Procedural Accidents—Whoops! Did I Do That?

Kweli K. Carson, DDS, MS
Diplomate, American Board of Endodontics
Expert Witness, Maryland State Board of Dental Examiners
Types of Procedural Accidents

- Crown and root perforations
- Iatrogenic canal obstruction (due to dentin shavings or dental materials)
- Ledge formation
- Separated instruments
- Swallowed or aspirated instruments
- Sodium hypochlorite incidents
- Underfilled or overfilled root canals
- Post space perforations
- Vertically fractured roots
- Treating the wrong tooth
Preventing Procedural Accidents

- Thorough clinical and radiographic exam
- Accurate diagnosis and treatment planning
- Use the AAE Endodontic Case Difficulty Assessment Form and Guidelines to determine risk factors
- Refer potentially difficult or challenging cases to an endodontist
AAE Endodontic Case Difficulty Assessment Form and Guidelines

Patient Information

Full Name

Street Address

City State Country Zip

Date

Disposion

Treat in Office

Refer Patient to:

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.

Criteria 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 provisions of care and quality assurance.

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

LEVELS OF DIFFICULTY

MINIMAL DIFFICULTY

Preoperative conditions indicate 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 conditions are 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 practitioner.

HIGH DIFFICULTY

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

Rearrange 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.

CRITERIA AND SUBCRITERIA MINIMAL DIFFICULTY MODERATE DIFFICULTY HIGH DIFFICULTY

A. PATIENT CONSIDERATIONS

MEDICAL HISTORY

- No medical problems (AAE Class 1)
- One or more medical problems (AAE Class 2)
- Complex medical history or medical problems (AAE Class 3)

INFECTION

- No evidence of infection
- Evidence of infection

PATIENT DENTITION

- Good
- Fair
- Poor

ABILITY TO COOPERATE

- No limitations
- Limitation in opening
- Significant limitation in opening

B. OPERATING CONDITIONS

- No
- Yes - requires additional intervention
- Yes - requires additional intervention or intervention

EMERGENCY CONDITION

- No
- Yes - requires additional intervention
- Yes - requires additional intervention or intervention
Procedural Accidents Occur

- During Access Preparation
- During Cleaning and Shaping
- During Obturation
- During Post Space Preparation and Post Insertion
Procedural Accidents During Access Preparation

- Perforations
  - Coronal - lateral
  - Coronal - furcation

- Iatrogenic canal obstructions
Perforations

Iatrogenic perforation

- Artificial opening in a tooth created by drilling, boring, piercing, or cutting through tooth structure (with burs, hand instruments)

- Communication between pulp system and external tooth surface
Perforation During Access Preparation
Prevention During Access

- Clinical examination
  - Rotation, tipping of crown
  - Cast crown may not represent original tooth structure

- Radiographic examination
Prevention During Access

- Orientation of bur
  - Depth of pulp chamber roof
  - Height of pulp chamber
  - Location of pulp horns
  - Level of chamber floor
- Be Patient
- ENDO-Z bur (non-cutting tip)
Recognition of Perforations During Access

- Sudden appearance of persistent hemorrhage
- Radiographic extrusion of a file into PDL or bone.
Identification of Perforations During Access

Dental operating microscope

Electronic apex locator
Treatment of Perforations

Lateral perforations can be repaired with geristore, composite or a crown (microscope recommended).

Al-Sabek, F. et al
JOE 2005: Vol 31, Num. 3, pp 205-208

“In vitro interpretation indicates that Geristore is less cytotoxic to gingival fibroblasts [than Ketac-Fil or IRM]”
Treatment of Perforations

Furcal perforations can be repaired with MTA or amalgam (microscope recommended) – a file or paper point should be placed in the canals to prevent blockage of canals with the repair materials.
Perforation Material - MTA

Mineral Trioxide Aggregate

Nakata, T. et al
JOE 1998: Vol 23, Num. 4, pp 184-196

“MTA was significantly better than amalgam at preventing bacterial leakage in furcal perforation repairs.”
Factors Affecting Prognosis – Perforations

- Relationship of perforation to the gingival sulcus
- Time lapse before perforation repair
- Adequacy of perforation repair
- Sterility of perforation repair
- Material used to seal perforation

Johnson W. et al
Iatrogenic Canal Obstructions

Restorative materials and dentin shavings can travel into canals during access
Iatrogenic Canal Obstructions

Prevention

- All necessary restorative material should be removed prior to exposing the pulp
- Place a small cotton pellet over the canal orifices if access is enlarged
- Frequent and copious irrigation
- Place files or paper points in canals if using repair materials
Procedural Accidents During Cleaning and Shaping

- Ledge formation
- Root perforations (apical, lateral, coronal)
- Separated instruments
- Swallowing or aspirating instruments
- Extrusion of irrigants into periapical tissues
Ledge Formation

Created when the working length (WL) can no longer be negotiated

Causes – inadequate straight-line access, filing a curved canal short of WL, over-enlargement of a small curved canal, debris packed in apical canal area
Ledge Formation

“Canal curvature was the most significant variable affecting the incidence of ledging”

Kapalas A. et al
Endod Dent Traumatol 2000: Vol 16, Num. 5, pp 229-231
Preventing Ledging During Cleaning & Shaping

- Straight line access
- Use small flexible files especially with curved canals (pre-curve if nec)
- Avoid forcing large files into curved canals
- Estimated working length verified by apex locator or radiograph
Root Perforations During C&S (apical, lateral, coronal)
Identification of Root Perforation

- Observation of bleeding
  - Direct
  - Indirect (paper points)
- Radiographs
  - Small file
- Apex Locator
Management of Root Perforations

Treatment plan depends on:
- Accessibility
- Visibility
- Perforation size
- Periodontal conditions
- Strategic importance of tooth
- Patient’s oral hygiene
- Quality of root canal treatment
- Experience of the operator

Alhadainy, HA
Repair Materials

MTA

Less leakage in lateral root perforations than amalgam or IRM

Lee, 1993
Root Repair Materials
Root Perforation (mesio-buccal) - Apicoectomy
Root Perforations

Iatrogenic perforation of a root surface during endodontic treatment or restorative procedures may:

- Decrease prognosis
- Cause secondary periodontal involvement
- Cause the loss of the tooth

Alhadainy, HA
Separated Instruments

- Potential hazard that patients should be informed of prior to treatment
- Usually occur in small, long, curved, calcified or irregular canals

“Factors attributed to breakage of rotary files include canal curvature and other anatomic challenges, practitioner experience, frequency of use, and speed of rotation”

Fishelburg G. et al
How to Minimize Separation

- Straight line access
- Light touch – gentle pressure
- Never force a file – take to resistance
- Consistent RPM
How to Minimize Separation

- Use plenty of irrigation/lubrication
- Establish finger rest – minimizes pulling into canal
- Instrument with rotaries to point of divergence or trouble spots
How to Minimize Separation

- File turning upon entry
- Know exact WL
- Clean and examine files frequently
- “When in doubt – throw it out”
Treatment – Separated Instruments

- Depends on location
- Ultrasonics to remove
- Bypass
- Leave in place (guarded prognosis – possible apicoectomy in the future)
If there is ONE thing you remember about endodontics from this lecture, remember this...

ALWAYS use a rubber dam!!
Swallowing or Aspirating Instruments

“The use of rubber dam is an absolute essential during endodontic treatment”
Lambrianidis T. et al
Endod Dent Traumatol 1996: Vol 12, Num 6, pp 301-304

“The placement of a rubber dam is considered the standard of care”
Fishelburg G. et al
ALWAYS USE A RUBBER DAM!
Extrusion of Irrigants into Periapical Tissues

- Prevention – use side-slotted needle, keep needle moving, do not wedge needle into canal

- Recognition – prolonged severe pain followed by rapid diffuse swelling

- Treatment – reassurance, patient education, analgesics, multiple follow-up visits
Procedural Accidents During Obturation

- Underfilling
- Overfilling
- Vertical fracture (rare)
Underfilling

Causes

- Natural barrier
- Ledge formation
- Insufficient flaring
- No straight-line access
- Poorly adapted master cone
- Inadequate condensation pressure
Underfilling

Treatment

- Depends on several factors
  - Radiographic findings
  - Post present
  - Crown margins

- Retreatment

- Surgery (apicoectomy)
Overfilling

- Extruded material can cause tissue damage and inflammation.
- Caused by overinstrumentation through the apical foramen.
- If overfilling is suspected, do working radiograph prior to searing gutta percha (remove all gutta percha if necessary).
- Treatment – mainly surgery (apicoectomy).
Vertical Fracture

Can be caused by condensation forces during obturation (rare)
Procedural Accidents During Post Space Preparation

- Misdirected post preparation
- Perforation
- Prevention
  - Examine radiograph carefully
  - Use heat to remove coronal gutta percha – to guide post drill
Procedural Accidents During Post Insertion

Use of an excessively large post, leading to vertical root fracture
Treating the Wrong Tooth
Discussing Procedural Accidents With Patients

- Be honest / Look them in the eye
- Review your informed consent form
- Inform them about the accident
- Tell them how prognosis is affected
- Discuss procedures necessary for correction
- Consider referring the patient
- Help them financially (depends on the issue)
- Call your malpractice carrier for advice
Questions?
Thank You!

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