

The Foremost Challenge in Endodontics and Pediatric Dentistry

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Anatomical challenges in the field of Endodontics

Many decades have passed and a new year is on the way, and our knowledge continues to grow on the root/root canal morphology which remains the main area of interest for research. Experimental investigations using ground sections, staining and clearing, conventional radiographic and micro computed tomography together with clinical surveys using two and three-dimensional imaging modalities always refer to “complexity” and “variability” to describe the morphology in human primary and permanent dentition [10, 2]. Despite these valuable documentations, the situation, unfortunately, is different when the subject comes into clinical practice, and the increased prevalence of missed canals continues to be the main cause of Root Canal Treatment (RCT) failures [8, 7, 4].

The logical question now is “How can we minimize the prevalence of missed roots/root canals to provide the best clinical outcomes to our patients?”. What are the guidelines that should be followed to locate the main and accessory root canals?. It is hoped that the following guidelines would highlight contemporary recommendations that should be followed by dental practitioners to prevent the undesirable consequences when a tooth scheduled for RCT is left with a missed anatomy.

Identification landmarks

i) Pre-operative assessment

Ignorance of the absolute confidence of the pre-estimated number of roots and root canals is an important “psychological tip”. Knowledge of normal and unusual anatomy, good anticipation and clinical thoroughness are essential requirements for practicing successful endodontic practice [6]. Proper clinical observation of coronal (size, number of cusp(s), presence of grooves or invaginations) and radicular (bifurcations or grooves) landmarks is essential for the detection of accessory roots/root canals. Good quality preoperative radiographs with more than one horizontal projection aid in the accurate detection of pulp canal space and periodontal ligament outlines, thus facilitating the interpretation of internal and external root anatomy. Magnifying devices during interpretation of radiographs are advantageous as some invisible details may become obvious once magnified. Cone beam computed tomography is a three-dimensional diagnostic modality that may be useful when conventional radiographs provide limited information and further details need to be identified [1, 4, 5, 6].

ii) Intra-operative assessment

Complete removal of the roof of the pulp chamber during access cavity preparation allows a full view of the internal anatomy of the pulp space. Careful visualization under assisted magnification and exploration of the pulp chamber floor and walls with an endodontic explorer and/or small k-files (# 8 or 10) (in addition to troughing the grooves between orifices using long shank small round burs or ultrasonic tips, if

indicated) can facilitate the detection of normal and accessory anatomical variations [4].

If one orifice was left undetected during access cavity preparation, the orifice can be further located during mechanical instrumentation by recognizing a bleeding point or remaining soft or calcified tissue below a de-roofed area. Small bubbles produced while using sodium hypochlorite as an irrigating

solution may indicate the extra canal orifice. A “catch” on the way towards the apical foramen may indicate the presence of an accessory canal orifice (Figure 1). Some of the other landmarks could be the eccentric location of an endodontic file on a radiograph during working length determination and inconsistent apex locator readings [4, 6].

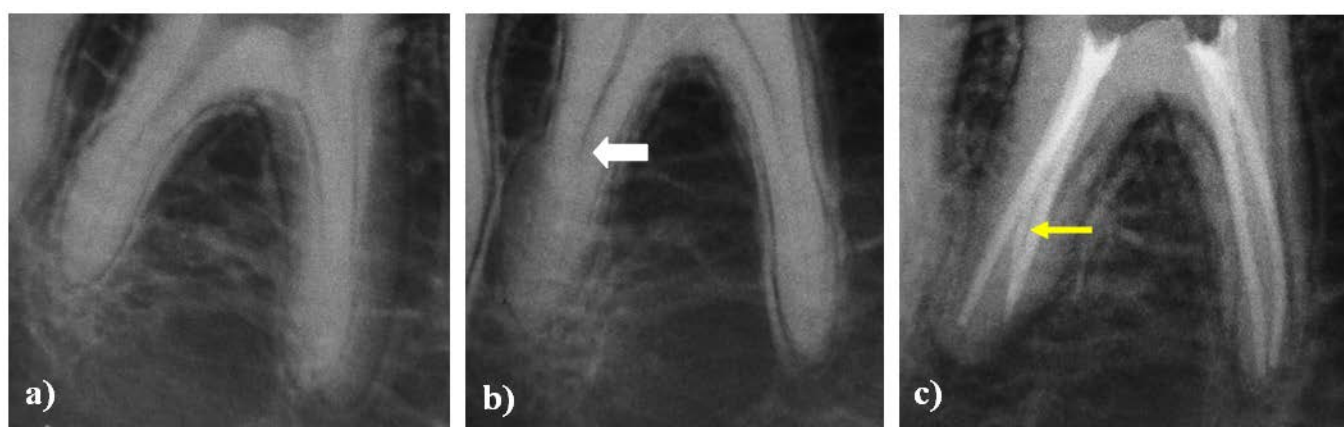


Figure 1: The importance to correlate the radiographic interpretation with clinical exploration. a) Periapical radiograph showing a single root canal in the distal root of a mandibular molar (no evidence of bifurcation). b) A “break point” was evident after changing the horizontal angulation (white arrow), and two separate root canals were detected in the distal root. During clinical exploration, a third middle distal root canal (yellow arrow) was identified (total number of canals = five).

iii) Post-operative assessment

Even when one canal was left untreated during mechanical instrumentation, the canal can be further located after obturation. Obturation material (root canal sealer and thermoplasticized gutta percha if applied) can propagate from the filled canal into the missed one through inter-canal communications, if present, and appear in the post-operative radiograph as a radiopaque line connecting to an empty space. Therefore, the outline of the filling material inside the root canal system should be examined carefully after obturation.

Anatomical challenges in Pediatric Dentistry

Total pulpectomy in primary teeth has been controversial since the question “Should deciduous teeth with non-vital pulps be treated?” was raised by Kabnick in 1933. The negative attitude toward complete pulpectomy in primary teeth, especially molars, is mostly due to fear of damage on the developing permanent tooth buds, as well as the difficulty in negotiating and filling the tortuous and bizarre morphology of the root canal systems encased in roots programmed for uneven physiologic resorption [3]. A number of dental practitioners prefer extraction of deciduous teeth having necrotic pulps with or without periapical affection and placement of space maintainers because of these anatomical challenges. However, no better space maintainer can substitute the primary tooth [3].

Attention should be given when total pulpectomy is indicated in the primary dentition, especially molar teeth, which also show considerable variations in the root and root canal morphology [3]. Notably, primary molars may have accessory roots, and encase up to six canals [2,3]. Unfortunately, the literature on the prevalence of, and the correlation between, a

missed root and/or root canal anatomy and failure in RCT of primary teeth is scarce [3].

Proper preoperative examination and intra-operative exploration of primary teeth scheduled for total pulpectomy procedures are essential to identify such anatomical aberrations in the root(s). The dental operating microscope can be used adequately with cooperative children. Proper management of the patient paves the way for safe and effective pulpectomy procedures in primary teeth [3].

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