Efficient Endodontics:
Hands-On Workshop

Diwakar Kinra
Welcome to the Greater New York Dental Meeting™
Executive Headquarters
200 West 41st Street, Ste. 1101, New York, NY 10036
Tel. (212) 398-6922, Fax. (212) 398-6934
E-mail: victoria@gnydm.com
www.gnydm.com
Sponsored by New York County & Second District Dental Societies

All programs and exhibits are held at the Jacob K. Javits Convention Center (unless otherwise indicated)
11th Avenue between 34th and 39th Street, New York City

General Registration Hours
Friday, November 29          12:00 Noon - 4:30 P.M.
Saturday, November 30         8:00 A.M. - 4:30 P.M.
Sunday, December 1 - Tuesday, December 3 8:00 A.M. - 5:30 P.M.
Wednesday, December 4 8:00 A.M. - 4:30 P.M.

Exhibit Hall Hours
Sunday, December 1 - Tuesday, December 3
9:30 A.M. - 5:30 P.M.
Wednesday, December 4 - 9:30 A.M. - 5:00 P.M.

FREE “Live” Dentistry
Hi-Tech 450 Seat Arena

SUNDAY
9:45 - 11:45
VOCO America, Inc.
Drs. Ron Kaminer & Marc Geissberger
Restorative

MONDAY
9:45 - 11:45
Shofu
Dr. Ron Kaminer
Restorative

TUESDAY
9:45 - 12:00
Millennium
Dr. Sunil D. Thanik
Laser

WEDNESDAY
9:45 - 12:00
Apa / CareCredit
Drs. Michael Apa
Aesthetic

9:45 - 11:45
VOCO America, Inc.
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Aesthetic

COURSE REGISTRATION
Pre-registration is required for all continuing education courses with the exception of the “Live” Dentistry and Affiliated Groups. Your seat will be held for 15 minutes after the start of the course; after that, those without tickets will be seated according to space availability. When the room is filled, no additional people will be admitted due to fire department regulations. If you have not pre-registered, please be prepared to select an alternate session to attend.

Tickets
Tickets are required for all courses excluding Live Dentistry. Tickets for all functions can be purchased at all general registration booths located in the Registration Area on the Upper Level in the Crystal Palace and online.

6 Days of Education Seminars, Hands-on Workshops & Essays
Friday - Wednesday

4 Days of Exhibits
Sunday - Wednesday

Celebrity Luncheon Speaker
John Quiñones
Monday, December 2nd
12:00 - 2:00 - Ticket 4010
$125.00

3D Printing & Digital Dentistry Conference
Dental Laboratory Technicians Programs
Sleep Apnea Symposium
Oral Cancer Symposium

5th Annual Global Orthodontic Conference
3rd Annual Pediatric Dentistry Summit
12th Annual INVISALIGN® - GNYDM EXPO
4 Days of Programming: Sunday - Wednesday
Botox and Facial Fillers Seminar & Workshop
Over 1,700 Exhibit Booths
### Emergency and Follow-Up Management of the Avulsed (Knocked-Out) Tooth

#### 10 years of age or older—permanent teeth with closed apex

<table>
<thead>
<tr>
<th>On-Site</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Replant Tooth</strong></td>
</tr>
<tr>
<td>Rinse gently to remove foreign objects from tooth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antibiotics</strong></td>
</tr>
<tr>
<td><em>a.</em> Penicillin—1000 mg stat and 500 mg every 6 hours for 7 days</td>
</tr>
<tr>
<td><em>b.</em> Doxycycline—100 mg every 12 hours for 7 days for patients not susceptible to tetracycline staining</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>7-10 Days</th>
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</thead>
<tbody>
<tr>
<td><strong>Remove flexible splint</strong></td>
</tr>
<tr>
<td><strong>Remove pulp</strong></td>
</tr>
<tr>
<td>Place calcium hydroxide paste</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>30 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obturate with gutta-percha if lamina dura intact:</strong> If root resorption present, replace Ca(OH)₂—evaluate and change Ca(OH)₂ every 3 months; then obturate with gutta-percha if lamina dura intact</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6 Months</th>
</tr>
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<tbody>
<tr>
<td>Clinical and radiographic exam (post-obturation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical and radiographic exam (follow-up for 5 years)</td>
</tr>
</tbody>
</table>

#### Under 10 years of age—permanent teeth with open apex

<table>
<thead>
<tr>
<th>On-Site</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unable to Replant</strong></td>
</tr>
<tr>
<td>Place in transport media</td>
</tr>
<tr>
<td>a. special storage media</td>
</tr>
<tr>
<td>b. milk</td>
</tr>
<tr>
<td>c. saline</td>
</tr>
<tr>
<td>d. saliva</td>
</tr>
<tr>
<td>Dry time greater than 1 hour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antibiotics</strong> (use appropriate doses for patient age and weight)</td>
</tr>
<tr>
<td>Penicillin—every 6 hours for 7 days</td>
</tr>
</tbody>
</table>

<table>
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<tr>
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<tbody>
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<td><strong>Remove pulp</strong></td>
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</table>

For additional guidelines, definitions of clinical and radiographic success/failure and references, visit the American Association of Endodontists' Web site at [www.aae.org](http://www.aae.org).
# Clinical and Radiographic Assessment of Other Dental Alveolar Injuries

<table>
<thead>
<tr>
<th>Diagnosis/Clinical Findings</th>
<th>Concussion</th>
<th>Subluxation</th>
<th>Extrusion</th>
<th>Lateral Luxation</th>
<th>Intrusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tooth tender to touch; no displacement; no mobility</td>
<td>Tooth tender to touch and mobile; bleeding from gums</td>
<td>Tooth partially protruding from bone/jaw</td>
<td>Tooth displaced axially from normal position; often tender to touch or mobile—possibly locked into bone (high metallic sound upon percussion)</td>
<td>Tooth is displaced deeper into the bone/jaw; high metallic sound upon percussion</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Radiographic/Clinical Assessment and Findings</th>
<th>Radiographs; evaluate pulp chamber size and root development; sensitivity testing</th>
</tr>
</thead>
</table>

| Treatment | Palliative; flexible splint (7―10 days) for comfort if needed | Reposition; flexible splint | Reposition into normal position; the tooth often must be extruded occlusally past the bony lock prior to repositioning; evaluate position with radiographs; flexible splint | Slightly luxate with forceps; with incomplete root formation, allow for spontaneous re-eruption; teeth with complete root formation, orthodontic or surgical repositioning |

| Patient Instruction | Splint removal; clinical/radiographic exam; sensitivity testing | Splint removal; in case of radiographic marginal bone breakdown, add 5―4 weeks to splint time; clinical and radiographic exam | Initiate root canal treatment in 1-3 weeks; splint removal except in teeth with open apices that erupt spontaneously |

| Up to 3 Weeks | 1. Soft diet; 2. Brush with soft toothbrush after each meal; 3. Rinse with 0.12% chlorhexidine every 12 hours for 1 week |

<table>
<thead>
<tr>
<th>Diagnosis/Clinical Findings</th>
<th>Uncomplicated</th>
<th>Complicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enamel or enamel-dentin fracture</td>
<td>Enamel-dentin fracture; pulp exposed</td>
<td>Crown attached to gingiva and mobile; pulp may or may not be exposed</td>
</tr>
<tr>
<td>Root Fracture</td>
<td>Crown usually mobile and sometimes displaced</td>
<td></td>
</tr>
<tr>
<td>Alveolar Fracture</td>
<td>Teeth and bone mobile</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
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<tr>
<th>Treatment</th>
<th>Cover dentin, a. glass ionomer (temporary); b. composite resin; c. bond fragment; consider Ca(OH)₂, if close to the pulp</th>
<th>Immature tooth: a. pulp capping; b. partial pulpotomy with Ca(OH)₂; c. bacteria-tight coronal seal</th>
<th>Mature tooth: a. pulp capping; b. partial pulpotomy with Ca(OH)₂; c. bacteria-tight coronal seal; d. root canal treatment</th>
<th>Emergency—stabilize coronal fragment with acid etch/resin splint; definitive treatment—expose subgingival fracture site by: a. gingivectomy; b. orthodontic or surgical extrision; Immature tooth: vital pulp therapy; Mature tooth: root canal treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reposition coronal fragment; flexible splint, 3-4 weeks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reeposition fragment; splint, 3-4 weeks</td>
<td></td>
<td></td>
<td></td>
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</table>

| Patient Instruction | 1. Soft diet; 2. Brush with soft toothbrush after each meal; 3. Rinse with 0.12% chlorhexidine every 12 hours for 1 week |

| 3-4 Weeks | Splint removal; clinical and radiographic exam; sensitivity testing |

| 6-8 Weeks | Clinical and radiographic exam, including sensitivity testing; further follow-up at 6 months, 1 year, and annually for 5 years |
Guidelines for Using the AAE Endodontic Case Difficulty Assessment Form

The AAE designed the Endodontic Case Difficulty Assessment Form for use in endodontic curricula. The Assessment Form makes case selection more efficient, more consistent and easier to document. Dentists may also choose to use the Assessment Form to help with referral decision making and record keeping.

Conditions listed in this form should be considered potential risk factors that may complicate treatment and adversely affect the outcome. Levels of difficulty are sets of conditions that may not be controllable by the dentist. Risk factors can influence the ability to provide care at a consistently predictable level and impact the appropriate provision of care and quality assurance.

The Assessment Form enables a practitioner to assign a level of difficulty to a particular case.

LEVELS OF DIFFICULTY

MINIMAL DIFFICULTY
Preoperative condition indicates routine complexity (uncomplicated). These types of cases would exhibit only those factors listed in the MINIMAL DIFFICULTY category. Achieving a predictable treatment outcome should be attainable by a competent practitioner with limited experience.

MODERATE DIFFICULTY
Preoperative condition is complicated, exhibiting one or more patient or treatment factors listed in the MODERATE DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for a competent, experienced practitioner.

HIGH DIFFICULTY
Preoperative condition is exceptionally complicated, exhibiting several factors listed in the MODERATE DIFFICULTY category or at least one in the HIGH DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for even the most experienced practitioner with an extensive history of favorable outcomes.

Review your assessment of each case to determine the level of difficulty. If the level of difficulty exceeds your experience and comfort, you might consider referral to an endodontist.

The contribution of the Canadian Academy of Endodontics and others to the development of this form is gratefully acknowledged.

E-mail: info@aae.org; Web site: www.aae.org

*American Society of Anesthesiologists (ASA) Classification System
Class 1: No systemic illness; Patient healthy.
Class 2: Patient with mild degree of systemic illness, but without functional restrictions, e.g., well-controlled hypertension.
Class 3: Patient with severe systemic illness which limits activities, but does not immobilize the patient.
Class 4: Patient with severe systemic illness that immobilizes and is sometimes life-threatening.
Class 5: Patient with severe systemic illness that is more than 24 hours whether or not surgical intervention takes place.

www.asahq.org/knsa/physicalstatus.htm
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INTRODUCTION

This updated joint position statement of the American Association of Endodontists and the American Academy of Oral and Maxillofacial Radiology is intended to provide scientifically based guidance to clinicians regarding the use of cone beam computed tomography in endodontic treatment and reflects new developments since the 2010 statement (1). The guidance in this statement is not intended to substitute for a clinician's independent judgment in light of the conditions and needs of a specific patient.

Endodontic disease adversely affects quality of life and can produce significant morbidity in afflicted patients. Radiography is essential for the successful diagnosis of odontogenic and nonodontogenic pathoses, treatment of the root canal systems of a compromised tooth, biomechanical instrumentation, evaluation of final canal obturation and assessment of healing.

Until recently, radiographic assessments in endodontic treatment were limited to intraoral and panoramic radiography. These radiographic technologies provide two-dimensional representations of three-dimensional anatomic structures. If any element of the geometric configuration is compromised, the image may demonstrate errors (2). In more complex cases, radiographic projections with different beam angulations can allow parallax localization. However, complex anatomy and surrounding structures can render interpretation of planar images difficult.

The advent of CBCT has made it possible to visualize the dentition, the maxillofacial skeleton, and the relationship of anatomic structures in three dimensions (3). CBCT, as with any technology, has known limitations, including a possible higher radiation dose to the patient. Other limitations include potential for artifact generation, high levels of scatter and noise and variations in dose distribution within a volume of interest (4).

CBCT should be used only when the patient’s history and a clinical examination demonstrate that the benefits to the patient outweigh the potential risks. CBCT should not be used routinely for endodontic diagnosis or for screening purposes in the absence of clinical signs and symptoms. Clinicians should use CBCT only when the need for imaging cannot be met by lower-dose two-dimensional radiography.

Volume Size(s)/Field of View

There are numerous CBCT equipment manufacturers, and several models are available. In general, CBCT is categorized into large, medium and limited-volume units based on the size of their “field of view.” The size of the FOV describes the scan volume of CBCT machines. That volume determines the extent of anatomy included. It is dependent on the detector size and shape, beam projection geometry and the ability to collimate the beam. To the extent practical, FOV should only slightly exceed the dimensions of the anatomy of interest.

Generally, the smaller the FOV, the lower the dose associated with the study. Beam collimation limits the radiation exposure to the region of interest and helps ensure that an optimal FOV can be selected based on disease presentation.
Smaller scan volumes generally produce higher-resolution images. Because endodontics relies on detecting small alterations such as disruptions in the periodontal ligament space, optimal resolution should be sought (5).

The principal limitations of large FOV CBCT imaging are the size of the field irradiated and the reduced resolution compared to intraoral radiographs and limited-volume CBCT units with inherent small voxel sizes (5). The smaller the voxel size, the higher the spatial resolution. Moreover, the overall scatter generated is reduced due to the limited size of the FOV. Optimization of the exposure protocols keeps doses to a minimum without compromising image quality. If a low-dose protocol can be used for a diagnostic task that requires lower resolution, it should be employed, absent strong indications to the contrary.

In endodontics, the area of interest is limited and determined prior to imaging. For most endodontic applications, limited FOV CBCT is preferred to medium or large FOV CBCT because there is less radiation dose to the patient, higher spatial resolution and shorter volumes to be interpreted.

**Dose Considerations**

Selection of the most appropriate imaging protocol for the diagnostic task must be consistent with the ALARA principles that every effort should be made to reduce the effective radiation dose to the patient “as low as reasonably achievable.” Because radiation dose for a CBCT study is higher than that for an intraoral radiograph, clinicians must consider overall radiation dose over time. For example, will acquiring a CBCT study now eliminate the need for additional imaging procedures in the future? It is recommended to use the smallest possible FOV, the smallest voxel size, the lowest mA setting (depending on the patient's size) and the shortest exposure time in conjunction with a pulsed exposure-mode of acquisition.

If extension of pathoses beyond the area surrounding the tooth apices or a multifocal lesion with possible systemic etiology is suspected, and/or a nonendodontic cause for devitalization of the tooth is established clinically, appropriate larger field of view protocols may be employed on a case-by-case basis.

There is a special concern with overexposure of children (up to and including 18 years of age) to radiation, especially with the increased use of CT scans in medicine. The AAE and the AAOMR support the Image Gently Campaign led by the Alliance for Radiation Safety in Pediatric Imaging. The goal of the campaign is “to change practice; to raise awareness of the opportunities to lower radiation dose in the imaging of children.” Information on use of CT is available at [www.imagegently.org/Procedures/ComputedTomography.aspx](http://www.imagegently.org/Procedures/ComputedTomography.aspx).

**Interpretation**

If a clinician has a question regarding image interpretation, it should be referred to an oral and maxillofacial radiologist (6).

**RECOMMENDATIONS**

The following recommendations are for limited FOV CBCT scans.

**Diagnosis**

Endodontic diagnosis is dependent upon thorough evaluation of the patient’s chief complaint, history and clinical and radiographic examination. Preoperative radiographs are an essential part of the diagnostic phase of endodontic therapy. Accurate diagnostic imaging supports the clinical diagnosis.

**Recommendation 1: Intraoral radiographs should be considered the imaging modality of choice in the evaluation of the endodontic patient.**

**Recommendation 2: Limited FOV CBCT should be considered the imaging modality of choice for diagnosis in patients who present with contradictory or nonspecific clinical signs and symptoms associated with untreated or previously endodontically treated teeth.**
Rationale:
• In some cases, the clinical and planar radiographic examinations are inconclusive. Inability to confidently
determine the etiology of endodontic pathosis may be attributed to limitations in both clinical vitality testing and
intraoral radiographs to detect odontogenic pathoses. CBCT imaging has the ability to detect periapical pathosis
before it is apparent on 2-D radiographs (7).
• Preoperative factors such as the presence and true size of a periapical lesion play an important role in
endodontic treatment outcome. Success, when measured by radiographic criteria, is higher when teeth are
endodontically treated before radiographic signs of periapical disease are detected (8).
• Previous findings have been validated in clinical studies in which primary endodontic disease detected with
intraoral radiographs and CBCT was 20% and 48%, respectively. Several clinical studies had similar findings,
although with slightly different percentages (9,10). Ex vivo experiments in which simulated periapical lesions
were created yielded similar results (11,12). Results of in vivo animal studies, using histologic assessments as the
gold standard, also showed similar results observed in human clinical and ex vivo studies (13).
• Persistent intraoral pain following root canal therapy often presents a diagnostic challenge. An example is
persistent dentoalveolar pain also known as atypical odontalgia (14). The diagnostic yield of conventional
intraoral radiographs and CBCT scans was evaluated in the differentiation between patients presenting with
suspected atypical odontalgia versus symptomatic apical periodontitis, without radiographic evidence of
periapical bone destruction (15). CBCT imaging detected 17% more teeth with periapical bone loss than
conventional radiography.

Initial Treatment

Preoperative
Recommendation 3: Limited FOV CBCT should be considered the imaging modality of choice for
initial treatment of teeth with the potential for extra canals and suspected complex morphology,
such as mandibular anterior teeth, and maxillary and mandibular premolars and molars, and
dental anomalies.

Intraoperative
Recommendation 4: If a preoperative CBCT has not been taken, limited FOV CBCT should
be considered as the imaging modality of choice for intra-appointment identification and
localization of calcified canals.

Postoperative
Recommendation 5: Intraoral radiographs should be considered the imaging modality of choice
for immediate postoperative imaging.

Rationale:
• Anatomical variations exist among different types of teeth. The success of nonsurgical root canal therapy
depends on identification of canals, cleaning, shaping and obturation of root canal systems, as well as quality of
the final restoration.
• 2-D imaging does not consistently reveal the actual number of roots and canals. In studies, data acquired by
CBCT showed a very strong correlation between sectioning and histologic examination (16,17).
• In a 2013 study, CBCT showed higher mean values of specificity and sensitivity when compared to intraoral
radiographic assessments in the detection of the MB2 canal (18).

Nonsurgical Retreatment

Recommendation 6: Limited FOV CBCT should be considered the imaging modality of choice if
clinical examination and 2-D intraoral radiography are inconclusive in the detection of vertical
root fracture.
Rationale:

• In nonsurgical retreatment, the presence of a vertical root fracture significantly decreases prognosis. In the majority of cases, the indication of a vertical root fracture is more often due to the specific pattern of bone loss and periodontal ligament space enlargement than direct visualization of the fracture. CBCT may be recommended for the diagnosis of vertical root fracture in unrestored teeth when clinical signs and symptoms exist.

• Higher sensitivity and specificity were observed in a clinical study where the definitive diagnosis of vertical root fracture was confirmed at the time of surgery to validate CBCT findings, with sensitivity being 88% and specificity 75% (19). Several case series studies have concluded that CBCT is a useful tool for the diagnosis of vertical root fractures. In vivo and laboratory studies (20, 21) evaluating CBCT in the detection of vertical root fractures agreed that sensitivity, specificity, and accuracy of CBCT were generally higher and reproducible. The detection of fractures was significantly higher for all CBCT systems when compared to intraoral radiographs. However, these results should be interpreted with caution because detection of vertical root fracture is dependent on the size of the fracture, presence of artifacts caused by obturation materials and posts and the spatial resolution of the CBCT.

Recommendation 7: Limited FOV CBCT should be the imaging modality of choice when evaluating the nonhealing of previous endodontic treatment to help determine the need for further treatment, such as nonsurgical, surgical or extraction.

Recommendation 8: Limited FOV CBCT should be the imaging modality of choice for nonsurgical retreatment to assess endodontic treatment complications, such as overextended root canal obturation material, separated endodontic instruments, and localization of perforations.

Rationale:

• It is important to evaluate the factors that impact the outcome of root canal treatment. The outcome predictors identified with periapical radiographs and CBCT were evaluated by Liang et al. (22) The results showed that periapical radiographs detected periapical lesions in 18 roots (12%) as compared to 37 on CBCT scans (25%). Eighty percent of apparently short root fillings based on intraoral radiographs images appeared flush on CBCT. Treatment outcome, length and density of root fillings and outcome predictors determined by CBCT showed different values when compared with intraoral radiographs.

• Accurate treatment planning is an essential part of endodontic retreatment. Incorrect, delayed or inadequate endodontic diagnosis and treatment planning places the patient at risk and may result in unnecessary treatment. Treatment planning decisions using CBCT versus intraoral radiographs were compared to the gold standard diagnosis (23). An accurate diagnosis was reached in 36%-40% of the cases with intraoral radiographs compared to 76%-83% with CBCT. A high level of misdiagnosis was noted in invasive cervical resorption and vertical root fracture. In this study, the examiners altered their treatment plan after reviewing the CBCT in 56%-62.2% of the cases, thus indicating the significant influence of CBCT.

Surgical Retreatment

Recommendation 9: Limited FOV CBCT should be considered as the imaging modality of choice for presurgical treatment planning to localize root apex/apices and to evaluate the proximity to adjacent anatomical structures.

Rationale:

The use of CBCT has been recommended for treatment planning of endodontic surgery (24, 25). CBCT visualization of the true extent of periapical lesions and their proximity to important vital structures and anatomical landmarks is superior to that of periapical radiographs.

Special Conditions

Implant placement

Recommendation 10: Limited FOV CBCT should be considered as the imaging modality of choice for surgical placement of implants (26).
Traumatic injuries

**Recommendation 11:** Limited FOV CBCT should be considered the imaging modality of choice for diagnosis and management of limited dento-alveolar trauma, root fractures, luxation, and/or displacement of teeth and localized alveolar fractures, in the absence of other maxillofacial or soft tissue injury that may require other advanced imaging modalities (27).

Resorptive defects

**Recommendation 12:** Limited FOV CBCT is the imaging modality of choice in the localization and differentiation of external and internal resorptive defects and the determination of appropriate treatment and prognosis (28, 29).
REFERENCES


Thank you to the Special Committee to Revise the Joint AAE/AAOMR Position Statement on Cone Beam-Computed Tomography:

Mohamed I. Fayad, Co-Chair, AAE
Martin D. Levin, AAE
Richard A. Rubinstein, AAE
Craig S. Hirschberg, AAE Board Liaison

Madhu K. Nair, Co-Chair, AAOMR
Erika Benavides, AAOMR
Sevin Barghan, AAOMR
Axel Ruprecht, AAOMR
Problem-Solving Flowchart

**PROBLEM: Unable to observe the pulp chamber floor due to excessive bleeding**

**Cause**
- This is usually caused by pulp tissue either in the chamber or in the canals

**Remedy**
- Enlarge the access by removing the pulp chamber roof without touching the chamber floor (Never touch the pulp chamber floor unless the floor-wall junction is fully seen)
- Place hemostatic agents in the chamber
- Use a barbed broach to remove the tissue

**PROBLEM: Calcification/pulp stones**

**Cause**
- Degenerating pulp

**Remedy**
- Following the complete removal of the pulp chamber roof and cessation of bleeding, a large smooth round bur (#6) can be used to smooth the pulp chamber floor to remove the calcification and delineate the floor-wall junction clearly

**PROBLEM: Unable to observe the pulp chamber floor due to inadequate light**

**Cause**
- Access too small
- Presence of crowns or restorative materials
- Lack of smooth surfaces of walls or pulp chamber floor (usually caused by too small round burs)

**Remedy**
- Enlarge access until floor-wall junction can be seen
- Remove restorative materials
- Use accessory light (LED headlight or surgical operating microscope) when crown is present
- Smooth all irregularities on walls and pulp chamber floor with round burs

**PROBLEM: Unable to observe the pulp chamber floor due to inadequate removal of pulp chamber roof**

**Cause**
- Improper selection of the initial access penetration point
- Inability to see the floor-wall junction 360 degrees around

**Remedy**
- Return to previous bur (either round or tapered) and continue to shave back until the floor-wall junction is visualized

**PROBLEM: Unable to observe the pulp chamber floor due to restorative materials impinging onto the pulp chamber**

**Cause**
- Inadequate removal of all restorative material before access has begun (in particular, Class V restoration may impinge onto the pulp chamber floor)

**Remedy**
- Remove all restorative material before beginning the access

**PROBLEM: Unable to observe the pulp chamber floor due to loss of orientation**

**Cause**
- Using occlusal surface as reference point
- Failure to observe tooth orientation such as rotated or tilted tooth
- Losing sight of CEJ circumference
- Improper angulation of initial access

**Remedy**
- Proper pre-access observation of tooth orientation
- Proper mental imaging of the CEJ
- Remove rubber dam during access to regain orientation
- Appropriate angle of penetration of initial access bur
**PROBLEM:** Flooding perforation

**Cause**
- Premature attempt to identify orifices
- Failing to measure occlusal-furcal distance
- Improper identification of the floor-wall junction
- Inadequate access

**Remedy**
- Remove entire pulp chamber roof before identifying orifice location
- Observe floor-wall junction 360 degrees around
- Set bur at length less than occluso-furcal distance
- Direct accessing bur towards center of the CEJ perimeter

**PROBLEM:** Unable to identify all orifices

**Cause**
- Failure to establish a complete access
- Lack of delineation of a distinct floor-wall junction
- Presence of restorative materials
- Presence of calcifications

**Remedy**
- Make sure a complete access is performed
- Smooth the pulp chamber floor to remove calcifications and delineate floor-wall junction
- Use laws of pulp chamber floor anatomy to identify the positions of orifices

**PROBLEM:** Lateral chamber wall perforation

**Cause**
- Failing to mentally image the CEJ
- Improper angle of access entry
- Using occlusal anatomy to begin access penetration

**Remedy**
- Remove entire pulp chamber roof before identifying orifice location
- Observe floor-wall junction 360 degrees around
- Direct accessing bur towards center of the CEJ perimeter
- Choose initial penetrating access point based on CEJ imaged perimeter

**Summary**

In order to increase the success rate of endodontically treated teeth, as much of the pulp complex should be removed as is possible. In order to accomplish this, all of the root canal orifices in a pulp chamber must be found. The only rational way to do this is by utilizing the laws of anatomy of the pulp chamber floor. The only way to utilize these laws is by having an access that permits the visualization of the pulp chamber walls meeting the floor 360 degrees around. This newsletter has demonstrated and provided solutions to all of the clinical conditions that may hinder this visualization. In addition, we have presented a problem-solving flowchart that addresses all of the common pitfalls during access and orifice location that may confront a general practitioner.
CHECKLIST

Go over correct access (previously done by the participants) and making sure of straight-line access. Correct if necessary.

☐ Fill the chamber with Prolube. Secure #10 file until resistance and if possible 1mm past apex.
   Record length:

   Canal _______ Length _______ Canal _______ Length _______

   Canal _______ Length _______ Canal _______ Length _______

☐ Obtain radicular access and enlarge with Orifice Opener (Lateral brushing away from furcation on outstroke)

☐ Take rotary glide path file to WL. Reconfirm WL with #15 hand file.

☐ Shape with the WaveOne file. Fill chamber with ProLube. Take 2-4 mm “bites” with WaveOne in lateral brushing motion. Remove file and always irrigate, recapitulate (confirm patency), and re-irrigate. Repeat until WL.

☐ Confirm WL with shape verifiers

☐ Irrigate canal and activate with EndoActivator. Dry Canals with paper points.

☐ Apply sealer with paper points and blot excess sealer.

☐ Obturate with Guttacore carriers matching correct shape verifiers for each canal. Insertion rate is 5-7 seconds per canal.

☐ Remove carrier with sharp spoon excavator

Please feel free to ask for personal instruction when necessary