

Strategies for More Effective Pain Control during Root Canal Treatment



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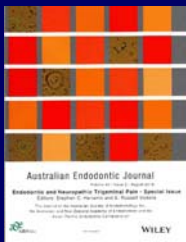



References



Yu and Abbott
Aust Endo J 2018; 44: 82-98

Endodontic and Neuropathic Trigeminal Pain - Special Issue August 2018





Abbott & Parirokh
Aust Endo J 2018; 44: 99-113

Importance of Pain Control During Treatment



- ◆ Patients want pain-free treatment
 - But many have the expectation of pain
 - Those who expect pain → more likely to have pain
 - Patient's pain coping strategies may not help
- ◆ Dentists do not want to hurt their patients

Importance of Pain Control During Treatment



- ◆ Most patients perceive that dental treatment is associated with pain
 - During and after treatment
 - Unfortunately, this is supported by research!!
 - ✦ e.g. Rogers et al JoE 1999

➤ **And just ask your own patients**

A Survey of Patients' Perceptions About, and Their Experiences, of Root Canal Treatment

Chandraweera L, Goh K,
Lai-Tong J, Newby J, Abbott PV.

Aust Endo J 2019; 42: 225-232.



A Survey of Patients' Perceptions About, and Their Experiences of Root Canal Treatment

- ◆ Surveyed patients seeing Endodontists in Perth
 - Private and public practice
- ◆ Two surveys completed:
 1. Prior to consult / treatment
 2. After completion of root canal filling
- ◆ Questions regarding patients' concerns about root canal treatment
- ◆ Pre- and post-treatment responses compared



Chandraweera, Goh, Lai-Tong, Newby, Abbott
- Aust Endo J 2019



A Survey of Patients' Perceptions About, and Their Experiences of Root Canal Treatment

Concerns	Pre-Treatment
No concerns	14 %
Pain associated with treatment	51
Cost	55
Time off work, number of appointments, etc.	16
More treatment/maintenance	13
Treatment failure	20
Other	4



Chandraweera, Goh, Lai-Tong, Newby, Abbott
- Aust Endo J 2019



What about Post-Operative Pain?

- ◆ 40% of patients experience some pain after endodontics (Seltzer et al 1961)
- ◆ 25% had moderate to severe pain after instrumentation appointment (Clem 1970)
- ◆ 16% had moderate to severe pain during or after treatment visits (O'Keefe 1976)
- ◆ 75% had "at least some pain" after initial treatment of asymptomatic chronic apical periodontitis (Orstavik et al 1998)

How Common is Tooth Pain After Root Canal Treatment?

Nixdorf DR, Moana-Filho EJ, Law AS,
McGuire LA, Hodges JS, John MT.

J Endod 2010; 36: 224 - 230

How Common is Tooth Pain After Root Canal Treatment?

Nixdorf *et al* - *J Endod* 2010

- ◆ 26 studies reviewed - 5,777 teeth
- ◆ **Six months after treatment - 5.3% of patients still had persistent pain**
- ◆ Higher quality reports suggested >7%
- ◆ **“All-cause pain” assessed**
 - i.e. regardless of the pre-treatment diagnosis and the treatment variations

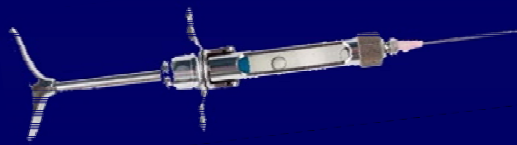
Pre- and Post-Operative Pain

- ◆ Strong relationship between pre-op. and post-op. pain
 - If moderate to severe pre-operative pain -
 - FIVE times more likely to have moderate to severe post-operative pain (O’Keefe 1976)
 - Significantly more post-operative pain with **“irreversible pulpitis and acute apical periodontitis”** compared to **“necrotic pulps with chronic apical periodontitis”**
 - ◆ Also - when appointment was less than 45 minutes - then significantly more cases with no post-op. pain (Segura-Egea *et al* 2009)

Importance of Pain Control During Treatment



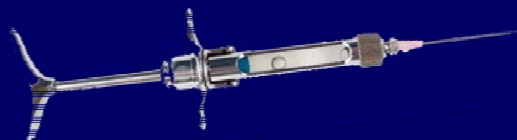
- ◆ Pain during treatment significantly impacts on the amount of post-op. pain
 - *Hence, adequate pain control is essential*
 - *i.e. effective Local Anaesthesia is needed !!!*



Local Anaesthesia

Hargreaves & Khan Endod Topics 2005

- ◆ Three goals of local anaesthesia:
 - *Anaesthesia during treatment*
 - *Haemostasis during treatment*
 - *Prolonged post-operative pain control*



Local Anaesthesia

Hargreaves & Khan *Endod Topics* 2005

- ◆ Pain control from local anaesthetics
 - two mechanisms

1. DIRECT

- Duration of effect: Minutes → Hours

2. INDIRECT

- Duration of effect: Hours → Days

Local Anaesthesia

Hargreaves & Khan *Endod Topics* 2005

- ◆ Inadequate local anaesthesia

1. Pain during treatment
2. More post-operative pain

- ◆ Since prolonged exposure to sensory input increases allodynia and hyperalgesia

Pain from non-injurious stimuli

Exaggerated sense of pain

Overcoming Difficulties with Pain Control during Dental Treatment

◆ Background

■ *LA does not always work !!*

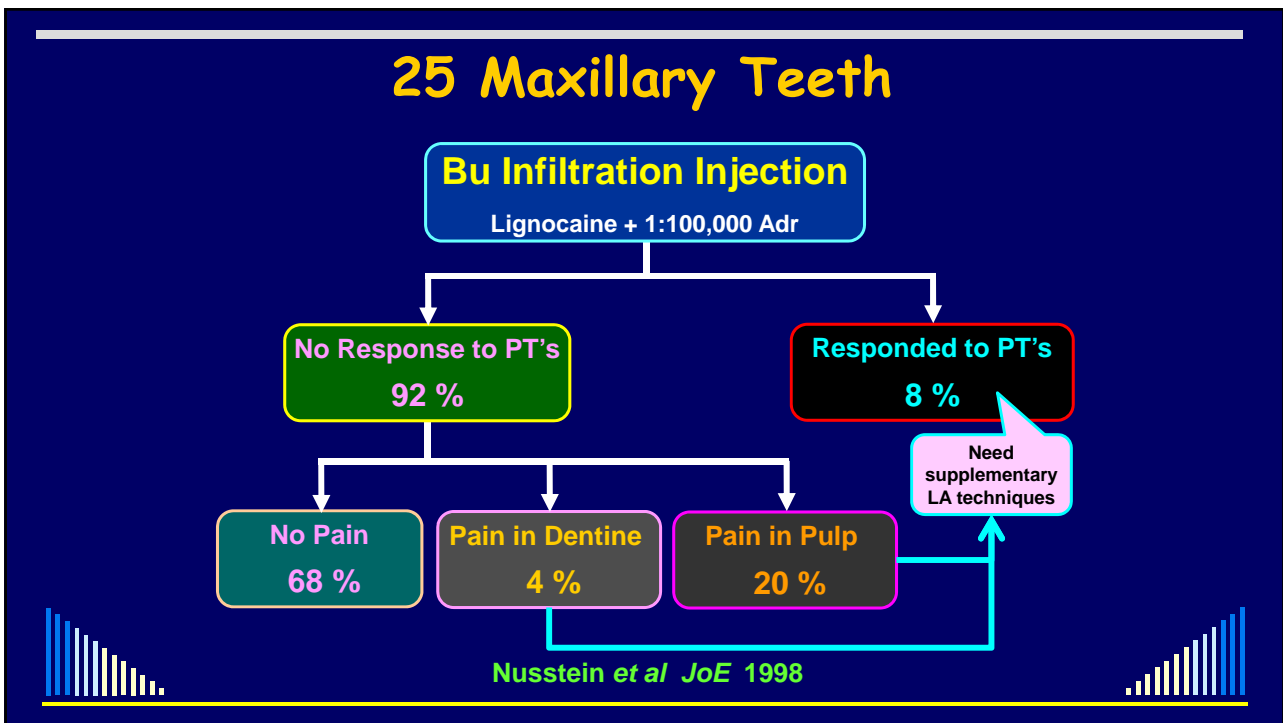
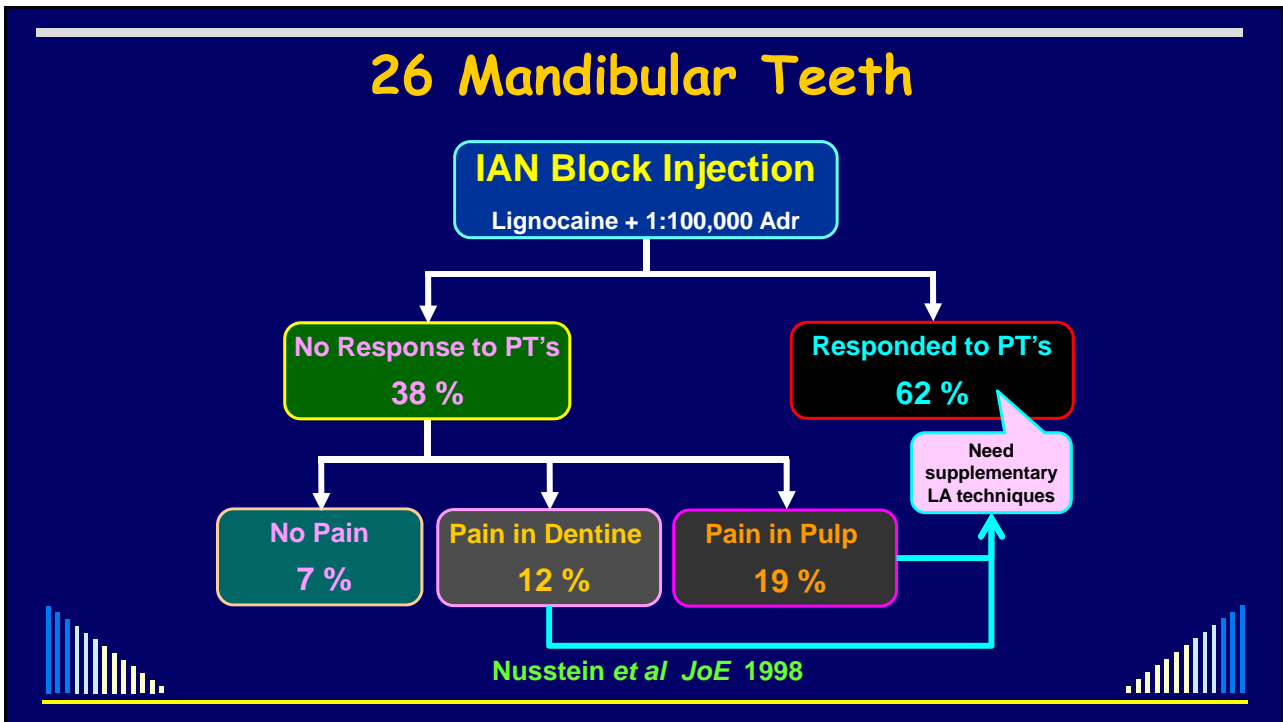
- Especially with acute irreversible pulpitis
- And especially for mandibular molars

- e.g. Inferior Alveolar Nerve block: 65 - 85 %
- e.g. Gow-Gates Mand. Nerve block: 92 - 99 %

Anaesthetic efficacy of the supplemental intraosseous injection of 2% lidocaine with 1:100,000 epinephrine in irreversible pulpitis

Nusstein J, Reader A, Nist R,
Beck M and Meyers WJ.

J Endod 1998; 24: 487 - 91



Pre-, Intra- & Post-Operative Pain Management


◆ Background

■ Acute irreversible pulpitis

→ A good model for investigating pain control

- ✧ LA does not always work adequately
- ✧ **FIVE** times more likely to have moderate-severe Intra-operative and Post-operative pain if there is moderate-severe Pre-operative pain (O'Keefe 1976)
- ✧ Inadequate pain control **DURING** treatment is sig. more likely to result in greater post-operative pain (Hargreaves & Keiser 2009)

Acute Irreversible Pulpitis

- ◆ It is NOT a “hot pulp” 
- Not a tooth of extreme attractiveness !!!
- Not a tooth undergoing an exothermic reaction in which its temperature is well above normal temperature
 - Temperature is not measured!!
 - Nusstein JM, Reader A, Drum M. *Dent Clin Nth Am* 2010; 54; 237-47.

Pre-, Intra- & Post-Operative Pain Management

◆ Background

- Previous studies have generally investigated:
 - Supplementary IADN blocks, Gow-Gates, etc
 - Other supplementary injections
 - ✦ Bu infiltration, intra-osseous, PDL, intra-pulp, etc.
 - But typically with “clinically normal pulps”
 - And by using electric pulp testers to assess the effectiveness of LA
 - Lignocaine -v- Articaine
 - Pre- & post-op. “courses” of various medications

Outline

- ◆ Effects of:
 - Pre-operative medication
 - Topical LA
 - Different LA solutions
 - Different volumes of LA
 - Different injection sites
 - Root lengths

Kerman University of Medical Sciences - Iran

Prof. Masoud Parirokh



CONSORT Randomized Clinical Trial

J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

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Abstract

Introduction: Achieving pulp anesthesia with irreversible pulpitis is difficult. This study evaluated whether nonsteroidal anti-inflammatory drugs assist local anesthesia. **Methods:** In a randomized double-blinded clinical trial, 150 patients (50 per group) with irreversible pulpitis were given placebo, 600 mg ibuprofen, or 75mg indomethacin 1 hour before local anesthesia. Each patient recorded their pain score on a visual analog scale before taking the medication, 15 minutes after anesthesia in response to a cold test, during access cavity preparation and during root canal instrumentation. No or mild pain at any stage was considered a success. Data were analyzed by the chi-square and analysis of variance tests. **Results:** Overall success rates for placebo, ibuprofen, and indomethacin were 32%, 78%, and 62%, respectively ($p < 0.001$). Ibuprofen and indomethacin were significantly better than placebo ($p < 0.01$). There was no difference between ibuprofen and indomethacin ($p = 0.24$). **Conclusions:** Premedication with ibuprofen and indomethacin significantly increased the success rates of inferior alveolar nerve block anesthesia for teeth with irreversible pulpitis. (J Endod 2010;36:1450-1454)

Pain control particularly during the early phases of endodontic treatment is of paramount importance and makes both the dentist and the patient confident and comfortable for the remainder of the treatment (1). The inferior alveolar nerve block (IANB) is the conventional method for anesthetizing mandibular molar teeth (2, 3). Research has shown that gaining anesthesia in mandibular molars with irreversible pulpitis is much more difficult in comparison to the teeth with normal healthy pulps (4-6). Some investigations have been performed to overcome pulp pain that remains despite having had an IANB injection (2, 3, 7-14). Numerous investigations have been performed to increase the success rate of anesthesia during dental, and particularly endodontic, procedures such as the use of various anesthetic techniques and solutions as well as pretreatment with analgesics (7-25).

The concept of using preoperative analgesic drugs to increase the effectiveness of IANB is based on reports of their beneficial effects on reducing postoperative pain (23). Previous investigations using analgesics before administering IANB have reported conflicting results (10, 23-25). For example, Modaresi et al (23) reported significant improvements in the success rate of IANB in teeth with inflamed pulps after the use of analgesics, and Ianiro et al (10) reported higher success rates although they were not significantly different. In contrast, two separate studies reported no significant difference in IANB success rates when the patients were premedicated with analgesics (24, 25). Several reasons could explain these promising but not completely different results such as an insufficient number of subjects (10) and a lack of similarity of methods and clinical conditions (23). The aim of this study was to compare two types of nonsteroidal anti-inflammatory (NSAID) medication (ibuprofen and indomethacin)

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Materials and Method:

- Randomized double-blinded clinical trial
- Mandibular molars - acute irreversible pulpitis
 - Confirmed by moderate-severe pain and lingering pain to cold pulp sensibility tests
 - BUT no spontaneous pain
 - AND no radiographic periapical changes
 - ✦ i.e. without acute apical periodontitis



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Materials and Method:

- 150 patients (50 per group) - given:
 - ✦ Placebo
 - ✦ Ibuprofen - 600 mg, or
 - ✦ Indomethacin - 75 mg
- Taken 1 hour before local anaesthesia
- 2% lignocaine + 1:80,000 adrenaline used
 - 1.8 ml given as an IAN block



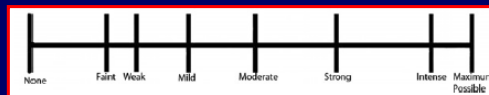
J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Materials and Method:

■ Pain scored on a visual analogue scale

- Before taking the medication
- 15 minutes after LA injection
- In response to a cold pulp test
- During access cavity preparation, and
- During root canal instrumentation



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Results:

- No sig. diff. in pre-treatment pain scores
- 120 pt's did not respond to the cold pulp sensibility tests 15 minutes after LA injection
 - But 34 (28%) had pain during treatment
- Overall 64 had ineffective LA
 - 30 of these had pain to cold testing



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Results:

■ Overall success

- Placebo - 32%
- Ibuprofen - 78%
- Indomethacin - 62%

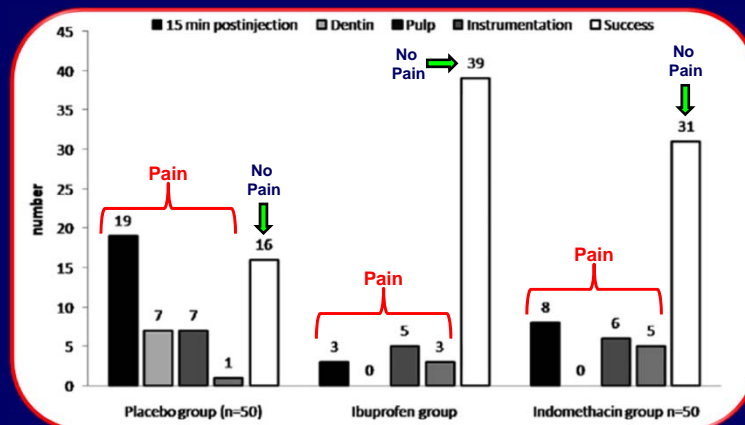
■ Ibuprofen + Indomethacin

- Sig. diff. to Placebo
- But not sig. diff. to each other



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Discussion:

- Pre-medication with an NSAID helped with pain control during treatment for acute irreversible pulpitis in mandibular molars
 - Ibuprofen more effective
 - And has less side effects than Indomethacin
 - ✦ Esp. re: risk of heart attack, stroke, GIT problems, ulcers, etc.



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Discussion:

- Previous studies - mixed results
 - Pre-medication with NSAID's is beneficial
 - ✦ e.g. Seymour and Ward (1996)
 - laniro *et al* (2010)



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Discussion:

■ Previous studies - mixed results

→ Others: Pre-medication NOT beneficial

✦ e.g. Aggarwal *et al* (2010), Oleson *et al* (2010)

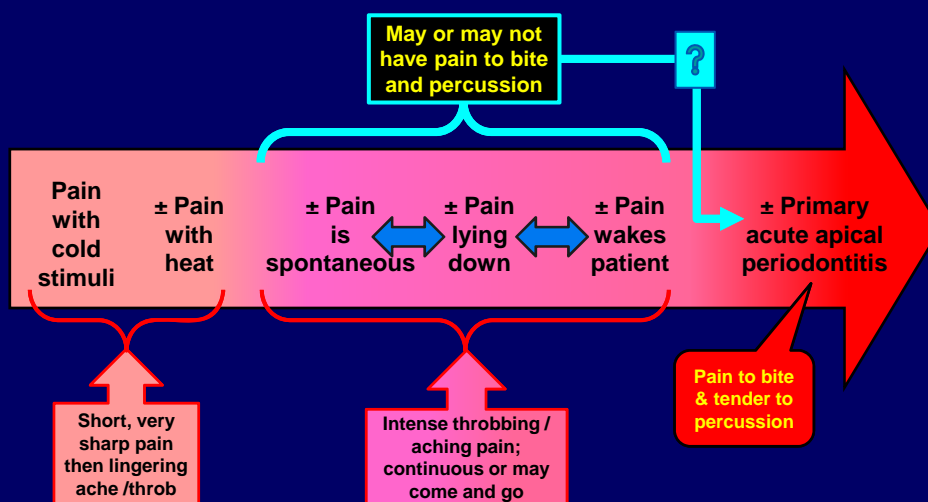
➢ Their main criterion for acute irreversible pulpitis was "spontaneous pain"

- More advanced pulp inflammation
 - NSAID and LA less effective

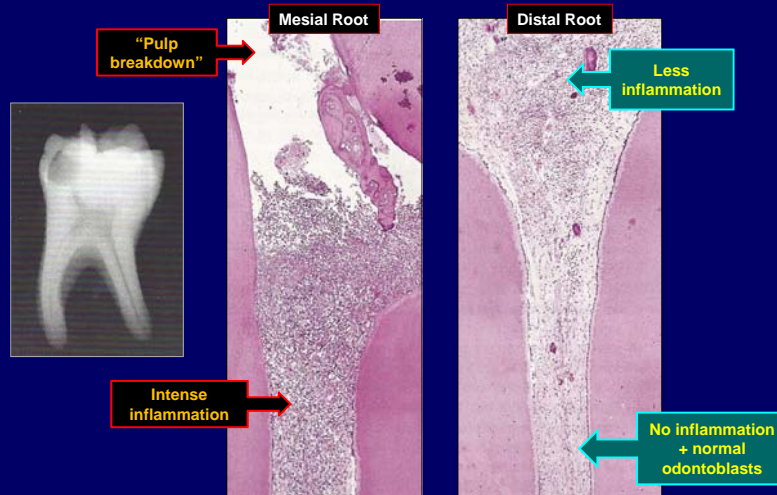


J Endod 2010; 36: 1450 - 1454

Acute Irreversible Pulpitis



Acute Irreversible Pulpitis



Olgart & Bergenholtz - *Textbook of Endodontology* - 2003

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

◆ Conclusion:

- Pre-medication with a single dose of Ibuprofen can help with pain control during treatment of acute irreversible pulpitis in mandibular molars
 - If there is no spontaneous pain
 - Highlights the need for a thorough history and diagnosis of the presenting complaint



J Endod 2010; 36: 1450 - 1454

The Effect of Premedication with Ibuprofen and Indomethacin on the Success of Inferior Alveolar Nerve Block for Teeth with Irreversible Pulpitis

- ◆ But not always practical for the emergency patient
 - Need to avoid taking NSAID's before the examination and testing procedures
 - To enable accurate diagnosis
 - Time required - one hour pre-operative
 - Have patient return later in the day ???
 - Effects on your other (waiting) patients ???



J Endod 2010; 36: 1450 - 1454

Outline

- ◆ Effects of:
 - Pre-operative medication
 - **Topical LA**
 - Different LA solutions
 - Different volumes of LA
 - Different injection sites
 - Root lengths

Effect of Topical Anesthesia on Pain during Infiltration Injection and Success of Anesthesia for Maxillary Central Incisors

◆ Results

- 72% had no response to EPT
- No Sig. Diff. in pain on needle insertion
- No Sig. Diff. in success of pulp anaesthesia
 - When moderate-severe injection pain compared to nil-mild injection pain



J Endod 2012; 38: 1553 - 1556

Effect of Topical Anesthesia on Pain during Infiltration Injection and Success of Anesthesia for Maxillary Central Incisors

◆ Conclusions

- Topical LA - no effect on pain of injection
- Pain during injection does not affect success of anaesthesia



J Endod 2012; 38: 1553 - 1556

Outline

- ◆ Effects of:
 - Pre-operative medication
 - Topical LA
 - **Different LA solutions**
 - Different volumes of LA
 - Different injection sites
 - Root lengths

Restor Dent Endod 2015; 40: 155-160

Research article
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<http://dx.doi.org/10.1016/j.rdent.2015.03.004>

RDE
Restorative Dentistry & Endodontics

The success rate of bupivacaine and lidocaine as anesthetic agents in inferior alveolar nerve block in teeth with irreversible pulpitis without spontaneous pain

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Objective: Achieving adequate anesthesia with inferior alveolar nerve blocks (IANB) is of great importance during dental procedures. The aim of the present study was to assess the success rate of two anesthetic agents (bupivacaine and lidocaine) for IANB when treating teeth with irreversible pulpitis. **Methods:** Sixty volunteer male and female patients who required root canal treatment of a mandibular molar due to caries participated in the present study. The inclusion criteria included protruded pulp to thermal stimulus but no spontaneous pain. The patients were randomly allocated to receive either 2% bupivacaine with 1:200,000 epinephrine or 0.5% bupivacaine with 1:200,000 epinephrine as an IANB injection. The sensitivity of the teeth to a cold test as well as the amount of pain during access cavity preparation and root canal instrumentation were recorded. Results were statistically analyzed with the Chi-Square and Fisher's exact tests. **Results:** At the final step, 50% more patients were included in the study. The success rate for bupivacaine and lidocaine groups were 20.0% and 24.3%, respectively. There was no significant difference between the two groups at any stage of the treatment process. **Conclusions:** There was no difference in success rate of anesthesia when bupivacaine and lidocaine were used for IANB injections to treat mandibular molar teeth with irreversible pulpitis. Further agent was able to completely anesthetize the teeth effectively. Therefore, practitioners should be prepared to administer supplemental anesthesia to overcome pain during root canal treatment. (Restor Dent Endod 2015;40(2): 155-160)

Key words: Anesthesia; Bupivacaine; Cold test; Inferior alveolar nerve block; Irreversible pulpitis; Lidocaine

Introduction

Patients desire and expect to receive dental treatment, particularly root canal procedures, without any pain.¹ Numerous investigations have been performed to determine the best methods and drugs for successful anesthesia during dental procedures. The inferior alveolar nerve block (IANB) injection has long been the method of choice for many clinicians for anesthesia when treating mandibular molar teeth.²⁻⁶ However, high number of instances of inadequate anesthesia following IANB administration with various anesthetic agents and techniques has motivated the need for continuing investigations in this field. Laboratory investigations have suggested that bupivacaine would be the anesthetic

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The Success Rate of Bupivacaine and Lidocaine as Anesthetic Agents in Inferior Alveolar Nerve Block in Teeth with Irreversible Pulpitis Without Spontaneous Pain

- ◆ Chronic irreversible pulpitis - lower molars
- ◆ 1.8 ml x 2% Lignocaine - 1:80,000 adren.
- ◆ 1.8 ml x 0.5% Bupivacaine - 1:200,000 adren.
- ◆ Assessed by a cold test and pain during treatment



Restor Dent Endod 2015; 40: 155-160

The Success Rate of Bupivacaine and Lidocaine as Anesthetic Agents in Inferior Alveolar Nerve Block in Teeth with Irreversible Pulpitis Without Spontaneous Pain

- ◆ Results
 - Bupivacaine - 20% success
 - Lignocaine - 24.1% success
 - No Sig. Diff.
- ◆ Conclusion
 - No difference between the two solutions



Restor Dent Endod 2015; 40: 155-160

Iran Endod J 2016; 11: 79-84



Efficacy of Articaine and Lidocaine for Buccal Infiltration of First Maxillary Molars with Symptomatic Irreversible Pulpitis: A Randomized Double-blinded Clinical Trial

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^aEndodontic Department, Dental School, Kermanshah University of Medical Sciences, Kermanshah, Iran; ^bEndodontic Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran; ^cDepartment of Endodontics, Kermanshah University of Medical Sciences, Kermanshah, Iran; ^dDepartment of Endodontics, University of Queensland, Australia; ^eDepartment of Endodontics, Shiraz University of Medical Sciences, Shiraz, Iran

<p>Article Type: Original Article</p> <p>Received: 21 Sep 2015 Revised: 01 Jan 2016 Accepted: 19 Jan 2016 DOI: 10.52092/iej.2015.11.1.01</p> <p>*Corresponding author: Masoud Paritokh, Oral and Dental Disease Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran. Tel: +98-913 3431736 E-mail: M_Paritokh@kums.ac.ir</p>	<p>Introduction: The aim of the present study was to compare the efficacy of 2% lidocaine to 4% articaine in buccal infiltration of maxillary first molars with irreversible pulpitis. However, the effect of root length on success of anesthesia irrespective of the type of anesthetic agent was assessed. Methods and Materials: Fifty patients suffering from painful maxillary first molars with irreversible pulpitis received an infiltration injection of either 4% articaine with 1:200000 epinephrine or 2% lidocaine with 1:80000 epinephrine. Each patient recorded their pain score to response to a cold test on a VAS-Pain visual analogue scale (VAS) before commencing the treatment, 5 min following injection, during access preparation, after pulp exposure and during root canal instrumentation. No or mild pain at any stage was considered a success. Data were analyzed using the median-rank sign test, regression analysis, chi-square and t-test. Results: Initially, 47 out of 50 patients were eligible to be included in the study. The anesthetic success rates in the lidocaine and articaine groups were 56.2% and 46.6%, respectively and the difference was not significant (P=0.674). Irrespective of the anesthetic agent, the length of the palatal root (odds ratio: 0.24, P=0.007) had an adverse effect on anesthetic success. There was an association between longer palatal root length and anesthetic failure. Conclusion: No significant difference was found between 2% lidocaine and 4% articaine in terms of anesthetic success in maxillary first molars with irreversible pulpitis. The length of the palatal root had a significant negative influence on anesthetic success.</p> <p>Keywords: Articaine; buccal injection; infiltration; irreversible pulpitis; lidocaine; Maxillary Molar; Palatal Root; Root Length.</p>
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Iran Endodontic Journal 2016;11(2): 79-84

Efficacy of Articaine and Lidocaine for Buccal Infiltration of First Maxillary Molars with Symptomatic Irreversible Pulpitis: A Randomized Double-Blinded Clinical Trial

- ◆ Acute irreversible pulpitis - upper molars
- ◆ 1.8 ml x 2% Lignocaine - 1:80,000 adrenaline
- ◆ 1.8 ml x 4% Articaine - 1:100,000 adrenaline
- ◆ Assessed by a cold test and pain during treatment



Efficacy of Articaine and Lidocaine for Buccal Infiltration of First Maxillary Molars with Symptomatic Irreversible Pulpitis: A Randomized Double-Blinded Clinical Trial

◆ **Results**

- **Lignocaine - 56.5% success**
- **Articaine - 66.7% success**
- **No Sig. Diff.**

◆ **Conclusion**

- **No difference between the two solutions**



Iran Endod J 2016; 11: 79-84

2010; 109: 468-473

Vol. 109 No. 3 March 2010



Oral Surgery, Oral Medicine,
Oral Pathology, Oral Radiology, and
Endodontology

ENDODONTOLOGY

Editor: Larz S.W. Spångberg

Efficacy of combining a buccal infiltration with an inferior alveolar nerve block for mandibular molars with irreversible pulpitis

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Objective. The aim of this study was to assess the efficacy of inferior alveolar nerve (IAN) block combined with buccal infiltration for mandibular molars with irreversible pulpitis.

Methodology. Eighty-four patients were randomly assigned to 3 groups of 28 patients each. Lidocaine 2% with 1:80,000 epinephrine was used for all injections. Group I patients received an IAN block with 1.8 mL of anesthetic. Group II patients received an IAN block using 3.6 mL. Group III patients received 1.8 mL as an IAN block and 1.8 mL as a buccal infiltration. A visual analogue scale was used to rate pain before anesthesia and discomfort experienced before and during access cavity preparation. Data were analyzed by chi-square, ANOVA, Kruskal-Wallis, and Mann-Whitney tests.

Results. The success rates for groups I to III were 14.8%, 39.3%, and 65.4%, respectively. Group III had significantly better anesthesia compared with group I ($P < .05$).

Conclusion. Combining an IAN block and a buccal infiltration injection provided more effective anesthesia in mandibular molars with irreversible pulpitis. However, some cases may still require further anesthesia to prevent pain during endodontic treatment. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;109:468-473)

Efficacy of Combining a Buccal Infiltration with an Inferior Alveolar Nerve Block for Mandibular Molars with Irreversible Pulpitis

- ◆ Acute irreversible pulpitis
- ◆ 2% Lignocaine with 1:80,000 adrenaline
 - 1.8 ml IAN Block
 - 3.6 ml IAN Block
 - 1.8 ml IAN Block + 1.8 ml Bu Infiltration
- ◆ Assessed by a cold test and pain during treatment



OS:OM:OP:OR:Endo 2010; 109: 468-473

Efficacy of combining a buccal infiltration with an inferior alveolar nerve block for mandibular molars with irreversible pulpitis

- ◆ Results - will discuss later
- ◆ Discussion:
 - This study tested lignocaine - 65.4%
 - Two Articaine studies with both IAN and Bu injections for irreversible pulpitis
 - RESULTS: 54% and 58% success



OS:OM:OP:OR:Endo 2010; 109: 468-473

Efficacy of Articaine

Literature review article - BDJ 2011

- ◆ Articaine for Irreversible Pulpitis
 - TWO studies - sig. better
 - One max. infilⁿ; one IAN block + Bu infilⁿ
 - SEVEN studies - no sig. difference
 - Max. Infilⁿ, IAN block ± Bu infilⁿ, G-G block
- ◆ Articaine for other injections (i.e. not irrev. pulpitis)
 - SEVEN studies - sig. better
 - TEN studies - no sig. diff.

OS:OM:OP:OR:Endo 2010; 109: 468-473

Efficacy of combining a buccal infiltration with an inferior alveolar nerve block for mandibular molars with irreversible pulpitis

- ◆ Discussion:
 - Hence, no advantage in using Articaine
 - ✳ Beware potential side effects with IAN blocks
 - ✳ Esp. lingual nerve paraesthesia
 - ? Neurotoxicity of the drug
 - esp. with 4% concentration



OS:OM:OP:OR:Endo 2010; 109: 468-473

Articaine and Neurotoxicity - A Review

Hopman AJG, Baart JA, Brand HS.

Brit Dent J - 2017

Articaine and Neurotoxicity - A Review

- ◆ Assessed risk of paraesthesia after LA
- ◆ Compared the number of cases with the market share of LA drugs
 - Studies in various countries

Hopman *et al* - *Brit Dent J* 2017

Articaine and Neurotoxicity - A Review

- ◆ Risk of paraesthesia with Articaine
 - Ranged from: 1:140,000 - 1:4,159,848
 - NB - All LA solutions: 1:160,571 - 1:4,156,848
- ◆ Usually following IADN blocks
 - But can occur after infiltrations
 - Both maxillary and mandibular
- ◆ Paraesthesia lasted:
 - From 1 day up to 2 years

Hopman et al - Brit Dent J 2017

Articaine and Neurotoxicity - A Review

- ◆ Paraesthesia typically affects:
 - Lip: 7 - 29 %
 - Tongue: 53 - 89 %
 - Lip and tongue: 4 - 10%
- ◆ Can be permanent
- ◆ Can severely affect patient function, comfort, quality of life, etc.

Hopman et al - Brit Dent J 2017

Articaine and Neurotoxicity - A Review

Time Period	Country	Articaine-rel'd Paraesthesia	Market Share for Articaine
1993	Canada	71%	38%
2003	Netherlands	89%	70%
2002 - 2004	Denmark	87%	42%
2001 - 2007	Denmark	78%	41%
1997 - 2008	UK	51%	14%
1998 - 2008	UK	77%	13%
2006 - 2008	Canada	70%	44%
2006 - 2011	USA	33%	38%

Hopman et al - Brit Dent J 2017

Higher concentration local anaesthetics causing prolonged anaesthesia. Do they? A literature review and case reports



Kington A, Sambrook P, Goss A.

Aust Dent J - 2011; 56: 348 - 351

Higher concentration local anaesthetics causing prolonged anaesthesia. Do they? Literature review & case reports

Table 2. Ratio of reported prolonged anaesthesia from different concentrations of local anaesthetic agents

	2%	3%	4%
Haas and Lennon ⁴	1	6.76	5
Hillerup and Jensen ⁶	1	1	14
Pogrel ⁷	1	7.6	2
Dower ¹¹	1	15	20

Kingon et al - Aust Dent J 2011

In Summary ...

- ◆ Avoid using Articaine for IADN block
 - To reduce risk of paraesthesia
 - Especially of the Lingual nerve

- ◆ Can use Articaine (**with care**) for infiltrations
 - May have a slight advantage
 - Due to being a different solution
 - ✦ And a different site for lower posterior teeth
 - Rather than having any increased benefit from the drug itself

Outline

- ◆ Effects of:
 - Pre-operative medication
 - Topical LA
 - Different LA solutions
 - Different volumes of LA
 - Different injection sites
 - Root lengths

J Endod 2015; 41: 1408–1411

CONSORT Randomized Clinical Trial

A Comparison of Different Volumes of Articaine for Inferior Alveolar Nerve Block for Molar Teeth with Symptomatic Irreversible Pulpitis

Ramin Abattarpoor DMD,¹ Masoud Parvizi, DMD, MSc,² Nouzar Nishkhan, MD³ and Paul V. Abbott, MD⁴

ABSTRACT

Introduction: Achieving anesthesia in mandibular molar teeth with irreversible pulpitis is very difficult. The aim of this study was to compare the efficacy of 1.0 mL and 1.5 mL volumes of inferior alveolar nerve block (IANB) when treating molar teeth with symptomatic irreversible pulpitis. **Methods:** In a randomized, double-blind, clinical trial, 62 first mandibular molar teeth with symptomatic irreversible pulpitis requiring removal of conventional IANB injection volume with 1.0 mL of articaine (2.0 mg/mL) were compared with 1.5 (2.25 mg/mL) articaine. The patients received their pain relief and during one-week postoperative as well as during root canal instrumentation using a dual-pulse ultrasonic unit. No significant differences were noted in surgical anesthesia, tooth pain, or patient satisfaction. **Results:** 50 patients were eligible for pain pain scale study, which is based on 20 of patients provided significantly higher scores (92.7%) of 100% compared with 13.6% of the same controls (27.5%) although neither group had 100% successful anesthesia ($P < .001$). Conclusions: Increasing the volume of articaine provided a significantly higher success rate of 100% in mandibular first molar teeth with symptomatic irreversible pulpitis, but it did not result in 100% anesthesia success. (*J Endod 2015;41:1408–1411*)

KEY WORDS

artocaine, articaine, inferior alveolar, irreversible pulpitis, mandibular molar, nerve block, symptomatic, pulpitis

Root canal treatment is a procedure in which pulp tissue and bacteria are removed from the root canal system (1). A major concern for dentists during root canal treatment is to provide profound anesthesia during the procedure (2). Numerous studies have been published to assess methods to overcome pain and discomfort during root canal treatment using various techniques, equipment, and materials solutions (3–6).

Teeth with irreversible pulpitis have shown greater difficulty in achieving anesthesia during root canal treatment. In addition, achieving anesthesia in mandibular molar teeth with irreversible pulpitis is more difficult compared with other molar teeth with the same condition (7). An inferior alveolar nerve block (IANB) is the most common anesthetic technique used in practice available for mandibular molars (8).

Articaine is known as a short-acting amide anesthetic agent in dentistry (9,10). Articaine is an amide anesthetic because of its chemical structure, which is similar to that of lidocaine (11). Articaine is known to penetrate the root canal and provide longer duration of pulp anesthesia compared with lidocaine (12). In some investigations, low concentrations of articaine (0.5 mg/mL) with other anesthetic agents (13–15). The results of these studies have shown no significant difference between articaine and lidocaine when used for IANB injections (16–18).

In a meta-analysis of dental anesthesia, it was concluded that the use of more than 1.0 mL of articaine for IANB injections was more effective than 1.0 mL of articaine for IANB injections. The authors have been recommended at the correct dose, but it does not guarantee pulp anesthesia. In addition, pulp anesthesia success is not achieved if lower molar pain is reported by the patient during or soon after preparation and root canal instrumentation (9). One of the reported methods to overcome the failure of conventional articaine administration is to increase the volume of the anesthetic solution (19–21). Manual pulp pressure monitoring has been suggested to determine the volume of anesthetic solution required. However, these studies have only used lidocaine as the anesthetic solution (22–25). The aim of this investigation was to compare the anesthetic success of 1.0 mL with articaine in teeth with symptomatic irreversible pulpitis and irreversible pulpitis when administered 1.5 mL of articaine.

Materials and Methods

The protocol of this study and the informed consent document were approved by the Institutional Review Board of the Faculty of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran. The sample size calculation, which was based on a type I error of 0.05 and a power of 80, indicated that a sample of 50 in each group would be required to detect a 20% difference in the success rate of 1 root group.

The inclusion criteria were 60 first mandibular molar teeth with 50 of them displaying symptomatic irreversible pulpitis with irreversible pulpitis and normal pulp vitality and positive response. The teeth were treated with an electric pulp test (F4000; Parapulse, NY) and cold and heat tests (Bruxor; Bruxor, Shiraz, Iran) to determine pulp vitality. The teeth were then prepared with step-down ultrasonic files (F4000; Parapulse) and having pain scale and pulp vitality responses to the relative scale (see Fig 1) recorded.

A Comparison of Different Volumes of Articaine for Inferior Alveolar Nerve Block for Molar Teeth with Symptomatic Irreversible Pulpitis

- ◆ Acute irreversible pulpitis - lower molars
- ◆ 4% Articaine with 1:100,000 adrenaline
 - 1.8 ml or 3.6 ml - IAN block
- ◆ Assessed by a cold test and pain during treatment



J Endod 2015; 41: 1408 - 1411

A Comparison of Different Volumes of Articaine for Inferior Alveolar Nerve Block for Molar Teeth with Symptomatic Irreversible Pulpitis

- ◆ Results
 - 1.8 ml - 27.5% success
 - 3.6 ml - 77.5% success
 - Stat. Sig. Diff.
- ◆ Conclusion
 - Increasing the volume of Articaine increased the success rate of an IANB



J Endod 2015; 41: 1408 - 1411

Outline

- ◆ Effects of:
 - Pre-operative medication
 - Topical LA
 - Different LA solutions
 - Different volumes of LA
 - Different injection sites
 - Root lengths

2010; 109: 468 - 473

Vol. 109 No. 3 March 2010

Oral Surgery, Oral Medicine,
Oral Pathology, Oral Radiology, and
Endodontology

ENDODONTOLOGY

Editor: Larz S.W. Spångberg

Efficacy of combining a buccal infiltration with an inferior alveolar nerve block for mandibular molars with irreversible pulpitis

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KERMAN UNIVERSITY OF MEDICAL SCIENCES AND UNIVERSITY OF WESTERN AUSTRALIA

Objective. The aim of this study was to assess the efficacy of inferior alveolar nerve (IAN) block combined with buccal infiltration for mandibular molars with irreversible pulpitis.

Methodology. Eighty-four patients were randomly assigned to 3 groups of 28 patients each. Lidocaine 2% with 1:80,000 epinephrine was used for all injections. Group I patients received an IAN block with 1.8 mL of anesthetic. Group II patients received an IAN block using 3.6 mL. Group III patients received 1.8 mL as an IAN block and 1.8 mL as a buccal infiltration. A visual analogue scale was used to rate pain before anesthesia and discomfort experienced before and during access cavity preparation. Data were analyzed by chi-square, ANOVA, Kruskal-Wallis, and Mann-Whitney tests.

Results. The success rates for groups I to III were 14.8%, 39.3%, and 65.4%, respectively. Group III had significantly better anesthesia compared with group I ($P < .05$).

Conclusion. Combining an IAN block and a buccal infiltration injection provided more effective anesthesia in mandibular molars with irreversible pulpitis. However, some cases may still require further anesthesia to prevent pain during endodontic treatment. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;109:468-473)

Efficacy of Combining a Buccal Infiltration with an Inferior Alveolar Nerve Block for Mandibular Molars with Irreversible Pulpitis

- ◆ Acute irreversible pulpitis
- ◆ 2% Lignocaine with 1:80,000 adrenaline
 - 1.8 ml IAN Block
 - 3.6 ml IAN Block
 - 1.8 ml IAN Block + 1.8 ml Bu Infiltration
- ◆ Assessed by a cold test and pain during treatment



OS:OM:OP:OR:Endo 2010; 109: 468 - 473

Efficacy of Combining a Buccal Infiltration with an Inferior Alveolar Nerve Block for Mandibular Molars with Irreversible Pulpitis

- ◆ Results - overall success

Group	Technique	No Pain
I	1.8 ml IAN Block	14.8%
II	3.6 ml IAN Block	39.3%
III	1.8 ml IAN Block + 1.8 ml Bu Infiltration	65.4%

Sig. Diff



OS:OM:OP:OR:Endo 2010; 109: 468 - 473

Efficacy of Combining a Buccal Infiltration with an Inferior Alveolar Nerve Block for Mandibular Molars with Irreversible Pulpitis

◆ Conclusions

- Greater volume of LA solution helps
- But alternative injection site is more effective
 - Targets different nerves / sites which may be involved in the pain sensation process



OS:OM:OP:OR:Endo 2010; 109: 468 - 473

Int Endod J 2014; 47: 926 - 933

INTERNATIONAL ENDODONTIC JOURNAL

doi:10.1111/iej.12236

Efficacy of supplementary buccal infiltrations and intraligamentary injections to inferior alveolar nerve blocks in mandibular first molars with asymptomatic irreversible pulpitis: a randomized controlled trial

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Abstract

Parirokh M, Sadr S, Nakhshaei N, Abbott PV, Askarifard S. Efficacy of supplementary buccal infiltrations and intraligamentary injections to inferior alveolar nerve blocks in mandibular first molars with asymptomatic irreversible pulpitis: a randomized controlled trial. *International Endodontic Journal*, 47, 926-933, 2014.

Aim This randomized double-blinded controlled trial was performed to compare the efficacy of inferior alveolar nerve block (IANB) injection for mandibular first molar teeth with irreversible pulpitis with or without supplementary buccal infiltration and intraligamentary injection.

Methodology Eighty-two patients with asymptomatic irreversible pulpitis received either a combination of intraligamentary injection + buccal infiltration + IANB or with traditional IANB injection in mandibular first molar teeth with irreversible pulpitis. Each patient recorded their pain score on a Hall-Parker visual analogue scale before commencing treatment, in response to a cold test 15 min after the designated

anaesthetic injection, during access cavity preparation and during root canal instrumentation. No or mild pain at any stage was considered a success. Data were analysed by chi-square test.

Results At the final stage of treatment, 69 of the 82 patients were eligible to be included in the study. No significant difference was found between age ($P = 0.560$) and gender ($P = 0.570$) amongst the patients in the two groups. The success rate of anaesthesia in the IANB and the combination groups were 22% and 58%, respectively. The success rate of anaesthesia in the combination group was significantly higher than the traditional IANB injection ($P = 0.003$).

Conclusion A combination of anaesthetic techniques can improve the success rate of anaesthesia for mandibular first molar teeth with irreversible pulpitis.

Keywords: anaesthesia, buccal infiltration, inferior alveolar nerve block, intraligamentary injection, irreversible pulpitis, supplemental anaesthesia.

Received 14 April 2013; accepted 17 December 2013

Efficacy of Supplementary Buccal Infiltrations and PDL Injections with Inferior Alveolar Nerve Blocks for Mandibular Molars with Irreversible Pulpitis

- ◆ Chronic irreversible pulpitis
- ◆ 2% Lignocaine with 1:80,000 adrenaline
 - 1.8 ml IAN Block
 - 1.8 ml IAN Block + 1.8 ml Bu Infiltration + 0.5 ml PDL injection
- ◆ Assessed by Cold test and pain during treatment



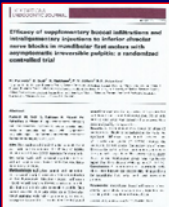
Int Endo J 2014; 47: 926 - 933

Efficacy of Supplementary Buccal Infiltrations and PDL Injections with Inferior Alveolar Nerve Blocks for Mandibular Molars with Irreversible Pulpitis

◆ Results:

Group	Technique	Successful Anaesthesia
I	1.8 ml IAN Block	22%
II	1.8 ml IAN Block + 1.8 ml Bu Infiltration + 0.5 ml PDL injection	58%

↑
Sig. Diff.
↓



OS:OM:OP:OR:Endo 2010; 109: 468 - 473

Efficacy of Supplementary Buccal Infiltrations and PDL Injections with Inferior Alveolar Nerve Blocks for Mandibular Molars with Irreversible Pulpitis

◆ **Conclusions:**

- Combining an IAN block with a Buccal infiltration and a PDL injection provided more effective LA for acute irreversible pulpitis in lower molars
- However, a considerable number of patients still had pain during root canal treatment



Int Endo J 2014; 47: 926 - 933

Outline

- ◆ **Effects of:**
 - Pre-operative medication
 - Topical LA
 - Different LA solutions
 - Different volumes of LA
 - Different injection sites
 - **Root lengths**

Int Endod J 2014; 47: 926 - 933

Clinical Research

The Effect of Maxillary First Molar Root Length on the Success Rate of Buccal Infiltration Anesthesia

Elham Hosaini Akbari, DMD,¹ Majid Faridi-Ah, DMD,MS,² Shauzar Nabbawi, MD,³ Hamid Reza Hosseini, DMD,MS,² and Paul V. Abbott, MD¹

Abstract Several variables may influence anesthetic success in maxillary molars. This investigation was conducted to evaluate the effect of root length on the success of infiltration injection of 2% lidocaine with 1:80,000 adrenaline. Methods: One hundred maxillary first molars with irreversible pulpitis were treated after the administration of buccal infiltration injection of 2% lidocaine with 1:80,000 adrenaline. The patients' pain during the root canal preparation and root canal instrumentation was evaluated using the self-report visual analog scale. The root canal preparation and instrumentation were compared at various root lengths. Data were analyzed by the chi-square test and Fisher's exact test. Results: Overall, 85% of the teeth had successful anesthesia of the root canal. Infiltration injection of a single buccal infiltration injection of anesthetic solution. The postoperative analgesic effect lasted for longer root lengths and distal root teeth with longer root lengths showed significantly higher anesthetic success rates (P < .05). However, root canal preparation and instrumentation were similar for teeth with shorter root lengths. Conclusion: Maxillary first molars having irreversible pulpitis with longer roots may have more successful anesthesia of a single buccal infiltration injection with 2% lidocaine and 1:80,000 adrenaline. (Int Endod J 2014; 47: 926-933)

Key Words: Anesthesia, infiltration, irreversible, length, lidocaine, maxillary molar, pulpitis, root, success

Introduction and Methods

The purpose of this study was approved by the Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran (IR.SUMS.1394.2013). The sample size was

The Effect of Maxillary First Molar Root Length on the Success Rate of Buccal Infiltration Anesthesia

- ◆ Acute Irreversible Pulpitis
 - Maxillary 1st Molars
- ◆ 1.8 ml 2% lignocaine with 1:80,000 adrenaline
- ◆ One Buccal Infiltration
 - Between DB and MB roots



J Endod 2016; 42: 1462 - 1466

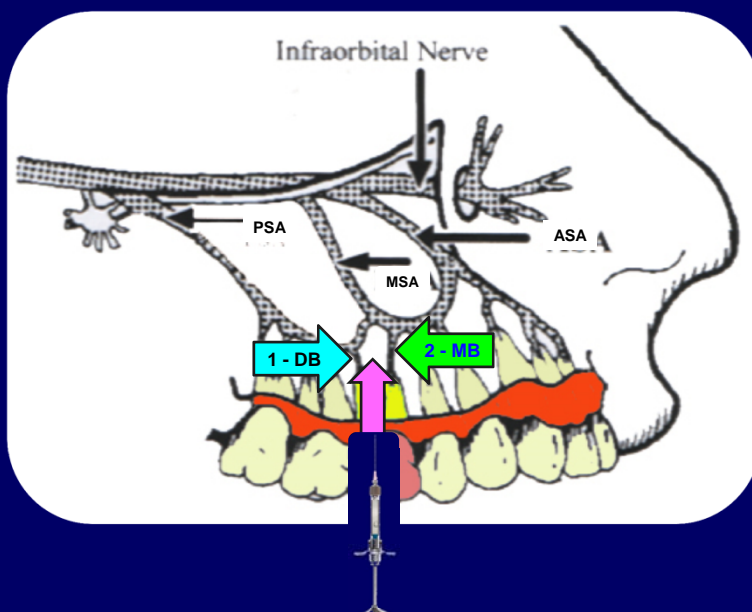
The Effect of Maxillary First Molar Root Length on the Success Rate of Buccal Infiltration Anesthesia

◆ Results

- 61% had adequate anaesthesia
- Length of the MB root - No Sig. Diff.



J Endod 2016; 42: 1462 - 1466



The Effect of Maxillary First Molar Root Length on the Success Rate of Buccal Infiltration Anesthesia

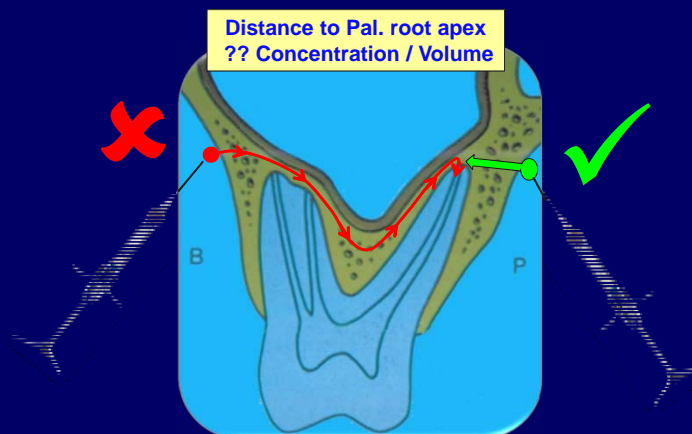
◆ Results

- 61% had adequate anaesthesia
 - Length of the MB root - No Sig. Diff.
 - DB and Pal roots - Longer roots had Stat. Sig. more LA failures
- But the “cut-off” length could not be determined



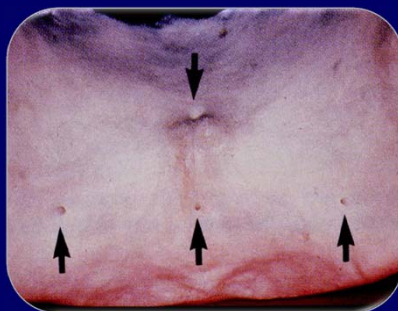
J Endod 2016; 42: 1462 - 1466

◆ Palatal infiltration for upper molars



Other Supplementary Injections

- ◆ Lingual infiltration for lower molars / premolars

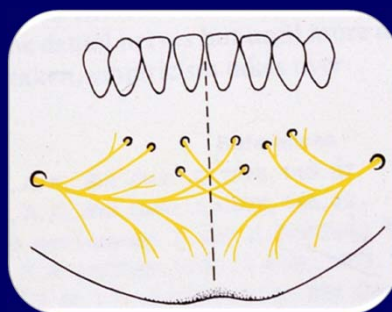


Accessory foramina on the Lingual of the mandible

Courtesy of Prof. Grant Townsend - Uni. of Adelaide

Other Supplementary Injections

- ◆ Labial infiltration for lower anterior teeth

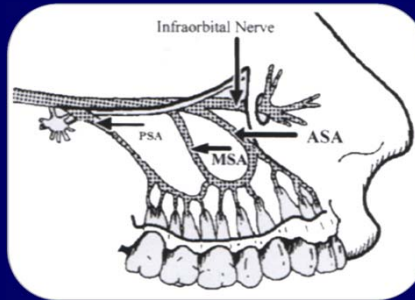
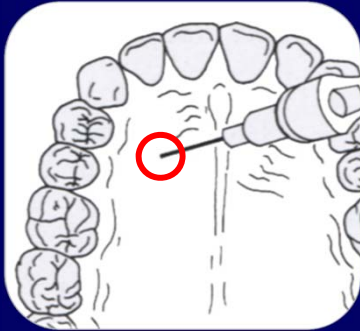


Cross innervation on labial of anterior mandible

Courtesy of Prof. Grant Townsend - Uni. of Adelaide

Other Supplementary Injections

- ◆ Palatal for upper premolars and anterior teeth
 - Anterior middle superior alveolar (AMSA) nerve block



Other Supplementary Injections

- ◆ Periodontal Ligament Injection



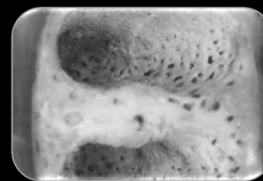
Other Supplementary Injections

- ◆ Periodontal Ligament Injection
 - A simple intra-osseous injection technique



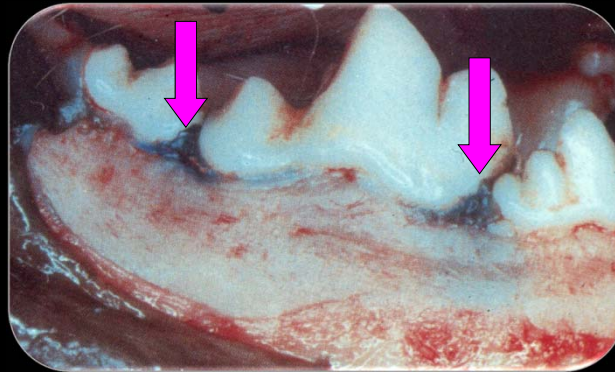
Other Supplementary Injections

- ◆ Periodontal Ligament Injection
 - A simple intra-osseous injection technique



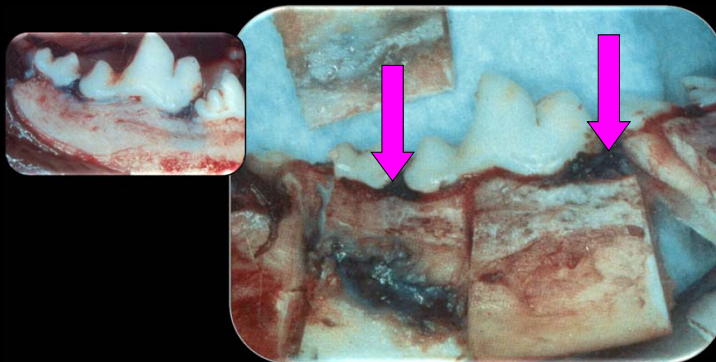
Other Supplementary Injections

- ◆ Periodontal Ligament Injection
 - A simple intra-osseous injection technique



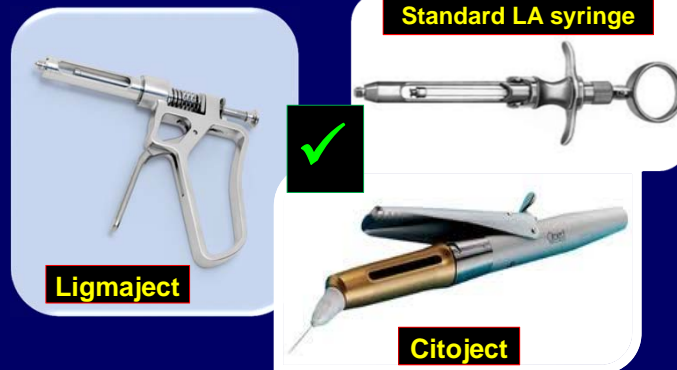
Other Supplementary Injections

- ◆ Periodontal Ligament Injection
 - A simple intra-osseous injection technique



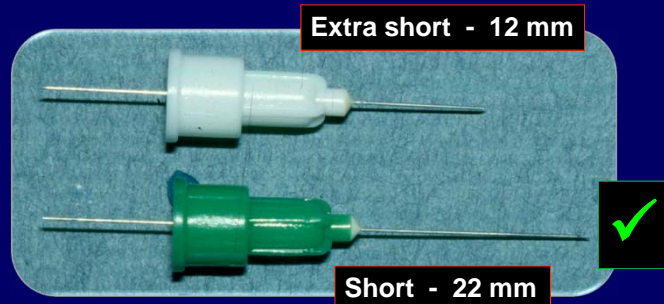
Other Supplementary Injections

- ◆ Periodontal Ligament Injection
 - A simple intra-osseous injection technique



Other Supplementary Injections

- ◆ Periodontal Ligament Injection
 - A simple intra-osseous injection technique



Intra-osseous Injections

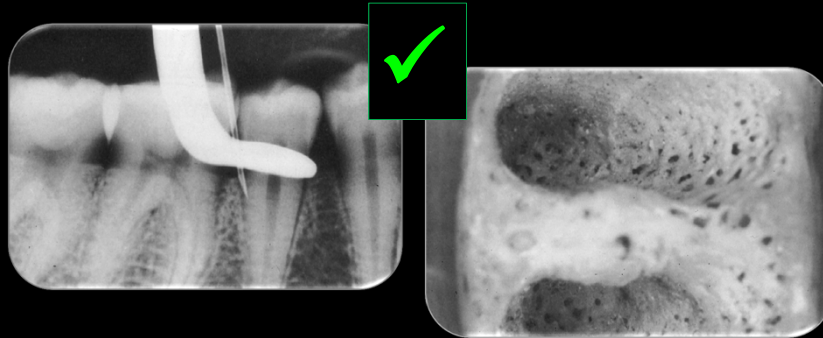


Intra-osseous Injections



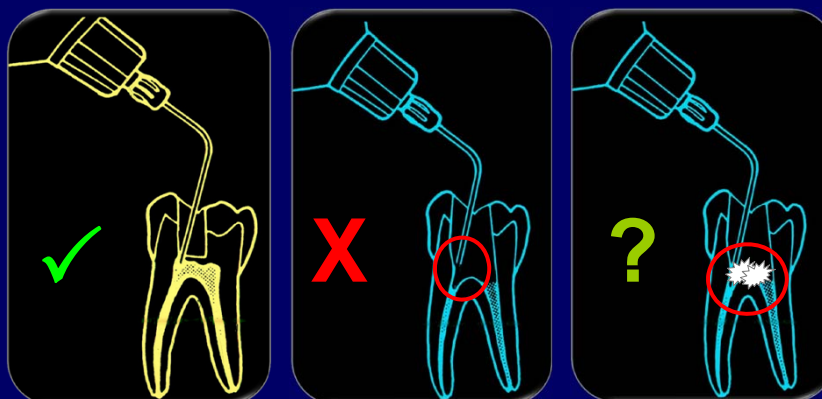
Other Supplementary Injections

- ◆ Periodontal Ligament Injection
 - A simple intra-osseous injection technique



Other Supplementary Injections

- ◆ Intra-Pulp Injection



Abbott & Parirokh
Aust Endo J 2018; 44: 99-113

Mandibular Teeth



Table 1 Steps to follow to improve pain management during root canal treatment of a MANDIBULAR molar tooth with acute irreversible pulpitis and primary acute apical periodontitis.

- Take thorough history of symptoms to allow accurate diagnosis.
- Consider premedication with non-steroidal anti-inflammatory drugs.
- Standard local anaesthetic injection for the tooth involved (e.g. inferior alveolar nerve blocks, Gow-Gates block).
- Allow sufficient time for initial signs of LA to be evident (i.e. lip numbness - needs at least 5 min).
- Administer supplementary LA injections (e.g. buccal infiltration).
- Allow more time for LA to work (at least 15 min from when the block was given).
- Test the tooth with a cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer a second block injection (e.g. repeat the original injection or use an alternate block technique).
- Allow adequate time for the extra injections to work (at least 15 min).
- Re-test with cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer supplementary intra-PDL injections.
- After 1-2 min, re-test with cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, consider further intra-PDL injections.
- On commencing treatment, turn off handpiece water spray.
- If pain on reaching dentine, administer further supplementary intra-PDL injections.
- If pain on reaching pulp chamber, administer intra-pulp injection.
- If pain on instrumenting root canal, administer intra-pulp injection into the root canal or consider using topical local anaesthetic gel in the canal.
- If still pain, perform a pulpotomy only (or minimal root canal treatment) and place a corticosteroid/antibiotic medicament in the root canal.
- Arrange post-operative pain medication.

Maxillary Teeth

Table 2 Steps to follow to improve pain management during root canal treatment of a MAXILLARY molar tooth with acute irreversible pulpitis and primary acute apical periodontitis.

- Take thorough history of symptoms to allow accurate diagnosis.
- Consider premedication with non-steroidal anti-inflammatory drugs.
- Standard local anaesthetic injection for the tooth involved (e.g. buccal infiltrations over mesiobuccal, distobuccal roots).
- Palatal infiltration.
- Allow sufficient time for LA to work (at least 15 min).
- Test the tooth with a cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer supplementary injections (e.g. ASAN, anterior middle superior alveolar nerve block).
- Allow adequate time for supplementary injections to work (at least 15 min).
- Re-test with cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer supplementary intra-PDL injections.
- After 1-2 min, re-test with cold pulp test
 - If adequate LA, consider further intra-PDL injections.
- On commencing treatment, turn off handpiece water spray.
- If pain on reaching dentine, administer further supplementary intra-PDL injections.
- If pain on reaching pulp chamber, administer intra-pulp injection.
- If pain on instrumenting root canal, administer intra-pulp injection into the root canal or consider using topical local anaesthetic gel in the canal.
- If still pain, perform a pulpotomy only (or minimal root canal treatment) and place a corticosteroid/antibiotic medicament in the root canal.
- Arrange post-operative pain medication.

Strategies to Manage Acute Irreversible Pulpitis in a Lower Molar

1. Pre-empt the difficult situation - i.e. Diagnosis !!
2. Consider pre-medication with ibuprofen
3. Test tooth: triplex air + percussion during examⁿ
4. Give a Gow-Gates Mandibular Nerve Block
 - ➔ First injection - then discuss findings, treatment, etc.
5. Re-test with triplex air + percussion
 - ➔ If no pain: place rubber dam and re-test !!
 - ➔ If still pain: Give IAN Block + Buccal Infiltration
6. Allow more time for LA to work
 - ➔ 10 - 15 minutes (minimum)

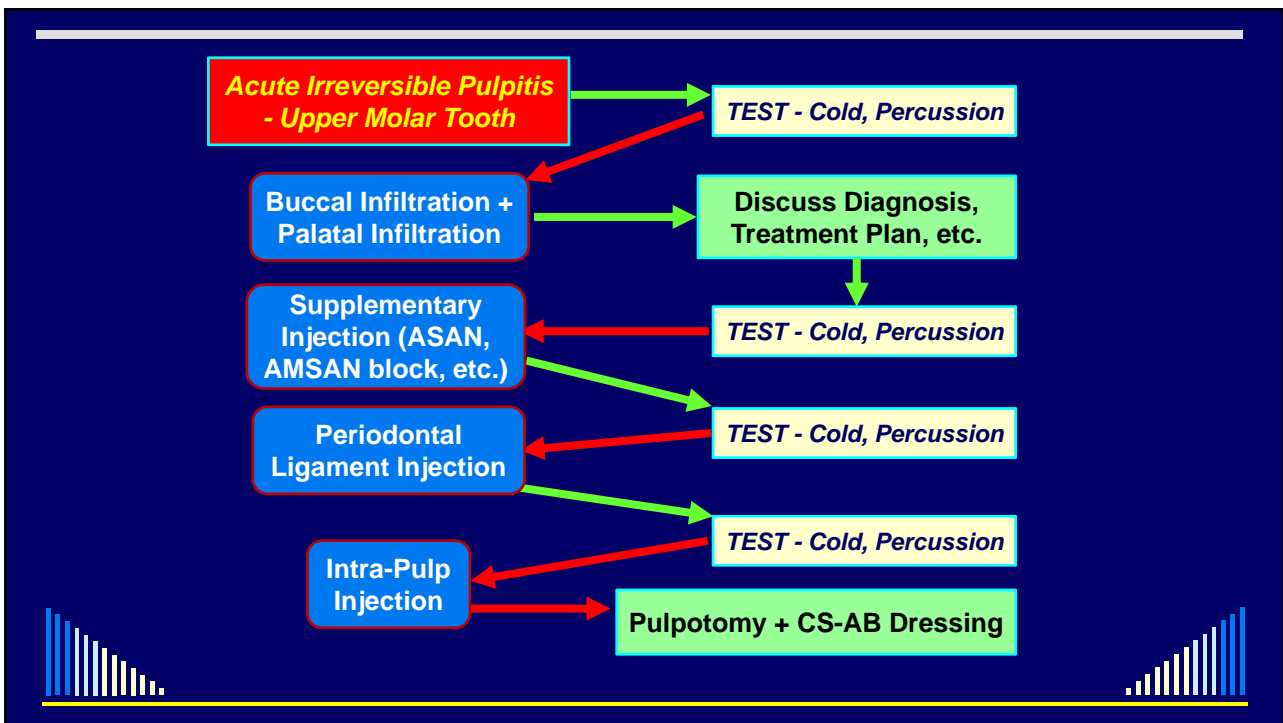
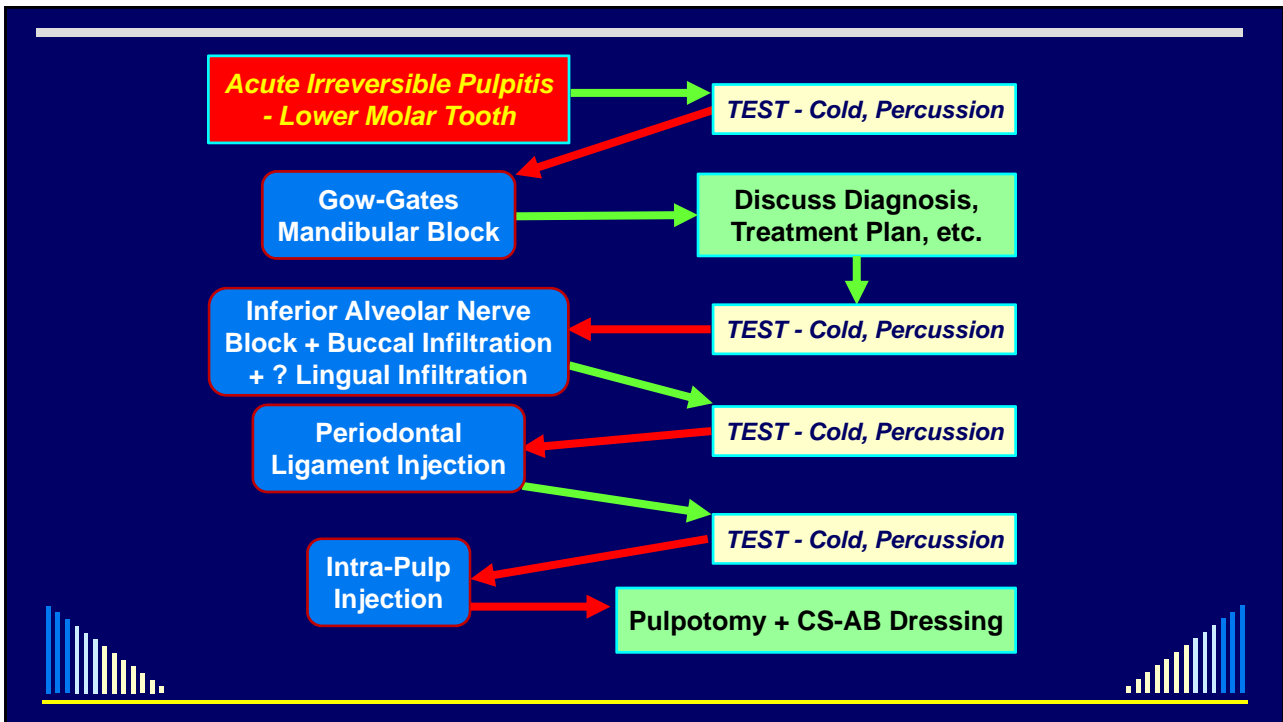
Strategies to Manage Acute Irreversible Pulpitis in a Lower Molar

7. **Re-test again with triplex air + percussion**
 - **If no pain: place rubber dam and re-test !!**
 - **If still no pain: proceed with treatment**
 - **Turn the H/S handpiece water off !!**
 - **If still pain: give Lingual infiltration**
8. **Place rubber dam - use the cuff technique**
9. **Re-test again with triplex air + percussion**
 - **If no pain: proceed with treatment**
 - **If still pain: give PDL injection and test again**
 - **Can then normally cut enamel or restoration**

Strategies to Manage Acute Irreversible Pulpitis in a Lower Molar

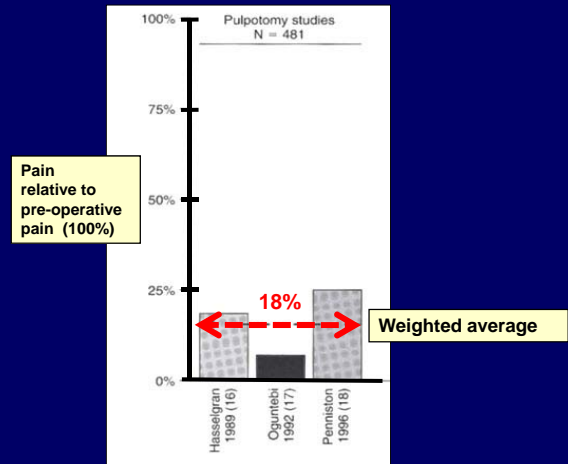
10. **If pain felt on reaching the dentine**
 - **PDL injection**
11. **If pain felt on reaching the pulp**
 - **Intra-pulp injection**
12. **If still pain**
 - **Pulpotomy only - CS-AB dressing**
 - + **Interim restoration**
 - **Re-appoint: 3 - 4 weeks later (minimum)**





Pain Relief after Pulpotomy

Hargreaves & Baumgartner - 2006



Pain Relief after Dental Treatment

Pain Level:	MILD	MODERATE	SEVERE
NSAID's can be taken	400 mg ibuprofen every 4 hours	400 - 600* mg ibuprofen 4 hourly PLUS 1000 mg paracetamol	400 - 600* mg ibuprofen PLUS 1000 mg paracetamol with 60 mg codeine **
NSAID's contra-indicated	1000 mg paracetamol every 4 hours	1000 mg paracetamol with 60 mg codeine	1000 - 1500* mg paracetamol with 60 - 90* mg codeine



NOTES:

ALL cases: 1 - 3 days usually sufficient. If still pain, see your dentist

*** Only take higher dose on 1 or 2 occasions**

**** Alternate ibuprofen & paracetamol/codeine at 2-hourly intervals**

Pain Relief after Dental Treatment

◆ Prescribe REST

● The Tooth + Restoration

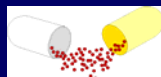
→ Adjust the occlusion

- Remove from contact in CO plus during all lateral and protrusive movements

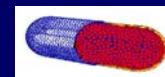
● General Rest

→ Sleep

→ No work, etc.



And ...



× **Do NOT prescribe antibiotics !!!**

- ◆ AB's are unnecessary and contra-indicated
- ◆ AB's are not pain relieving medications
- ◆ AB's do not help treat inflammation
- ◆ Pulpitis is an INFLAMMATORY condition
- ◆ Pulpitis is not a bacterial infection
 - *Even though it is caused by the presence of bacteria in the tooth*
 - *And a systemically-administered AB will not reach the bacteria in in the caries, crack, restoration/tooth interface, etc.*

The following is a light hearted look at biohazards from a patient's perspective. Fiona is a theatre nurse, specialising in oral-maxillofacial surgery and likes to write in her spare time.

♦ Root Canal Memoirs ♦
by Fiona Fyatt

My first day of leave and I planned to do nothing, besides sit on the couch and read my book. The first lunge of biohazards was merely an emotion as I had to get up to take an antiseptic. Settling back down, I waited for it to take effect. No such luck. It was back to the medicine cabinet. I was not amused as this was monochromatic on my busy schedule. It was too late to call the dentist, but I was fairly confident that, with enough drugs, it would go away. Disinfection set in. Not keeping track of time and dosage, I read out on Coccinea. My kidneys were begging for mercy and my hair was having far less toxic pastures. By this time, extremely grumpy, I curled up on the couch with my "Bianchi" wanted to combine temperature, pressed to my aching jaw, in the vain hope of relief. It was strange I was on the phone to the dentist. Fortunately, I have them on speed dial. With my blood glucose levels at 100% level, I was experiencing mild double vision so couldn't have read their number if I tried. Calm enough, I explained my desperate predicament to the receptionist. Half "yes one"? Did she understand the gravity of this situation? Apparently she did. "Dad" was not far off. I took it. Having crunched, swallowed and called my way through everything the medicine cabinet held, I went in search of more pain relief. I trapped the pharmacist to the ground when he started on the "safe dosage" lecture, and when I had him in a headlock, swallowed a handful. With the amount of what I was getting, I was beginning to believe I'd been given placebo.


One o'clock rolled around patiently slowly. I arrived early to find my caring dentist AT LUNCH. How dare he! The penny, young receptionist asked if she could get me anything. I suggested a dentist. She giggled and asked me he would be long. Eventually, with me seated in the chair and my my sunglasses on, he walked in. I went through my long-winded explanation. He called for Dry ice. Dry ice? Dry ice applied to a "ner" both eyes pain - a "dead" tooth, no pain. "Not and error through pain? Just needed to indicate which hand. My right hand being the tray of equipment, indicated quite adequately. The Dent Ages approach to modern dentistry eventually proved both of us right. Then came the injection.

I fell in Love with this man!

With me in a state of euphoria, he started drilling. My trusty right hand indicated that there was still a smidge of life present. Out came the needle. And an injection into the tooth pulp.

I promptly fell Out of love with this man!

Patients don't wear sunglasses for protection, they're so dentists can't see the dirty looks we give them. In my case, I needed a headlock. Drilling progressed and continued as usual until, after with antibiotic drug. As my dentist handed me a tray for antibiotics, he cheerfully asked: "No more pain relief, please?" "I'm completely unsure?" I had been awake for 24 hours - I was in pain - and now NO anesthetics? While filling the script, he released the "no-achar" policy and renewed the antibiotic pills for his troubles. Bizarrely though, I was pain free. That was grand. I went to bed that night, my pain had started next to me. I woke after a good night's sleep and spent the day on the couch reading my book.



Root Canal Memoirs

- ♦ By a patient - a theatre OMFS nurse
- ♦ Classic description
 - 37 - Acute irreversible pulpitis
- ♦ Endodontic treatment started
 - But with local anaesthesia problems

+ a prescription for Antibiotics!!!

Summary

- ♦ Effects of:
 - Pre-operative medication → **SOME CASES**
 - Topical LA → **NIL**
 - Different LA solutions → **NIL**
 - Different volumes of LA → **YES**
 - Different injection sites → **YES**
 - Root lengths → **YES**

Summary

- ◆ Achieving adequate pain control is difficult, and unpredictable, when treating acute irreversible pulpitis
- ◆ Dentists need various strategies to ensure good pain control for their patients
 - Before treatment
 - During treatment
 - After treatment

Abbott & Parirokh
Aust Endo J 2018; 44: 99-113

Mandibular Teeth

- Table 1** Steps to follow to improve pain management during root canal treatment of a MANDIBULAR molar tooth with acute irreversible pulpitis and primary acute apical periodontitis.
- Take thorough history of symptoms to allow accurate diagnosis
 - Consider premedication with non-steroidal anti-inflammatory drugs
 - Standard local anaesthetic injection for the tooth involved (e.g. inferior alveolar nerve blocks, Gow-Gates block)
 - Allow sufficient time for initial signs of LA to be evident (i.e. lip numbness – needs at least 5 min)
 - Administer supplementary LA injections (e.g. buccal infiltration)
 - Allow more time for LA to work (at least 15 min from when the block was given)
 - Test the tooth with a cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer a second block injection (e.g. repeat the original injection or use an alternate block technique)
 - Allow adequate time for the extra injections to work (at least 15 min)
 - Re-test with cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer supplementary intra-PDL injections
 - After 1–2 min, re-test with cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, consider further intra-PDL injections
 - On commencing treatment, turn off handpiece water spray
 - If pain on reaching dentine, administer further supplementary intra-PDL injections
 - If pain on reaching pulp chamber, administer intra-pulp injection
 - If pain on instrumenting root canal, administer intra-pulp injection into the root canal or consider using topical local anaesthesia gel in the canal
 - If still pain, perform a pulpotomy only (or minimal root canal treatment) and place a corticosteroid/antibiotic medicament in the root canal.
 - Arrange post-operative pain medication.

Maxillary Teeth

- Table 2** Steps to follow to improve pain management during root canal treatment of a MAXILLARY molar tooth with acute irreversible pulpitis and primary acute apical periodontitis.
- Take thorough history of symptoms to allow accurate diagnosis
 - Consider premedication with non-steroidal anti-inflammatory drugs
 - Standard local anaesthetic injection for the tooth involved (e.g. buccal infiltration over mesio-buccal, disto-buccal roots)
 - Palatal infiltration
 - Allow sufficient time for LA to work (at least 15 min)
 - Test the tooth with a cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer supplementary injections (e.g. ASAN, anterior middle superior alveolar nerve block)
 - Allow adequate time for supplementary injections to work (at least 15 min)
 - Re-test with cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, administer supplementary intra-PDL injections
 - After 1–2 min, re-test with cold pulp test
 - If adequate LA, proceed with treatment but be prepared for pain!
 - If inadequate LA, consider further intra-PDL injections
 - On commencing treatment, turn off handpiece water spray
 - If pain on reaching dentine, administer further supplementary intra-PDL injections
 - If pain on reaching pulp chamber, administer intra-pulp injection
 - If pain on instrumenting root canal, administer intra-pulp injection into the root canal or consider using topical local anaesthesia gel in the canal
 - If still pain, perform a pulpotomy only (or minimal root canal treatment) and place a corticosteroid/antibiotic medicament in the root canal.
 - Arrange post-operative pain medication.

