Optimizing endodontic treatment: Best practices and strategies to optimize success and minimize malpractice risk

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A successful root canal procedure relies primarily on strategies that optimize preoperative preparation, risk assessment, patient-clinician compatibility, accurate pulpal and periapical diagnosis, treatment planning, informed consent, treatment plan execution, post-endodontic restorative planning and treatment, and appropriate referrals as needed. Secondary but essential strategies include achieving absolute pain control with local anesthesia and other means as necessary. In contrast, unsuccessful procedures often omit one or more of these elements and generally suffer from poor planning and execution.

As an expert witness and consultant in dental malpractice cases involving general dentistry and endodontics for many years, the author has identified recurring patterns of omissions and errors in clinical technique. These not only contribute to treatment failure but also underpin virtually all malpractice allegations. Adhering to high standards in managing primary and secondary treatment strategies significantly reduces the risk of both clinical failure and legal claims and optimizes the chances of clinical success.

This article provides clinical recommendations that align with the legal standard of care while embodying best practices in endodontics.[1] Ignoring these steps increases the likelihood of preventable failure and substandard care. As a foundation, two fundamental principles merit review and discussion. These two principles are the standard of care and who establishes this standard. The standard of care is defined as the treatment that a skillful, reasonable, and prudent clinician would provide in similar circumstances, and this standard is determined at two levels. Endodontic specialists set the national benchmark, reflecting what a competent endodontist or endodontic clinician would do in the given scenario under similar circumstances, and ultimately the legal standard of care is whatever a jury decides in a malpractice trial given the circumstances.[1,2]

Endodontic treatment — whether initial orthograde therapy or retreatment — divides into three equally critical segments: preoperative, operative, and postoperative. For instance, a flawlessly cleaned and shaped canal (operative phase) offers no benefit if performed on the wrong tooth (preoperative error) or if the tooth lacks a proper coronal seal (postoperative error).

PREOPERATIVE PHASE

The endodontic examination must systematically include:

- Recording the chief complaint in the patient's own words.
- Assessing and documenting percussion, palpation, mobility, and probing depths of the suspected tooth and control teeth for comparison.
- Performing and recording thermal pulp testing (hot and cold as indicated) *(Figs. 2A-C)*.
- Documenting symptoms, including frequency, duration, nature (sharp or dull), origin (thermal, chewing, spontaneous), and pain relievers.
- Noting relevant findings, such as caries, restorations (including depth relative to the pulp chamber), short or tipped/rotated roots, internal/external resorption, calcification, root curvature, open apices, coronal/vertical fractures, canal/root number, posts, prior obturation quality, iatrogenic events, and anatomic variations.
- Evaluating strategic tooth value and restorability *(Fig. 1A-B)*.
- Reviewing and documenting an x-ray survey (2D radiographs or cone-beam computed tomography [CBCT]) for bone support (periodontal status), apical bone (lesions, abscesses), and proximity to vital structures *(Fig. 3)*.
- Assessing periodontal tissues beyond bone status, including gingival findings (abfractions, mucogingival defects, attached tissue loss, inflammation, poor hygiene, etc.).

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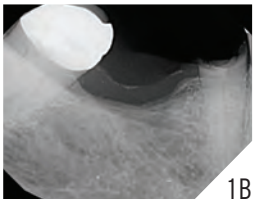
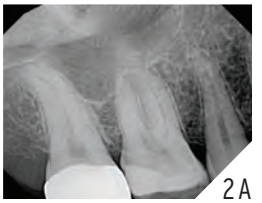
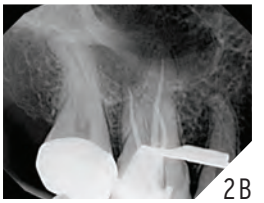
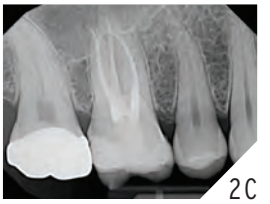
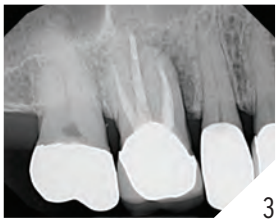










1AB. The lower right first bicuspid was treatment planned for RCT and creation of a new bridge. After IV sedation, sectioning of the bridge, and caries control #28 was deemed non restorable. The case was referred from a general practitioner to an endodontist who performed the caries control. Alternatively, with optimal treatment planning, this tooth should have been scheduled for extraction at the outset. **2ABC.** The patient could not determine if the pain he was experiencing to hot, cold, and chewing was coming from the upper right second molar or upper right first molar. Thermal tests helped determine that the upper right first molar was the offending tooth. Note in Figure 2B that a master cone fit x-ray has been exposed to assure the placement of gutta percha to the desired canal length. **3.** The "tunneling" defect at the mesial, combined with a probing on the MB to the apex of the MB root assures that the MB root of #3 is vertically fractured. A CBCT could be taken to confirm the diagnosis if desired. This tooth needed immediate extraction.

- Confirming review of the medical and dental history prior to treatment.
- Identifying history-related factors affecting root canal candidacy (e.g., limited opening, anxiety, gagging) that may warrant referral.
- Ruling out non-odontogenic pain sources.
- Documenting unrelated oral pathology (soft/hard tissue).
- Establishing a pulpal and periapical diagnosis (or differential) to guide therapy.
- Noting any specialist referrals.

This systematic approach prevents diagnostic errors and confirms the correct tooth, its condition, and suitability for treatment.[3] Vague notations like "caries into the pulp" or omitting periapical interpretations fall below the standard of care, depriving the clinician of critical insights (e.g., vertical fractures, periodontal loss, fracture risks, post placement safety).[3]

Additional preoperative cornerstones include:

Informed Consent: This must detail the procedure, expected success rates, and potential complications. Abbreviations like "PARQ" or lengthy jargon-filled forms do not suffice; patients require clear information to make educated decisions.[4] Actively listen to concerns (e.g., inability to recline, limited opening, numbness difficulties, prior trauma). Self-assess: Can I treat this patient and tooth? If not, refer.

Pain Control and Sedation: Endodontics on severely inflamed pulps in anxious patients is challenging. Prioritize absolute anesthesia via meticulous techniques, including intraosseous injections alongside blocks.[5] Administer slowly and gently to minimize anxiety and systemic epinephrine. Verify numbness preoperatively with patient feedback and cold/percussion tests. For profound anxiety, consider IV sedation (preferred by the author over oral sedation for titration and reversibility) or referral.[5]

OPERATIVE PHASE

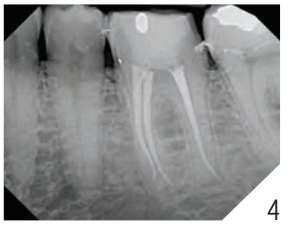
Collectively, these sequential steps enhance success and minimize iatrogenic events (e.g., perforations, transportation, blockages, separations).[6]

- Mark the tooth pre-rubber dam to confirm identity, especially in crowded arches.
- Estimate working length pre-operatively via radiographs for apex locator comparison.
- Use new, substrate-appropriate burs (e.g., water-cooled diamonds for porcelain). Avoid lateral cutting until the chamber floor is located to prevent weakening the tooth circumferentially. Employ a surgical operating microscope for 3D visualization, particularly with limited access.[6]
- Rubber dam isolation is the legal and clinical standard, reducing contamination and errors.[7]
- All perforations are preventable; the pulp chamber is darker than dentin, and canals align symmetrically with external anatomy. Preoperative imaging (2D or CBCT) reveals canal count and position (e.g., MB2 often mesial to the MB1-palatal line).[3,7]

Universal shaping strategies to avoid iatrogenic misadventure include:[6]

a. Remove coronal restrictive dentin before middle/apical thirds, avoid rushing apically.
b. Negotiate with small hand files (#6–10) to confirm patency.
c. Pre-curve hand files for expected curvatures to aid negotiation.
d. Confirm working length early via apex locator at the tactile "pop" or estimated length.
e. Validate the working length with bleeding paper point measurement.
f. Always take a cone-fit radiograph.[8]
g. Maintain patency with hand files post-rotary or reciprocation.
h. Inspect NiTi files for deformation after every insertion.
i. Advance NiTi passively (3-4 mm increments).
j. Wipe file flutes frequently, irrigate after every insertion.

k. Patience and tactile control prevent fractures/blockages and maintains the canal path.
l. Frequently rinse the chamber with sodium hypochlorite (NaOCl) to clear debris.
m. Alternate NaOCl (organic dissolution) with liquid EDTA (inorganic dissolution).
n. Use ~30 mL NaOCl and 3–5 mL 17% EDTA per molar.
o. Blended solutions (e.g., chlorhexidine/EDTA) may be appropriate for final rinses.[9]
p. Activate irrigants (standard of care) via sonic, ultrasonic, negative pressure, laser, or mechanical means for superior disinfection over cold passive syringe delivery.[9]
q. Confirm master cone/obturation at the apical constriction (minor foramen) via cone-fit x-ray with sealer.
r. Obturate to confine sealer/gutta-percha coronally; avoid extrusion (e.g., into mandibular canal or sinuses), especially near vital anatomic structures.[6]
s. Place immediate coronal restoration under the rubber dam for optimal seal *(Fig. 4)*.[6]
t. Verify occlusion post-buildup to avoid hyper occlusion *(Figs. 5A-B)*.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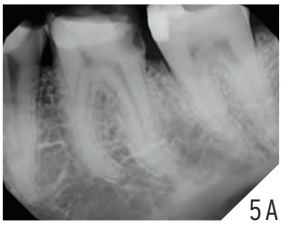
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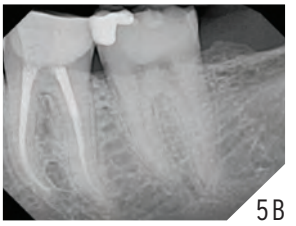
5B

4. Place a coronal seal immediately while the patient is still under the rubber dam. In this case the pre-existing large distal amalgam was removed and replaced with a composite bonded core build up. The distal contact was removed at the time of buildup fabrication. **5AB.** Clinical case managed as per the clinical guidelines suggested in this article.

POSTOPERATIVE PHASE

- Review the final radiograph with the patient, explaining procedures and next steps (e.g., crown placement).
- Provide after-hours contact, written instructions, and recalls at 6 months, 1 year, and 2 years.[10]

Adhering to these steps optimizes outcomes and mitigates liability. A key risk — extrusion of calcium hydroxide or other materials into the mandibular canal causing inferior alveolar nerve injury — is preventable. Determine apex-mandibular canal proximity preoperatively; instrument/obturate 1–2 mm short of the constriction, and, when applicable, limit calcium hydroxide to the coronal half via passive placement.[6,11]

Patients rarely sue trusted, empathetic clinicians. Malpractice cases often involve injured patients with eroded communication, rushed care, inadequate consent, and poor documentation (e.g., often delegated to untrained staff).[11,12] Thorough navigation of all phases, with attention to clinical and the patients' emotional needs (e.g., anxiety), minimizes failures, complications, and claims.

This article aims to equip clinicians with recommendations for superior endodontic care, emphasizing accurate diagnosis, iatrogenic avoidance via careful negotiation/irrigation, and immediate coronal sealing. Questions and feedback are welcome. OH

Oral Health welcomes this original article.

Author's Note: After creation, this paper was reviewed by Grok Ai for clarity and suggested literature references. Final editing, authorship, and article content are entirely the responsibility of Dr. Mounce.

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