Title: Flare-ups after endodontic treatment: a meta-analysis of literature

Author: Tsesis I. et al

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Reviewed by: Ali Sarraf, DMD

Definition: Flare-up is defined as acute exacerbation of asymptomatic pulp or periradicular pathosis after the initiation or continuation of root canal treatment.

Purpose: To determine the frequency of flare-ups and to evaluate factors that affect them using meta-analysis of results of previous studies

Materials and Methods: The following search engines used: Medline & Medical Subject Headings (MeSH)
Key words used: “flare-up;” “interappointment pain;” “post-obturation pain;” “post-treatment pain;” and “interappointment emergency”. Sixty-five studies were found and were subjected to suitability test in accordance with the inclusion and exclusion criteria.

TABLE 1. Inclusion and Exclusion Criteria Used in the Meta-analysis

Inclusion criteria
1. Randomized control trials and prospective case series
2. Flare-up defined as strong pain with or without swelling that occurs after initiation or continuation of root canal treatment
3. Patients had not received any medicinal therapy either before or after endodontic treatment
4. Presented detailed diagnosis of pulp and periapical region
5. Pain intensity and swelling occurrence estimated within 24 or 48 hours after endodontic treatment (pain intensity in both time periods, for purpose of analysis; the strongest one between the two was selected)
6. Severe pain estimated by using VAS by each patient separately

Exclusion criteria
1. Retrospective studies, case reports, review articles, expert opinions
2. Different definition of flare-up
3. Timing of pain level evaluation was not mentioned or was not within 24–48 hours after treatment
4. No pain level estimation by using VAS or no differentiation between various degrees of pain
5. Patients had received medicinal therapy either before or after treatment

Only 6 studies met all of the inclusion and exclusion criteria. Meta-analysis was made from these studies

Discussion: Flare-up frequency was 8.4% on the basis of 982 pts. from 6 studies that defined flare-up as strong pain with or without swelling occurred after initiation or continuation of root canal treatment and estimated within 48 hours after the procedure.
This result is very similar to Multiple appt: 8% by Eleazer etal; 8.1% by Oginni etal
Single appt: 3% by Eleazer etal; 18.3% by Oginni etal
Title: Prion disease: the implications for dentistry

Author: Azarpazhooh et al

Journal: JOE, vol 34, no 10, 1158, Oct 2008

Reviewed by: Kathy Le, DDS

Introduction: Prion proteins (PrP) are infectious, transmissible proteinaceous particles that lack nucleic acid. When accumulated in the Central Nervous System (CNS), prion proteins can cause a microscopic vacuolization of brain tissue called spongiform degeneration, a group of fatal neurodegenerative diseases called transmissible spongiform encephalopathies (TSEs)

Purpose: To provide the dental community with a brief overview of the characteristics, risk of transmission and the infection control implications of prions in dentistry.

Methods: Literature search (up to July 2007) for relevant articles was performed using MEDLINE, EMBASE, and CINAHL

Results: Human TSEs include:

- **Creutzfeldt-Jakob Disease (CJD):** the most commonly occurring human TSE. 80-85% cases are of unknown origin. 10-15% are inherited and associated with mutations in the PrP gene. And about 1% of cases are iatrogenic, as a result of invasive medical procedures, including human dura mater and corneal grafts, contaminated neurosurgical devices, administration of human GH or human gonadotrophin hormone extracted from the organs of human cadavers. Patients with CJD experience rapid onset of dementia, walking difficulties, and visual deficits. There is no approved cure at the moment. The disease is rapid and fatal, usually 85% die within 1 yr of onset.

- **Variant CJD (vCJD):** have different clinical and pathologic characteristics from classic CJD. There is a causal relationship between "mad cow disease" (BSE) and vCJD. Consuming BSE-contaminated products may cause vCJD years or even decades later.

Oral manifestations of Prion Diseases: Oral symptoms occur rarely in patients with prion disease. These include dysphagia (difficulty swallowing), dysarthria (speech disorder), oral facial dysesthesia (abnormal sensation), paresthesia, or loss of taste and smell. Experimentally, prions have been easily transmitted to animal gingival tissues from endodontic files contaminated with suspensions of contaminated human brain tissue, which proves that gingival tissues in animals are susceptible and that endodontic files could be a vector.

Diagnosis: Based on the clinical and pathologic characteristics of CJD. Some diagnostic tests include: blood tests, EEG, cranial MRI, CSF, tonsillar biopsy and brain tissue biopsy

Prion and Dentistry: There is no risk of transmission of TSE to health care workers through normal social and clinical contact or noninvasive clinical procedures. Theoretically, it is possible that health care workers may acquire TSE from patients with accidental needle sticks. In case of a needle stick injury, the WHO common sense actions are recommended (table 3)

- To date, there are no reported definite or suspected cases of disease transmission arising from dental procedures, and there seems to be no correlation between dental tx and CJD.
- Because there is a theoretical but real risk of transmission of prion disease from dental instruments; appropriate family and medical hx (including the risk for prion diseases) should be obtained from all patients before all dental procedures.
- Since prion agents resist conventional sterilization methods especially when the infected tissue become dried onto glass or metal surfaces, it is recommended by the WHO and the CDC that nondisposable instruments should be mechanically cleaned before final sterilization.

Conclusion: TSE research regarding diagnosis, transmission, tx, and inactivation of prions and other transmissible amyloidoses are ongoing. Dental professionals should maintain optimal and up to date standards of knowledge, infection control, and decontamination
Title: Effect of sublingual triazolam on the success of inferior alveolar nerve block in patients with irreversible pulpitis

Authors: M. Lindemann et al


Reviewer: Ramya Ramamurthy, DDS

Background: Triazolam (Halcion) is a benzodiazepine and is chemically related to diazepam (Valium). Triazolam has a rapid onset of action and a short duration. Ehrich et al. (9) found that triazolam was a more effective anxiolytic agent than diazepam or a placebo for endodontic patients.

Purpose: To determine the effect of the administration of sublingual triazolam on the success of the inferior alveolar nerve (IAN) block in patients experiencing irreversible pulpitis.

Materials and Methods: Fifty-eight emergency patients diagnosed with irreversible pulpitis of a mandibular posterior tooth randomly received, in a double-blind manner, an identical sublingual tablet of either 0.25 mg of triazolam or a placebo 30 minutes before administration of a conventional IAN block.

- Each patient rated his or her initial pain on a Heft-Parker visual analogue scale (VAS). Patients also completed a Corah dental anxiety scale to rate their level of anxiety
- Access was begun 15 minutes after completion of the IAN block, and all patients had profound lip numbness. Patients were instructed to definitively rate any pain felt during the endodontic procedure. If the patient felt pain, the treatment was immediately stopped, and the patient rated their discomfort by using the Heft-Parker VAS
- Success was defined as no or mild pain (visual analog scale recordings) on access or initial instrumentation.

Results: The success rate for the IAN block was 43% with triazolam and 57% with the placebo, with no significant difference ($P = .43$) between the 2 groups.

Conclusions: For mandibular posterior teeth, triazolam in a sublingual dose of 0.25 mg did not result in an increase in success of the IAN block in patients with irreversible pulpitis. Therefore, when using conscious sedation, profound local anesthesia is still required to eliminate the sensation of pain during endodontic treatment for patients with irreversible pulpitis.
Title: Retrospective analysis of open apex teeth obturated with mineral trioxide aggregate

Author: Witherspoon, D., et al


Reviewer: Kristina Shagramanova, DDS

Background Information:

- **Apexification** - treatment of teeth with necrotic pulps with open apices. It is a “method of inducing a calcified barrier in a root with open apex or the continued apical development of an incompletely formed root in teeth with necrotic pulps” (Glossary of endodontic terms). The materials used are (1) Ab paste, (2) Ca(OH)2 mixed w/ various materials, (3) MTA

- **MTA**
  - Mineral Trioxide Aggregate, composed of dicalcium and tricalcium silicate, bismuth oxide, calcium sulfate
  - Hydration of the powder results in fine crystalline gel, which solidifies to a hard structure in less than 3 hours.
  - Compressive strength equal to IRM and Super-EBA. Commercially available as ProRoot MTA
  - Induces cementum-like hard tissue when used adjacent to periradicular tissues
  - Has a superior sealing property
  - Sets in the presence of moisture (blood does not affect its sealing ability)
  - Biocompatible
  - Reduces tx time if used in apexification procedure
  - Requires less visits to the dentist
  - Tooth is less likely to fracture

Purpose: To report on the clinical and radiographic outcome when MTA is used to obturate teeth with open apices

Materials and Methods:

- 116 patients from a single endodontic practice treated between 1999-2006
- One or two visit tx
- 1-visit procedure: (local, RDI, rotary Ni-Ti files, 6% NaOCl, 17% EDTA, 2% CHX)
- 2-visit procedure: (same as 1-visit + Ca(OH)2 for 3 wks, temp w/ cotton + IRM)
- Obturation: (series of pluggers, smallest one fitting 1 mm from WL, MTA placed to apical and middle parts w/ MAP System and compacted w/ ultrasonic; remained of canal restored w/ composite directly over MTA)
- Recall intervals at 6 months

Clinical criteria:

1. Healed: no Hx of pan, discomfort, altered sensation
2. Healing: no Hx of pan, discomfort, altered sensation
3. Persistent Disease: Hx of pan, discomfort and altered sensation

Radiographic criteria:

1. Healed: normal PDL space (< 2 X normal width) and lamina dura
2. Healing: decrease in size of PARL, but presence of PDL space and lamina dura are not with in normal limits
3. Persistent Disease: increase or no decrease in size of PARL

Results:

- 1-visit healing: 93.5% (1 or > yrs of recall, 51% available at recall)
- 2-visit healing: 90.5% (1 or > yrs of recall, 61.5% available at recall)
Title: Anatomic determination of the mesiobuccal root resection level in maxillary molars

Author: Degerness et. al.


Reviewer: Kevin Sameti D.D.S.

Purpose: To provide a more precise examination of MB root system of maxillary molars for retrograde root resection.

Materials and Methods: Uninstrumented mesiobuccal roots from 153 extracted maxillary first (90) and second (63) molars were embedded in clear resin. The roots were sectioned horizontally at increments of ~1mm, pulpal tissue was stained (with To Dye For, by Roydent) and looked at under microscope (8x magnifications). Observations made per sections included the number of accessory canals, presence of isthmus, and the canal wall thickness.

Results:

- 390 accessory canals were seen, with the majority being within 4 mm from the apex.
- 80% of these canals were found to be within the apical 3.6 mm of the root.
- The total incidence of accessory canals in 1st and 2nd molars combined was 20.1% (this number excluded the accessory canals found at the apical delta)
- Generally near the apex no isthmus was seen. At 3.12 mm from the apex variety of isthmuses sizes started to be visible.
- Root wall thickness was 1mm at depth of 3mm from the apex.
- A 2mm wall thickness was available only at the coronal 1/3 of the root.

Discussion:

- It has been suggested to resect a root to a length that allows for 2 mm of wall thickness around the preparation cavity to minimize micro-fracture occurrence during ultrasonic preparation. But, a 2 mm wall thickness did not occur up to the coronal 1/3.
- Authors suggested root resection level of 3.6 mm, to reduce the incidence of accessory canals and to allow for a greater wall thickness.
Title: Mechanism of N-acetyl cysteine-mediated protection from 2-hydroxyethyl methacrylate-induced apoptosis

Author: Paranjpe et al., 2008


Reviewer: Avedis Encioiu, DDS

Purpose: To show that N-acetyl cysteine (NAC) prevents 2-hydroxyethyl methacrylate (HEMA)-mediated apoptotic cell death through the inhibition of caspases and restoration of mitochondrial membrane potential.

Materials and Methods:
- Cells used: Jurkat (T-lymphocytes), HEp2 (oral epithelial cells), Osteoblasts, Dental pulp stromal cell cultures (DPSCs) and human mesenchymal stem cells.
- To determine DNA staining and Apoptosis, cells were treated with HEMA and NAC and were washed with a binding buffer containing FITC-Annexin V/propidium iodine, placed on ice for 15 min and then tested by flow cytometry.
- Jurkat cells were treated with different concentrations of HEMA, stained with DiOC6 (mitochondria specific dye) for 30 min, then analyzed by flow cytometry, to determine mitochondrial membrane depolarization.

Results and Conclusions:
- Cell death induced by HEMA is dose and time dependent. Using HEp2 oral epithelial cells and Jurkat T cells, the concentrations of HEMA required to induce cell death were determined (Fig. 1A-D).
- Both apoptotic and necrotic cell death was observed depending on the cell type and the concentration of HEMA used (Fig. 1A-D).
- Induction of cell death by HEMA in all of the previously mentioned cells was significantly decreased in the presence of NAC (Fig. 1).
- HEMA-induced cell death was effectively blocked in the presence of both pre-treatment and simultaneous treatment with NAC and HEMA (Fig. 1); significant cell death was also observed when dental pulp stromal cells, osteoblasts and mesenchymal stem cells were treated with HEMA. (Data not shown)
- Optimal blocking concentration of NAC on HEMA-mediated cell death was found to be 20mmol/L (Fig. 1)
- The induction of cell death in Jurkat cells was paralleled with a decrease in mitochondrial membrane potential, and the addition of NAC prevented the loss of this potential (Fig. 2)
- HEMA increased active caspase 3 expression in Hep2 and Jurkat cells; NAC prevented the induction of active caspase 3 when added to HEMA (Fig. 3C)
- Thus, NAC is an anti-inflammatory agent that could be used in dental restorations and in endodontic materials to protect pulpal and peri-radicular cells and tissues from the toxic effects of resin-based materials and methacrylates.
Title: Identification of a C-shaped canal system in mandibular second molars – part III: anatomic features revealed by digital subtraction radiography.

Author: Wei Fan et. al.


Reviewed by: Aneel Belani, DDS

Purpose: To use digital subtraction radiography to visualize anatomy of C-shaped canals in mandibular second molars using a contrast medium and compare its effectiveness to microCT reconstruction.

Materials and Methods: Thirty mandibular second molars were scanned with microcomputed tomography and reconstructed. The canals were cleaned. Digital radiovisography (RVG) images were taken from B-L direction with bone plates. Contrast medium was put into teeth. RVG images were taken again and image subtraction was done. All images from both reconstruction and subtraction radiography were classified into three groups (I: merging canals, II: symmetrical, and III: asymmetrical) by postgraduate students. The reconstructed canal images were used to test sensitivity and specificity of digital subtraction radiography.

Results: In all cases sensitivity and specificity were very high. With 100% sensitivity of type I, 100% specificity of type II, and 100% sensitivity of type III.

Conclusion: It is very important to understand the anatomy of C shaped canals in order to perform successful root canal therapy. C shaped canals are very difficult to identify because of their complexity and because they are often found in mandibular second molars which may be surrounded by thick bone. It seems that digital subtraction radiography could help in determining the morphology of these canals due to its high specificity and sensitivity. It does however require a strict repetition of image positioning and is still only two dimensional. This method of visualization also requires complete cleaning of and emptying of tissue debris in order to allow total perfusion of the contrast medium which is more difficult in vivo.
Title: Confocal laser scanning microscopy is appropriate to detect viability of *Enterococcus faecalis* in infected dentin

Author: Zapata R. et al

Journal: JOE – Vol 34, Number 10, October 2008

Reviewed by: Jay Gupana, DMD

Purpose: To explore the potential of Confocal laser scanning microscopy (CLSM) for in situ identification of live and dead bacteria inside infected dentinal tubules and to describe the distribution and vitality of the bacteria *E. faecalis* in infected dentin of bovine origin.

Background: *E. faecalis* is a gram positive, facultative organism found in the GI tract. It has the ability to tolerate higher pH and is known to survive in obturated root canals. It is the most prevalent bacterial strain in endodontic cases with persistent endodontic lesions.

Materials and Methods:

- Ten non-carious teeth were reduced to a root segment of 7-8mm and enlarged to a gates glidden size 5, smear layer removed using 17% EDTA, washed with sterile water and sterilized in autoclave
- Teeth were then infected with pure cultures of *E. faecalis*, 3ml of BHI (brain heart infusion) inoculated with 200μL of *E. faecalis* was used to infect dentin, BHI was changed every 48 hrs, root canals were then washed and fractured into 2 dentin segments
- To determine viability of the bacteria, one dentinal segment was stained with fluorescein diacetate (FDA), and propidium iodide (PI). Viable cells stained with FDA are green, dead bacteria are stained with PI and are red
- The other dentin segment was washed and stained with acridine orange, which has the ability to bind with bacterial RNA-emitting red fluorescence and to bind with bacterial DNA-emitting green fluorescence, this allows analysis of bacterial metabolism
- As a negative control two sterile roots were analyzed with CLSM
- Following staining, the specimens were analyzed with CLSM

Results:

- CLSM analysis allowed visualization of both viable and dead bacteria following staining by FDA and PI
- Single dentinal tubules presenting viable and nonviable bacteria was the most frequent finding
- Acridine orange showed metabolic activity of *E. faecalis* inside dentinal tubules by its red fluorescence

Discussion: CLSM is an effective way to analyze the viability of bacteria in infected dentin *in situ*. This technique has advantages over other bacterial sampling techniques, TEM, and PCR techniques. CLSM is a useful methodology that can be used as an adjunct to other established microbiological techniques.