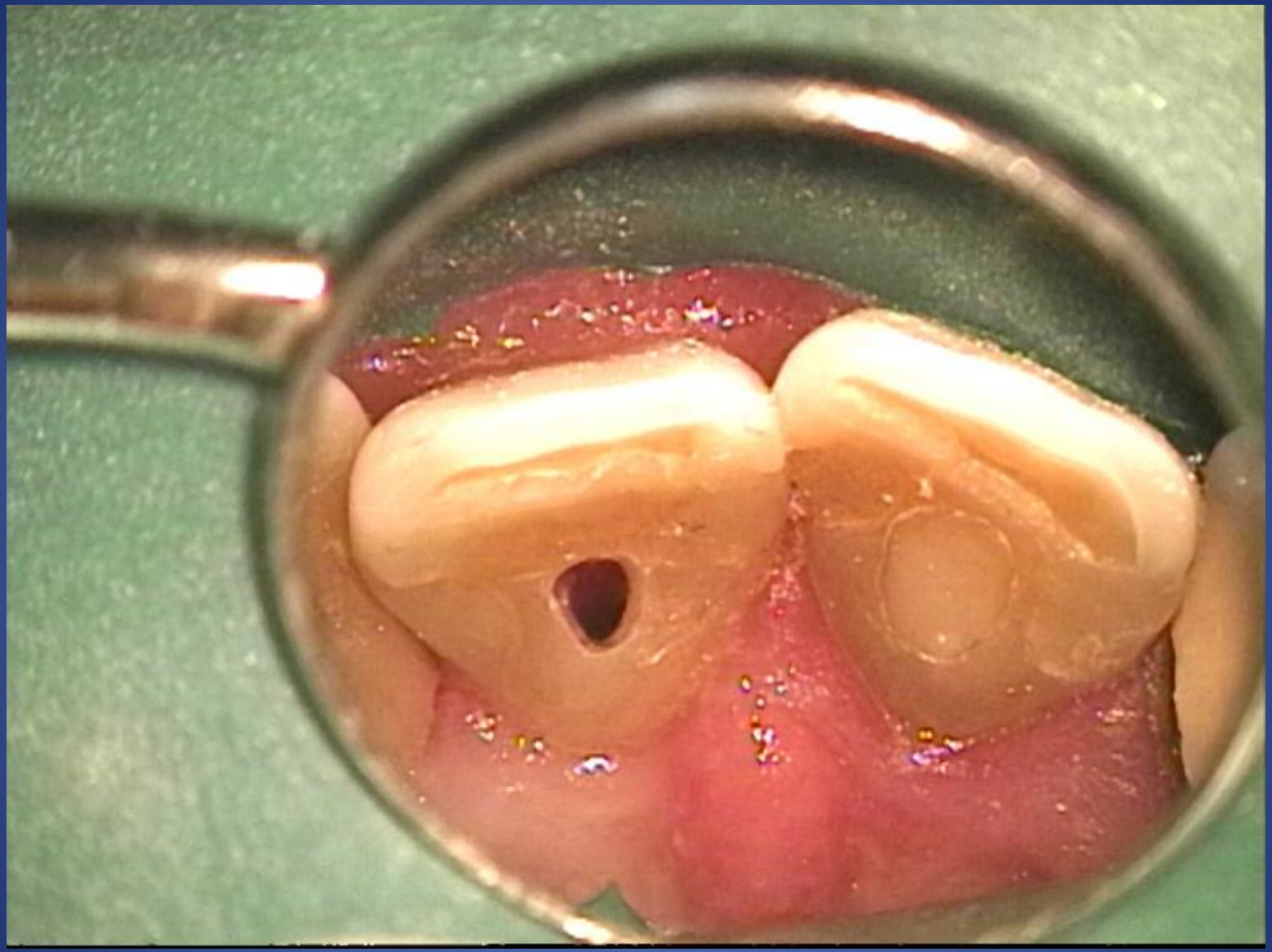
- Penicillin 500mg tid
- Cephalosporins 500mg qid
- Clindamycin 150mg tds

Access and Debridement is essential

Drainage

- ***Through the tooth***
- ***Through the soft tissue***
- ***Through the bone***

Drainage through the tooth



Drainage through the tooth

Apical trephination:

placement of a size 10/15 file through the apical foramen

9.59am

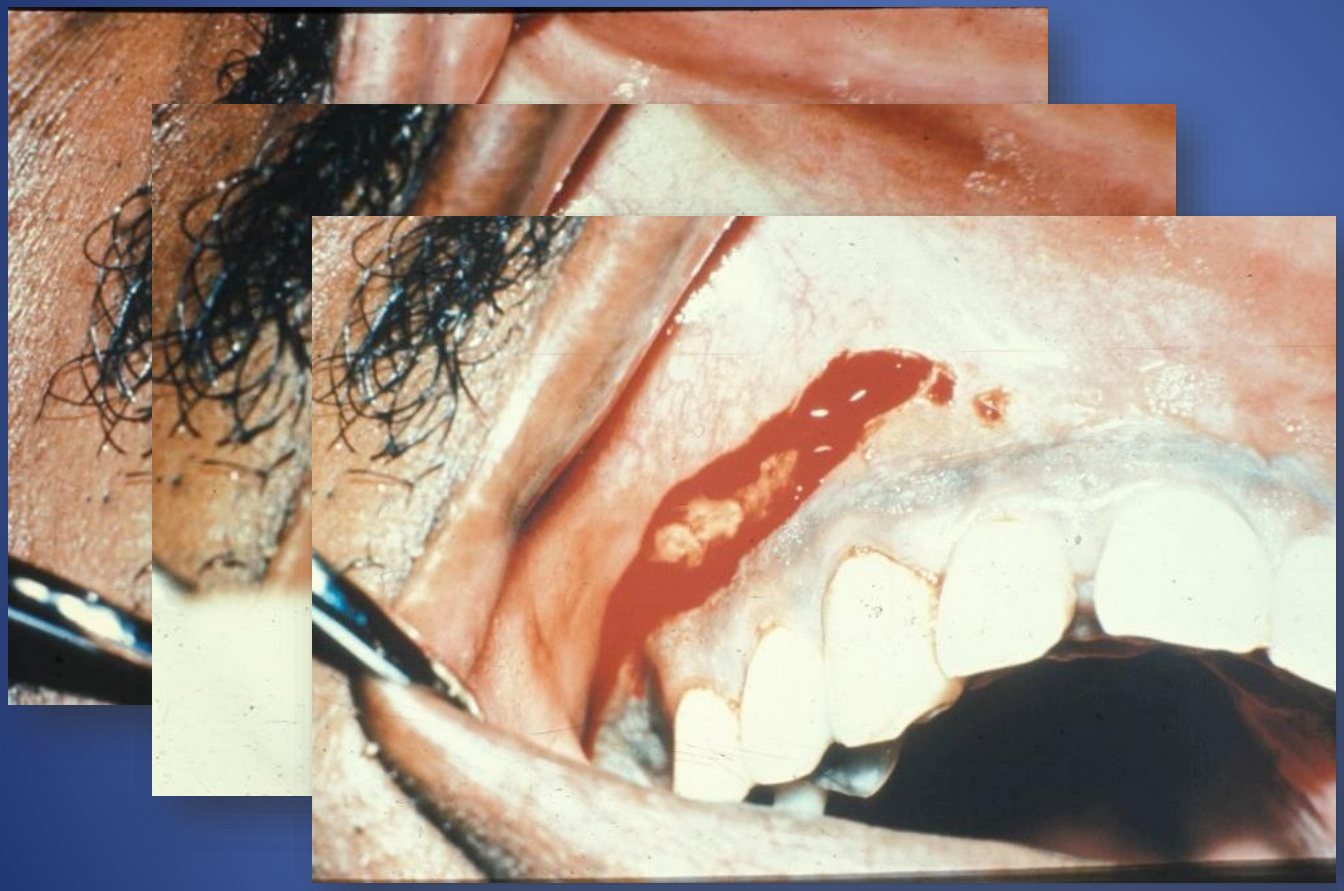
10.06am

10.16am

10.30am

Incision and Drainage Through the Soft Tissue

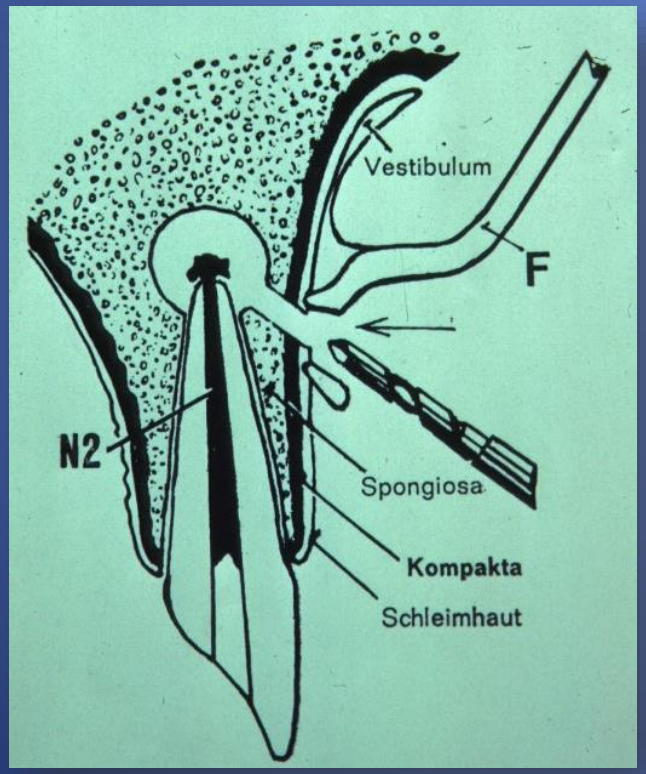
Incision and Drainage Through the Soft Tissue



Drainage through the bone

Cortical trephination - small incision through soft tissue adjacent apex of involved tooth
- #2 round bur through the cortical plate
- #25 file to apex of tooth

→ "creating a sinus tract"



- ***Rest***

General - post operative "let down reflex"

Occlusal - relieving the occlusion

"The effect of occlusal reduction on pain after endodontic instrumentation."

Rosenberg PA. et al. J Endod. 1998:24:492-6.

"Conclusion: a highly predictable simple strategy to help prevent post op pain".

Prevention of Emergency Visits a.k.a. "Rules of Disengagement"

- *Talk about expectations*
- *Reassure patients of your availability*
- *Provide appropriate prescriptions & instructions*
- *Schedule follow-up visits*
- *Know when to cut your losses*

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