Endodontic exacerbations - biological and clinical factors

Prof. Paul Rosenberg–New York University, USA

Endodontic Exacerbations
Biological and Clinical Factors

Professor Paul A. Rosenberg, DDS
Diplomate American Board of Endodontics
Department of Endodontics
New York University
College of Dentistry
par1@nyu.edu

Overview

- Diagnosis
- Causes of pain
- Preventing pain
- Pain treatment

Treating patients with similar teeth, comparable medical / dental histories, using the same approach, may not result in a common outcome

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Question

Are some of our patients predisposed to pain?

Overall approach to pain

Preventative

vs.

Reactive

Pulp and periapical response to trauma
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Pulp and periapical response to trauma

Host response to tissue damage

What's missing from the flowchart?

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There are predisposing factors that affect a patient's variable responses to endodontic procedures

- Genes
- Psychological state
- Ethnicity
- Gender
- Age
- Environmental factors

Comorbidities

Could we identify patients likely to experience an exacerbation or treatment failure?

A complex mix

Genetic influence on variability in human acute experimental pain sensitivity associated with gender, ethnicity and psychological temperament


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Pain complexity

...sensory input is filtered through an individual's genetic composition, prior learning, current physiological status, expectations, mood states, and sociocultural environment.


Pain complexity

These influences result in variability in pain sensitivity, perception and tolerance. Relative contribution and interaction of these factors remain unknown.

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Validity of specific predictors

International Endodontic Journal

Predictive models of pain following root canal treatment: a prospective clinical study
A. Aron*, J. C. de la Mousse**, J. J. Melgosa** & M. J. Aracil*

- A total of 500 single-visit root canal treatments were completed by an endodontist
- 500 questionnaires concerning pain were given to patients and 274 were returned

Results

Predictive models showed that the incidence of post-endodontic pain was lower when:

- The treated tooth was not a molar (P=0.003)
- Had no history of previous pain (P=0.006)
- Demonstrated periapical radiolucencies (P=0.003)
- No occlusal contact (P=0.0001)

Results

Predictive models showed that the probability of experiencing moderate or severe pain was higher with:

- Increasing age (P=0.09)
- Mandibular teeth (P=0.045)

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Results

The probability of pain lasting more than 2 days was:

- Increasing age (P=0.1)
- Decreased in males (P=0.0007)
- When a radiolucent lesion was present on radiographs (p=0.1)

Another study

Predicting Severe Pain after Root Canal Therapy in the National Dental PBRN

Factors predicting severe post operative pain:

1. Preoperative pain intensity
2. Diagnosis of symptomatic apical periodontitis
3. Pain made worse by stress
Factors not predicting severe post operative pain:

1. Dentists’ level of training
2. Patients age\sex
3. Diagnosis of necrotic pulp, swelling, tooth type, number of appointments

Study omissions

Psychosocial factors not considered

Pain intensity ratings were based on recall (1 week) rather than after each post operative day

How do we determine the cause of a flare-up?
How do we determine the cause of a flare-up?

- Periodontal problem
- Perforation from the root canal
- Fracture

23b

How do we determine the cause of a flare-up?

- Apex
- Dentin
- Root canal
- Gingiva
- Crown

23c

How do we determine the cause of a flare-up?

- Apex
- Dentin
- Root canal
- Gingiva
- Crown

23d

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Vital exacerbations

Essentially a problem of managing inflamed tissue

Vital exacerbations causes

- Usually iatrogenic
- Obturation (within the canal)
- Measurement (accurate & maintained)
- Occlusion
- Instrumentation (within the canal)

Exacerbations: treatment options

- Pulpotomy
- Incision & drainage
- Pulpectomy / Reinstrumentation
- Trephination
- Occlusal adjustment
- Medication
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“When should I take an analgesic?”

- At the conclusion, or just prior to the visit
- Take the analgesic by the clock, not as needed

Non vital exacerbations

An imbalance between host and parasite

Non vital exacerbations: primary causes

- Bacteria and by-products pushed periapically
- Biological shift (anaerobic / aerobic)
- Obturation (within the canal)
- Occlusion

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“...all I did was open the tooth”

Inflammatory responses are complex and consist of diverse elements including immediate-type responses and non-specific immune responses

Periapical pathosis

Granuloma

An area of dynamic activity

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Periapical abscess

Represents localization of an infectious process

Cellulitis

Inability to localize an infectious process

Treatment of non vital exacerbations

- Decompression
- Establishment of drainage

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**Drainage**

*Represents a release of infectious fluid and pressure*

**Clinical clue**

*Do not depend on an antibiotic alone to resolve an exacerbation*

- Emergency treatment must include instrumentation, irrigation and closure*
- Some cases require I&D, and some also require antibiotics

*Some clinicians find it beneficial to leave the tooth open between visits*

**Clinical clue**

*Advantageous to see the patient again within 24h-48h*

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A Basic Pain Preventive Strategy

Evidence based

The Effect of Occlusal Reduction on Pain after Endodontic Instrumentation

Paul A. Rosenberg, DDS, Peter J. Balicki, DDS, Leon Schortez, DDS, and Anthony Leung, DDS

Occlusion had nothing to do with post operative pain

Sample size X 3

Under what conditions was occlusion a factor?
The Effect of Occlusal Reduction on Pain after Endodontic Instrumentation

Sample size X 3

Present to clinicians menu of findings

Findings present
- Reduce occlusion

No findings
- Leave occlusion as is

Preoperative conditions

- Pulp vitality
- Percussion sensitivity
- Periradicular radiolucency
- Preoperative pain
- Swelling
- Stoma
- History of bruxism

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Clinical procedure

What we did...

- Occlusal reduction
- Simulated reduction
- Control

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Clinical procedure

<table>
<thead>
<tr>
<th>No pain</th>
<th>Moderate pain</th>
<th>Severe pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>The tooth involved felt normal or slightly sensitive. &quot;Pain killers&quot; were not necessary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

43a

Clinical procedure

<table>
<thead>
<tr>
<th>No pain</th>
<th>Moderate pain</th>
<th>Severe pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>The tooth involved caused inconvenience and/or pain, but neither work nor sleep were disturbed. With the use of &quot;pain killers&quot;, the pain could be held under control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

43b

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Clinical procedure

- No pain
- Moderate pain
- Severe pain

The pain disturbed normal work or sleep. “Pain killers” had little or no effect.

Statistical evaluation

Vital pulp (n=66) p= <0.01

- Total Reduction
- Simulated Reduction
- Control

Patient response, 48 hours

No Pain: 31.3%
Moderate Pain: 20%
Severe Pain: 70%

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Vital pulp (n=66) p < 0.01

Non vital pulp (n=51) p=0.58

Hypothesis:
In most non-vital cases the periodontal ligament typically has been destroyed

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Significant conditions

What would happen if we took the worst and most likely candidates for post operative pain?

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Pre operative pain

Pulp vitality

Percussion sensitivity

Absence of periradicular radiolucency

49b

How many exhibited all four significant conditions?

27

How did those teeth respond to the different occlusal treatments?

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How many exhibited all four significant conditions?

- No Pain
- Moderate Pain
- Severe Pain

Patient response, 48 hours

Total Reduction
Simulated Reduction
Control

New research

Possible biological basis of occlusion/pain

Effect of Experimentally Induced Occlusal Trauma on Substance P Expression in Human Dental Pulp and Periodontal Ligament

51 52 53

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Method

Pulp and periodontal ligament samples taken from twenty-eight healthy premolars to be extracted for orthodontic reasons

54a

Method

• One half of the teeth had a resin block over their occlusal surfaces and patients chewed gum for 30 minutes
• The remaining patients had no occlusal interference and also chewed gum for 30 minutes

54b

Findings

In teeth with induced occlusal trauma...
45% greater expression of SP in dental pulp and 120% more SP in periodontal ligament of those teeth when compared to control group

55
Conclusions

Occlusal trauma experimentally induced increased SP expression in the pulp and PDL, constituting a probable mechanism that could lead to an inflammatory mechanism in the pulp and PDL.

Conclusions

Does this scenario also help explain why taking a tooth out of occlusion and putting the periodontal ligament at rest results in less post operative pain?

Thank you