

The New Era of Foramenal Location

Predictable endodontic success demands accurate determination of, and strict adherence to the preparation length of the root canal space in order to create a small wound site and good healing conditions.¹ Each portal of exit (POE) on the root face has biologic significance; this includes the furcal canals of bifurcations and trifurcations, lateral and accessory arborizations and the myriad of apical termini (Fig. 1a–d).

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The ability to distinguish between the inner-most (physiologic/histologic foramen) and outer-most (anatomic foramen) diameters of the apical terminus is essential to the creation of the Apical Control Zone.² The Apical Control Zone is a mechanical alteration of the apical terminus of the root canal space that addresses the rheology of thermolabile filling materials, offering resistance and matrix style retention form against the condensation pressures of obturation (Fig. 2a–c).

late that optimal success rates occur when instrumentation, debridement, disinfection and obturation are contained within the region of apical narrowing (bracketed by the minor apical diameter and apical foramen).^{5,6,7} In teeth/roots with apical periodontitis (AP) for example, a millimeter loss in working length can increase the chance of treatment failure by 14%.⁸ The Toronto Study noted that the highest healing rate differential (15%) was observed in teeth with AP that were most likely overinstru-



Fig. 1a: Arrows indicate multiple POE's associated with the mesial-buccal and distal-buccal apices of a maxillary first molar. – Fig. 1b and c: The complexity of the root canal system has been graphically evidenced since the work of Hess in the 1920's. Radical improvement in materials and techniques are now enabling the clinician to replicate that complexity as evidenced in the cleared specimen (Fig. 1b) and the radiograph (Fig. 1c) (courtesy of Dr. William Watson). – Fig. 1d: The number, shape and diameter of the physiologic foramina at the root apex mandate the continuing pursuit of excellence in endodontics through increased sophistication in materials and methods and the alliance of scientific innovation and clinical acumen. From Gutierrez and Aguayo, OS, OM, OP June 1995.

The determination of the instrumentation finishing level is one of the primary factors associated with the resolution of an endodontic infection both clinically and histologically.^{3,4} The majority of studies postu-

mented resulting in transportation of contaminated debris periapically.⁹ The evidence is indisputable that electronic root canal length measuring devices provide significantly more accurate results than radiographs^{10,11} and therefore offer greater control of the creation of the Apical Control Zone.

In 1942, SUZUKI discovered that the electrical resistance (single current source) between an instrument inserted into a root canal and an electrode attached to the oral mucosa registered a consistent value. In 1962, SUNADA using a direct current device with a

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