Hermetic sealing of the apical foramen or foramina by the introduction into the root canal of an obturating material that can be well compacted is essential to a successful outcome in endodontic therapy. It is equally recognized that the first requisite a root canal must have to allow a good obturation is the continuously tapering conical form, with cross-sectional diameters progressively diminishing in a corono-apical direction. This can be easily achieved in mature permanent teeth in which there is an apical constriction and the canal tends to be wider coronally than apically.

Teeth with immature apices do not have this apical constriction; instead, the foramen is very wide (Fig. 29.1A). The canal walls can be parallel or even diverge corono-apically, depending on the degree of maturity. In the latter, so-called “blunderbuss” canal, the apical foramen is even wider than the widest portion of the canal, so that its shape is exactly the opposite of that required (Fig. 29.1B, C).

Clearly, with such an endodontic anatomy it is not possible to compact any canal obturating material without gross excesses of material beyond the apex; it would be tantamount to trying to obturate a second-class cavity without matrices.

Fig. 29.1. A. Upper premolar extracted for orthodontic reasons before the root completed its development. B. Histological section of a tooth with an immature apex. Note the divergence of the canal walls in the apical portion. C. Detail of the preceding figure (Courtesy of Dr. N. Perrini).
Therefore, when as a consequence of caries or trauma, endodontic therapy of a tooth with an immature apex becomes necessary, prior to undertaking routine therapy, one must stimulate the maturation of the apex or the formation of a “matrix” against which the obturating material can be compacted in the traditional manner.

At this point, one must distinguish between teeth with immature apices and vital pulp and teeth with immature apices and necrotic pulp, as the treatments differ. The importance of careful case assessment and accurate pulpal diagnosis in the treatment of immature teeth with pulpal injury cannot be overemphasized. Clinical assessment of pulpal status requires a thorough history of subjective symptoms, careful clinical and radiographic examination and performance of diagnostic tests. As far as the radiographic examination is concerned, the clinician should remember that its interpretation can be difficult. A radiolucent area normally surrounds the developing open apex of an immature tooth with a healthy pulp. It may be difficult to differentiate between this findings and a pathologic radiolucency resulting from a necrotic pulp. Comparison with the periapex of the contralateral tooth may be helpful. On the other hand, the clinician should also remember that vitality testing in the immature tooth is inherently unreliable as these teeth provide unpredictable responses to pulp testing. For all these reasons sometimes to make a correct diagnosis could be difficult, but it is hoped that combining the results of the history, examination and diagnostic tests, an accurate clinical diagnosis of pulpal vitality can be made in most cases.

When the pulp is deemed vital, apexogenesis techniques can be attempted. A necrotic pulp condemns the tooth to apexification. The two treatments differ, but share a final common goal: establishing in the apical region an anatomy that permits conventional canal obturation without overfilling.

APEXOGENESIS

“Apexogenesis” (Fig. 29.2) refers to a vital pulp therapy whose goal is to preserve the vitality of the radicular pulp, particularly the apical pulp, so as to allow continued physiological development and formation of the root end, in particular the closure of the apex (Fig. 29.3).