Strategies for More Effective Pain Control during Root Canal Treatment

Prof. Paul V. Abbott AO
BDSc, MDS, FRACDS(Endo), FPFA, FADI, FICD, FACD, FIADT
Specialist Endodontist
Winthrop Professor of Clinical Dentistry
School of Dentistry
The University of Western Australia
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
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.

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

### Concerns Pre-Treatment

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

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
Pain control from local anaesthetics
- two mechanisms

1. **DIRECT**
   - Duration of effect: Minutes ➔ Hours

2. **INDIRECT**
   - Duration of effect: Hours ➔ Days

Inadequate local anaesthesia
1. Pain during treatment
2. More post-operative pain
   - Since prolonged exposure to sensory input increases allodynia and hyperalgesia
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
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26 Mandibular Teeth

IAN Block Injection
Lignocaine + 1:100,000 Adr

No Response to PT's
38%

No Pain 7%

Pain in Dentine 12%

Pain in Pulp 19%

Responded to PT's
62%

Need supplementary LA techniques

Nusstein et al JoE 1998

25 Maxillary Teeth

Bu Infiltration Injection
Lignocaine + 1:100,000 Adr

No Response to PT's
92%

No Pain 68%

Pain in Dentine 4%

Pain in Pulp 20%

Responded to PT's
8%

Need supplementary LA techniques

Nusstein et al JoE 1998
Strategies for More Effective Pain Control during Root Canal Treatment

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ASE(WA) – Sept. 2019 Page 11

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!!
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
Strategies for More Effective Pain Control during Root Canal Treatment
Prof. Paul V. Abbott AO

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
Masoud Parirokh, DDS, MS,* Reza Askari, DDS, DMDS,† Ali Reza Sebabadi, DDS, MSc,‡ Nasir Nazabi, MD, MS,§ Abbas Parvordosti, DDS, MS,∥ Sara Askari-Ghadi, DDS, MS,,* and Paul V. Abbott, DDS, PhD*

Abstract
Introduction: Achieving pulp anesthesia with irreversible pulps is difficult. This study evaluated whether nonsteroidal anti-inflammatory drugs exist local anesthesia. Methods: A randomized double-blinded clinical trial. 150 patients (75 per group) with irreversible pulps were given placebo, 25 mg Ibuprofen, or 15 mg Indomethacin 1 hour before local anesthesia. Epinephrine 8% epinephrine was added to the local anesthetic drug. The success rates of local anesthesia at a single test, during access cavity preparation and during root canal instrumentation. In all pain at any stage was considered a success. Data were analyzed by the chi-square and analysis of covariance tests. Results: Overall success rates for placebo, ibuprofen, and indomethacin were 25%, 70%, and 24%, respectively (p < 0.001). Successes and failures were significantly better for placebo + placebo than placebo (p < 0.001). There were no differences between chlorhexidine and indomethacin (p = 0.76). Conclusions: Local anesthesia with ibuprofen and indomethacin significantly increased the success rates of local anesthesia versus local anesthesia with placebo + placebo. (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:**
- 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

**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
Results:
- Overall success
  - Placebo - 32%
  - Ibuprofen - 78%
  - Indomethacin - 62%
- Ibuprofen + Indomethacin
  - Sig. diff. to Placebo
  - But not sig. diff. to each other

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)
    - Ianiro 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
      - Their main criterion for acute irreversible pulpitis was “spontaneous pain”
        - More advanced pulp inflammation
          - NSAID and LA less effective

Acute Irreversible Pulpitis

- Pain with cold stimuli ± Pain with heat
- ± Pain is spontaneous
- ± Pain lying down
- ± Pain wakes patient
- ± Primary acute apical periodontitis
- Short, very sharp pain then lingering ache /throb
- Intense throbbing / aching pain; continuous or may come and go
- Pain to bite & tender to percussion
Strategies for More Effective Pain
Control during Root Canal Treatment

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Acute Irreversible Pulpitis

Mesial Root

“Pulp breakdown”

Intense inflammation

Distal Root

Less inflammation

No inflammation + normal odontoblasts

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

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

- 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 ???

Outline

- Effects of:
  - Pre-operative medication
  - Topical LA
  - Different LA solutions
  - Different volumes of LA
  - Different injection sites
  - Root lengths
Labial Infiltration: 1.8 ml Prilocaine
- With 20% Benzocaine Topical LA
  → Applied for 1 minute
- Without Topical LA
  → Placebo used for 1 minute

Anaesthesia assessed by EPT
- 5, 15, 30 and 60 minutes later
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*

**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

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

Results

- Bupivacaine - 20% success
- Lignocaine - 24.1% success
  ➔ No Sig. Diff.

Conclusion

- No difference between the two solutions
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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

Iran Endod J 2016; 11: 79-84
Results

- Lignocaine - 56.5% success
- Articaine - 66.7% success

No Sig. Diff.

Conclusion

No difference between the two solutions
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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

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
Articaine for Irreversible Pulpitis

- **TWO studies - sig. better**
  - One max. infiln; one IAN block + Bu infil
- **SEVEN studies - no sig. difference**
  - Max. infil, IAN block + Bu infil, G-G block

Articaine for other injections (i.e. not irrev. pulpitis)

- **SEVEN studies - sig. better**
- **TEN studies - no sig. diff.**

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
Articaine and Neurotoxicity - A Review

Hopman AJG, Baart JA, Brand HS.

*Brit Dent J* - 2017

- 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

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Country</th>
<th>Articaine-rel’d Paraesthesia</th>
<th>Market Share for Articaine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Canada</td>
<td>71%</td>
<td>38%</td>
</tr>
<tr>
<td>2003</td>
<td>Netherlands</td>
<td>89%</td>
<td>70%</td>
</tr>
<tr>
<td>2002 - 2004</td>
<td>Denmark</td>
<td>87%</td>
<td>42%</td>
</tr>
<tr>
<td>2001 - 2007</td>
<td>Denmark</td>
<td>78%</td>
<td>41%</td>
</tr>
<tr>
<td>1997 - 2008</td>
<td>UK</td>
<td>51%</td>
<td>14%</td>
</tr>
<tr>
<td>1998 - 2008</td>
<td>UK</td>
<td>77%</td>
<td>13%</td>
</tr>
<tr>
<td>2006 - 2008</td>
<td>Canada</td>
<td>70%</td>
<td>44%</td>
</tr>
<tr>
<td>2006 - 2011</td>
<td>USA</td>
<td>33%</td>
<td>38%</td>
</tr>
</tbody>
</table>

Hopman et al - Brit Dent J 2017

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

Kingon 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

<table>
<thead>
<tr>
<th></th>
<th>2%</th>
<th>3%</th>
<th>4%</th>
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</thead>
<tbody>
<tr>
<td>Haas and Lennon⁴</td>
<td>1</td>
<td>6.76</td>
<td>5</td>
</tr>
<tr>
<td>Hillerup and Jensen⁴</td>
<td>1</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Pogrel⁷</td>
<td>1</td>
<td>7.6</td>
<td>2</td>
</tr>
<tr>
<td>Dower⁴</td>
<td>1</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

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
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

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
Strategies for More Effective Pain Control during Root Canal Treatment

Prof. Paul V. Abbott AO

Outline

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

2010; 109: 468 - 473

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

Masoud Patankar, DDS, MS,* Seyed Amir Siostr, DDS, BS† Rohollah Shareh, DDS,* Ali Reza Rehak, DDS, BS† Halyna Gnediak, DMD, MS† Nazar Nakhday, BS,* and Paul V. Abbott, DDS, MS,* Kedwa, India, and Perth, Australia.

KUWAIT 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 pulps.

Methodology. Eighty-four patients were randomly assigned to 3 groups of 24 patients each. Lidocaine 2% with 1:100,000 epinephrine was used for all injections. Group A patients received an IAN block with 1.5 ml of anesthetic. Group B patients received an IAN block using 3.0 ml. Group C patients received an IAN block with 1.5 ml as a buccal infiltration. A visual analog 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 Shapiro-Wilk’s tests.

Results. The success rates for groups A to C were 14.5%, 39.3%, and 65.4%, respectively. Group B had significantly better anesthesia compared with group C (P < 0.05).

Conclusion. Combining an IAN block and a buccal infiltration injection provided more effective anesthesia in mandibular molars with irreversible pulps. However, some cases may still require further anesthesia in the event of pain during endodontic treatment. (ORAL SURG ORAL MED ORAL PATHOL ORAL Radiol ENDOD 2010;109:468-473.)
Strategies for More Effective Pain Control during Root Canal Treatment

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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

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

Results - overall success

<table>
<thead>
<tr>
<th>Group</th>
<th>Technique</th>
<th>No Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.8 ml IAN Block</td>
<td>14.8%</td>
</tr>
<tr>
<td>II</td>
<td>3.6 ml IAN Block</td>
<td>39.3%</td>
</tr>
<tr>
<td>III</td>
<td>1.8 ml IAN Block + 1.8 ml Bu Infiltration</td>
<td>65.4%</td>
</tr>
</tbody>
</table>

Sig. Diff

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


Int Endod J 2014; 47: 926 - 933
Strategies for More Effective Pain Control during Root Canal Treatment

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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

Results:

<table>
<thead>
<tr>
<th>Group</th>
<th>Technique</th>
<th>Successful Anaesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.8 ml IAN Block</td>
<td>22%</td>
</tr>
<tr>
<td>II</td>
<td>1.8 ml IAN Block + 1.8 ml Bu Infiltration + 0.5 ml PDL injection</td>
<td>58%</td>
</tr>
</tbody>
</table>

Int Endo J 2014; 47: 926 - 933

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.

Outline

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

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

Infraorbital Nerve
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

Distance to Pal. root apex
?? Concentration / Volume

X

V
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

Extra short - 12 mm
Short - 22 mm
Intra-osseous Injections

- **Stabident**
- **X-Tip**
Other Supplementary Injections

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

Other Supplementary Injections

- Intra-Pulp Injection
Strategies for More Effective Pain Control during Root Canal Treatment

1. Pre-empt the difficult situation - i.e. Diagnosis !!
2. Consider pre-medication with ibuprofen
3. Test tooth: triplex air + percussion during exam
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)
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

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)
Acute Irreversible Pulpitis
- Lower Molar Tooth

Gow-Gates Mandibular Block

Inferior Alveolar Nerve Block + Buccal Infiltration + ? Lingual Infiltration

Periodontal Ligament Injection

Intra-Pulp Injection

Pulpotomy + CS-AB Dressing

Discuss Diagnosis, Treatment Plan, etc.

TEST - Cold, Percussion

Acute Irreversible Pulpitis
- Upper Molar Tooth

Buccal Infiltration + Palatal Infiltration

Supplementary Injection (ASAN, AMSAN block, etc.)

Periodontal Ligament Injection

Intra-Pulp Injection

Pulpotomy + CS-AB Dressing

Discuss Diagnosis, Treatment Plan, etc.

TEST - Cold, Percussion

TEST - Cold, Percussion

TEST - Cold, Percussion

TEST - Cold, Percussion

TEST - Cold, Percussion

TEST - Cold, Percussion
Pain Relief after Pulpotomy
Hargreaves & Baumgartner - 2006

- Pain relative to pre-operative pain (100%)
- Weighted average 18%

Pain Relief after Dental Treatment

<table>
<thead>
<tr>
<th>Pain Level</th>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>400 mg ibuprofen every 4 hours</td>
<td>400 - 600 mg ibuprofen PLUS 1000 mg paracetamol</td>
</tr>
<tr>
<td>NSAID's can be taken</td>
<td>1000 mg paracetamol every 4 hours</td>
<td>1000 mg paracetamol with 60 mg codeine</td>
<td>1000 – 1500 mg paracetamol with 60 – 90 mg codeine</td>
</tr>
<tr>
<td>NSAID's contra-indicated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 ...

\[ \times \text{ Do NOT prescribe antibiotics !!!} \]

- 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 the caries, crack, restoration/tooth interface, etc.
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
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