Title: Letter to the editor: Warm vertical compaction and its influence on the properties of root canal series

Author: Al-Haddad A

Source: JOE, Vol. 43(8):1229

Reviewer: Reza Akahaven DMD

Purpose: This letter comments on a research article authored by Qu et al titled “Influence of Warm Vertical Compaction Technique on Physical Properties of Root Canal Sealers” published in JOE, volume 42, issue 12.

Letter Summary: Qu et al found that warm vertical compaction influenced some properties (the setting time, flow, and porosity) of tested sealers. A significant reduction of setting time and flow was found in RoekoSeal (Roeko/Coltene/Whaledent Langenau, Germany) and iRoot SP (Innovative Bioceramix Vancouver, Canada) sealers at a high temperature. However, the Materials and Methods section indicated that the application of temperature was not limited to the time of vertical compaction application only, and the specimens were incubated in a high temperature of 140°C between 10 minutes to 48 hours according the time of the experiments. The clinical significance of this study was to choose proper sealers in the warm vertical compaction technique. However, the method used was not mimicking the clinical practice of vertical compaction. In warm vertical compaction, the duration of heating applied is no more than 4 seconds for safety considerations. Such a huge difference in the assumed clinical practice time and the experiment time could affect the result and its clinical implication.

Response from original article authors

• The heating temperature was set at 140°C, which was based on the actual median temperature of pluggers measured in our previous study.
• Authors list four other studies with high temperature setting used including Camilleri et al where the specimens were kept at 100°C for 1 minute and then transferred to an incubator at 37°C until the end of setting. Authors claim that applying a changing temperature mode seems to be reasonable to mimic the clinical practice, but this makes the experimental procedure more complicated and difficult to control the changing temperature for researchers. Further, they mention that there is no sound evidence regarding how long to heat and then transfer the specimens to 37°C.
• In summary, their response is that an in vitro study cannot mimic all clinical situations completely.

LOE: 5
Title: The role of varicella zoster virus (VZV) in the development of periapical pathoses and root resorption: A systemic review

Author: Jakovljevic A et al.

Journal: JOE, Vol. 43(8):1230

Reviewer: Reza Akhavan, DMD

Purpose: This study analyzed available data on the association among varicella zoster virus (VZV), subsequent herpes zoster (HZ) infection, and the development of periapical pathoses and root resorption.

Material and Methods: Inclusion criteria: documented data on the identification of VZV in samples obtained from apical periodontitis, acute apical abscesses, and root resorption—or data on clinical and radiographic signs and symptoms of apical periodontitis, acute apical abscesses, and root resorption in areas previously affected by HZ attack. Cell culture laboratory studies or animal studies were excluded.

Results: Seven case reports and 3 cross-sectional studies were included in the final review. When summarized, in 7 patients with a history of a previous HZ attack and with no other apparent cause, 23 teeth were diagnosed with apical periodontitis, 8 teeth with internal and 1 tooth with external root resorption. The cross-sectional studies investigated the presence of VZV DNA in samples of acute apical abscess. The VZV DNA was found only in 2 of 65 samples. All studies included in this systematic review had a low level of evidence (4 and 5). However, the potential role of VZV in the etiopathogenesis of periapical pathoses and root resorption cannot be ruled out.

Conclusion: Future investigations should be directed toward the analysis of VZV pathologic effects on pulp blood vessels, which might cause local ischemia and tissue necrosis.

LOE: 3
Title: Effectiveness in the removal of endotoxins and microbiological profile in primary endodontic infections using 3 different instrumentation systems: A randomized clinical study

Author: Cavalli D et al.

Journal: JOE Volume 43(8): 1237-1245

Reviewer: Adnan Kazim DMD

Purpose: This study compared the effectiveness of three different instrumentation systems.

Materials and Methods:

- 30 patients with diagnosis of pulp necrosis and periradicular lesions
- exclusion criteria: periodontal pockets greater than 4mm, previously endo tx, antibiotic tx or antifungal tx in the last 3 months, teeth that could not be isolated with RDI.
- All steps of dental intervention were performed under aseptic techniques.
- Canals were sampled before instrumentation with sterile paper point to length determined radiographically
- #15 K-file used to initially enlarge canal prior to rotary instrumentation with 24mL of 2.5% NaOCl and with a 30 SS K-file at the end of instrumentation. Sample S2 taken after irrigation with 5% sodium thiosulfate and 10mL of sterile physiological saline. Dried with paper points and filled with Ca(OH)_2
  - Group 1 - Mtwo Rotary- 8 files
  - Group 2 - Reciproc – 1 file
  - Group 3 - Genius hybrid- 3 files
- Samples submitted to endotoxin analysis, microbiological culture, and checkerboard test

Results: There was no statistical difference between the 3 groups (ie, Mtwo, Reciproc, and Genius) regarding the removal of microorganisms from the root canal. However, statistically significant difference was observed between the Mtwo and Genius groups in all 3 samples regarding the mean number of bacterial species. Although endotoxin was found in all samples, at S2 a significant reduction in the number of endotoxins was observed in all groups (P < .05) but with no differences among the groups. Mtwo (95.2%) showed the best result followed by Genius (91.8%) and Reciproc (64.8%).

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Positive associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous pain</td>
<td>Prevotella nigrescens</td>
</tr>
<tr>
<td>Tenderness to</td>
<td>Porphyromonas gingivalis</td>
</tr>
<tr>
<td>percussion</td>
<td>Veillonella parvula</td>
</tr>
<tr>
<td>Capnocytophaga</td>
<td>spirogena</td>
</tr>
<tr>
<td>Prevotella nigrescens</td>
<td></td>
</tr>
<tr>
<td>Eubacterium</td>
<td>saburreum</td>
</tr>
<tr>
<td>Sinus Tract</td>
<td>Gram-positive facultative anaerobic</td>
</tr>
<tr>
<td></td>
<td>Eikenella corrudens</td>
</tr>
<tr>
<td></td>
<td>Parvimonas micro</td>
</tr>
<tr>
<td></td>
<td>Campylobacter showae</td>
</tr>
<tr>
<td></td>
<td>Eubacterium saburreum</td>
</tr>
</tbody>
</table>

Conclusion: Biomechanical preparation of canals was effective in reduction of microorganisms and endotoxins but not entirely. Signs and symptoms were associated to the presence of gram positive and negative anaerobic microorganisms.

LOE: 4
Title: Development of periapical lesions in endodontically treated teeth with and without periodontal involvement: A retrospective cohort study

Author: Ruiz X, et al.

Journal: JOE, Vol. 43(8):1246

Reviewer: Laura Hayoung Kim DDS

Purpose: To examine the incidence of apical periodontitis (AP) in endodontically treated teeth with and without periodontal involvement.

Material and Methods:

- 775 root canal treated teeth treated in University Clinic in Spain from January 2009 and December 2011 were evaluated
- Selected 205 teeth that were treated endodontically without periapical disease
- Teeth observed were divided into two groups based on the patient’s periodontal status: (1) Periodontally healthy patients and (2) Periodontally diseased patients undergoing nonsurgical periodontal treatment (patients in groups 2, 3, or 4 in the PBL classification explained below).
- Periodontal Bone Loss (PBL) classification was made by two calibrated periodontics for the first evaluation according to the following categories:
  1. Normal: Alveolar crest is 2mm under the CEJ
  2. Mild: <25% bone loss
  3. Moderate: 25-50% bone loss
  4. Severe: >50% bone loss
- Teeth with minimum of 2-year observation period were chosen
- For the follow-up radiographic evaluation, two calibrated endodontists evaluated the follow-up PA’s and classified the teeth according to the periapical index.
- Statistical analysis was performed to analyze the relationship between presence of pre-operative periodontal disease and follow up AP

Results: Apical periodontitis was found in 3% (3 teeth) of non-periodontal samples and 14% (13 teeth) in periodontal samples. Variables significantly related to development of AP were hypertension and initial periodontal status.

Conclusion: The risk of developing AP in endodontically treated teeth is 5.19 times higher for patients with periodontal disease compared with patients without periodontal disease

LOE: 2
Title: A retrospective, radiographic outcomes assessment of 1960 initial posterior root canal treatments performed by endodontists and dentists

Author: Ramey K et al

Journal: JOE Vol 43(8):1250-1254

Reviewer: Sodam Lee DMD

Purpose: This study assessed the outcome of initial posterior root canal treatments (RCTs) completed by Air Force(AF) and referred civilian providers through the Active Duty Dental Plan

Materials and Methods:

- Radiographic data analysis: pre-/post-op PA, BWs, PANO on 1,960 posterior RCTs performed between 07/01/2011 and 10/15/2011
- Radiographic outcome was assessed with (1) obturation quality (adequate/inadequate) (2) healing of periapical pathosis and (3) presence and quality of cuspal coverage (adequate/inadequate) among 6 different providers.
- AE: AF endodontist, AD0: AF general dentist with no additional training, AD1: AF general dentist with 1-year additional training, AD2: AF general dentist with 2-year additional training, CE: civilian endodontist, CD: civilian general dentist
- Statistical analysis

Results:

- Obturation quality: 1,810 RCTs were evaluated and 96% were considered adequate.
- Cuspal coverage restorations: 1,856 RCTs were evaluated and 2.7% were inadequately restored.
- Healing of periapical pathosis: 91.5%(AF), 85.7% (civilian providers: CE+CD)
- Survivability (avg. Follow-up 27 mos, overall 94.7%): 94.7%(AE), 87.9%(AD0), 96.5%(AD1), 88.3%(AD2), 93.9%(CE) 78.4%(CD)

Discussions:

- No info regarding preop symptoms or pulpal and periapical diagnosis were available.
- Data was limited to radiographic interpretation in judging obturation quality and cuspal coverage restoration,
- RCT success determination cannot be done only with radiographic evaluation. Clinical exams and symptoms need to be included to fully assess the success of RCT.
- The trend toward referring a tooth for RCT before restorability determination negatively impacts success and survivability.

Conclusions: AF providers had a healing of 91.5% compared to that of civilian providers (85.7%). Evidence-based practices as followed in the Air Force Dental Service and accredited postgraduate training resulted in improved treatment outcomes.

LOE: 3
Purpose: This study determined the factors that influence endodontists’ decisions regarding the completion of board certification.

Purpose: Board certification identifies those clinicians who possess superior knowledge and skill within their specific specialty. Currently, only 23% of endodontists are board-certified, the lowest of all the dental specialties. This study aims to identify specific impediments to obtaining board certification among endodontic specialists.

Materials & Methods: A 16-question survey was administered to collect demographic data as well as information regarding training program-specific advice and individual opinions concerning the decision to become board certified. The survey was sent to 5073 board-certified and non-board-certified US endodontists and endodontic residents who are AAE members.

Results:

- Among respondents who had no plans of becoming board-certified, the two most frequently cited reasons were “graduated too long ago” and “don’t have time,” followed by “process is too long” and “it is not required to become an endodontist.”
- 73.8% of respondents felt that board certification was important, yet only 32% were board certified.
- Board-certified endodontists had a significantly stronger correlation with practice in a group setting compared with non-board-certified endodontists.
- Significantly more board-certified endodontists graduated from a program that encouraged board certification.
- When comparing residents with endodontists, residents were much more likely to plan on becoming board-certified. Common reasons among those not planning to become board-certified included “case portfolio is too difficult,” “oral exam is too difficult,” and “exams are too literature oriented.”
- A lower percentage of endodontists reported that “examination is too literature oriented” as a concern suggesting practicing endodontists see the value in possessing a thorough knowledge of the literature.

Discussion: The disconnect between perceived importance and actual achievement of board-certification is significant and warrants further investigation. It is suggested that endodontists with established practices have less incentive to become board certified, and may also feel that they have less available time to do so. Many endodontists are discouraged from pursuing board-certification due to the lengthy and time-consuming process involved. Accordingly, improvements have been made by the ABE to shorten the time and lessen the requirements needed to complete the process.

Conclusion: A further study should seek to evaluate patient satisfaction and clinical outcomes in relation to board certification.

LOE: 5
Title: Relationship between the mental foramen, mandibular canal, and the surgical access line of the mandibular posterior teeth: A cone-beam computed tomographic analysis

Author: Wang X, et al.,

Journal: JOE, Vol. 43(8):1262

Reviewer: Reza Akahaven DMD

Purpose: This study investigated the relationships between the location of the mental foramen (MF) and the mandibular canal (MC) and the surgical access line (SAL) of the mandibular posterior teeth using cone-beam computed tomographic (CBCT) scans.

Materials and Methods: CBCT scans of 204 subjects ranging in age from 18–76 years old were evaluated. The vertical and horizontal distances from the MF to the SAL of the mandibular premolars and first molars and the vertical distance from the MC to the SAL of the second premolars and first molars were measured via CBCT scans.

Results and Conclusions: The average vertical distance between the MF and the SALs showed significant increases sequentially from the first premolars to the distal roots of the first molars, and the shortest average distance of 2.74 mm was obtained for the first premolars. The SALs of the second premolars were the closest to the MF in the horizontal direction with an average distance of 1.5 mm. In 19.9% of the cases, the vertical and horizontal distances between the MF and the SALs of the second premolars were less than 2 mm. In addition, the MF was located superior to the root apices in 6.62% of the cases. Men and women exhibited significant differences in both the horizontal distance from the MF to the SALs of the first premolars and the vertical distance from the MC to the SALs of the second premolars.

LOE: 5
Purpose: This study analyzed the external and internal morphologies of 3 rooted maxillary first premolars using cone-beam computed tomographic (CBCT).

Methods: Fifty-six 3-rooted maxillary first premolars were scanned with CBCT. Teeth were analyzed for the internal and external morphology.

Results:

- Group A- 39.3% (22/56)- Teeth with 3 distinct roots, MB, DB, and P. The buccal (B) and palatal (P) roots are separated, below which point, the buccal root is divided into the MB and DB roots
  - Group A1 (9/22): The MB root bifurcated from the DB root at the cervical third of the root
  - Group A2 (11/22): The MB root bifurcated from the DB root at the midthird of the root
  - Group A3 (2/22): The MB root bifurcated from the DB root at the apical third of the root

- Group B- 33.9%, (19/56): Teeth with fused MB and DB roots and a completely or partially separate palatal root. This group included teeth in which the MB and DB roots bifurcated at a distance of 1.0 mm or less from the apex.

- Group C- 16.1% (9/56): Teeth with completely or partially fused DB and palatal roots.

- Group D- 10.7% (6/56): Teeth with 3 fused roots. These teeth exhibited visible grooves showing the fusion of roots. This group included teeth in which any of the 3 roots bifurcated at a distance of 1.0 mm or less from the apex

- All teeth (apart from the C-shaped teeth) initially presented with 2 orifices, a B and a smaller P orifice. None had 3 orifices.

- The majority of the teeth had triangular/heart-shaped B orifice and a tear-shaped P orifice (with the base of the tear located palatally), with the B side of the orifices being greater in dimension than the P side. These orifice configurations are key indicators of the possibility of 3 canals

- The mean distance between the MB-DB and B-P bifurcations in group B was greater than those in groups A and C.

- 4/56 teeth were 3-rooted premolars with a C shaped root canal systems

- B root canal bifurcated into MB and DB at different heights of the root, below the separation of B and P roots

LOE: 5
Title: Histologic evaluation of regenerative endodontic procedures with the use of chitosan scaffolds in immature dog teeth

Author: Palma P et al


Reviewer: Sodam Lee DMD

Purpose: This study assessed histologically the regenerative potential (REP) of two chitosan-based different scaffolds compared with the use of a blood clot (BC) in immature dog teeth with pulp necrosis (PN) and apical periodontitis (AP)

Materials and Methods:

- PN and AP were induced in Dog’s teeth by exposing pulp and placing oral plaque.
- 96 teeth were divided into 2 controls and 4 test treatment groups: 1) MTA apexification, 2) REP with BC, 3) REP with hyaluronate chitosan (HA:CS) and 4) REP with pectin chitosan (P:CS)
- All root canals were disinfected with 2.5% NaOCl. For apexification group, Ca(OH)₂ was placed and sealed with Cavit. For REP groups, triple antibiotic (ABX) paste was placed.
- After 2 wks, intracanal medicaments were removed. For apexification group, canals were filled with MTA and sealed with wet cotton pellet and glass ionomer composite (GIC). For REP groups, bleeding was induced for blood clot formation and canals were double sealed with MTA and GIC. (For group3 and group4, each scaffold gel was added to blood.)
- After 13 wks, animals were killed and jaw blocks were dissected for histologic processing, histomorphometric analysis.

Results:

<table>
<thead>
<tr>
<th></th>
<th>Apexification</th>
<th>REP w/ BC</th>
<th>REP w/ HA:CS</th>
<th>REP w/ P:CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apical healing</td>
<td>94%</td>
<td>79%</td>
<td>47%</td>
<td>58%</td>
</tr>
<tr>
<td>Apical closure</td>
<td>83%</td>
<td>68.5%</td>
<td>63.1%</td>
<td>68.4%</td>
</tr>
<tr>
<td>Mineralized tissues formed on the root canal wall</td>
<td>66.7%</td>
<td>100%</td>
<td>78.9%</td>
<td>84.2%</td>
</tr>
</tbody>
</table>

- HA:CS groups and P:CS group had still a residual fragments of scaffolds, which might have been reason for persistent inflammatory reaction.
- The greatest amount of mineralized tissue inside the canal was observed in BC group when compared with HA:CS and P:CS.
- REP with BC allowed more predictable healing and formation of a vascularized tissue that was devoid of inflammation than the other chitosan groups.
- 21% of samples in REP group with BC had the presence of dentin formation with surrounded odontoblast like cells. → The first demonstration of true regeneration.
Conclusion: The addition of chitosan scaffolds to blood in REPs in dogs did not improve the formation of new mineralized tissues along the root canal walls and histologic evidence of regeneration of a pulp-dentin complex.

LOE: 5

1. Sara Fayazi, Comparative Evaluation of Chemotactic Factor Effect on Migration and Differentiation of Stem Cells, JOE, Vol. 43, No. 8, 1288 (August 2017)

R. Mitrani

Title: Use of platelet-rich plasma in endodontic procedures in adults: Regeneration or repair? A report of 3 cases with 5 years of follow-up

Author: Gavino Orduna J et. al.

Journal: JOE, Vol. 43(8):1294

Reviewer: Adnan Kazim DMD

Purpose: To report on the outcomes of the use of autologous platelet-rich plasma (PRP) in endodontic therapy in adults by monitoring periapical tissue healing with periodic periapical radiographs and CBCT. Regeneration endodontic procedures (REPs) provide 3 advantages over traditional methods of apexification: 1. promote root development, 2. increase root length, they allow thickening of the root dentinal walls, and 3. provide apical closure.

Materials and Methods:

- Case 1: 35-year-old with maxillary left central incisor with PARL and incomplete root development, thin dentinal walls and open apex. At 50 months, complete resolution of PARL. Existence of vestibular cortical bone completing the bone healing around root apex. Slight invagination of bone inside the canal was observable
• Case 2: 21-year-old with trauma 13 years ago, presented with right upper central incisor. Incomplete root development thin root walls, open apex. Clinical and radiographic examine were sufficient to avoid CBCT and dx of asymptomatic granulomatous apical periodontitis was made. At 6 months, a slight decrease in PARL, a CBCT at 5 years showed resolution of PARL and intact cortical plates with complete bone healing around root apex and invagination of bone inside the canal, slight increase in root length also noted.

• Case 3: 24-year-old with pain from a previously endodontically treated maxillary left lateral incisor. Tender to percussion and palpation. Radiographically showed big composite restoration with metal post, poorly filled apical third, and PARL with an open apex. At 48 months, calcified structure below MTA barrier, irregular calcified tissue over entire internal root walls, especially in the apical third of the canal.

Conclusion: The use of PRP helps control the level of placement of MTA and could be a good choice to promote the healing process. In the present case series, it was not possible to obtain a histological evaluation, the authors could not conclude if tissue repair or regeneration was obtained.

LOE: 5

2. Sung Hee Lee, et. al., Three Dimensional Sphere-forming Cells Are Unique Multipotent Cell Population in Dental Pulp Cells, JOE, Vol. 43, No. 8, 1302 (August 2017)