Use of Cone-Beam Computed Tomography in the Diagnosis and Treatment of an Unusual Canine Abnormality

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Case Report

A 24-year old male presented to the Oral Medicine Department of the Government Dental College in Kozhikode, Kerala, India, in 2015 with a complaint of pain in his right upper canine of four days’ duration. His medical and family history was normal. He had previously undergone an unsuccessful root canal treatment, after which he had been referred to an endodontic specialist. Clinically, the crown of the canine appeared to have a normal morphology with evidence of an access opening in the palatal aspect. On palpation, the attached gingiva of the canine revealed a depression 5 mm apical to the gingival margin, very close to a bony prominence. The patient reported that the tooth was tender upon percussion.
A digital periapical radiograph of the tooth showed a canine with a short blunt root and attempted root canal preparation with inadequate access to the cavity. The apical third of the root appeared to be superimposed by the crown of an impacted supernumerary tooth [Figure 1A]. Additional exposure with 10–15 degree changes in horizontal angulation revealed only minimal changes in the position of the supernumerary tooth. In accordance with ‘as low as reasonably achievable’ principles, CBCT of the maxilla was performed at a dose of 19 µSv (CS 9300 System, Carestream Health Inc., Rochester, New York, USA). The axial, sagittal and transverse CBCT reformations were inspected using 0.16 mm slice thicknesses. Interestingly, this revealed that there was no supernumerary tooth; instead, the radicular portion of the canine was malformed, with a sharp invagination on the labial aspect of the middle-third of the root involving the labial and pulpal dentin surfaces, giving the appearance of a dens in dente. The entire tooth measured 27.2 mm from the cusp tip to the end of the root, with the invagination 17.1 mm from the cusp tip. In addition, there was an ill-defined radiolucency in the apical and palatal aspect of the apical third of the root, suggestive of periapical bone destruction [Figure 1B].

Subsequently, an access opening to the tooth was secured via the palatal aspect and the canal was negotiated up to the root tip. Biomechanical preparation was performed until the measured length of the invagination and a dentin substitute (Biodentine®, Septodont, Paris, France) was inserted. Two weeks later, a labial full-thickness rectangular mucoperiosteal flap was elevated following the administration of local anaesthesia using 2% lidocaine and 1:100,000 adrenaline. There was evidence of dehiscence in the apical third of the root. The labial cortical plate coronal to the dehiscence was explored, exposing the sharp indentation on the middle third of the root. A blunt resection at 45 degrees was performed at the level of the invagination, with the resected end then filled with the dentin substitute (Biodentine®, Septodont). The surgical bed was rinsed with saline and the flap was secured with sutures.

Postoperatively, the retrograde filling was assessed using radiography. The resected end was subjected to ground sectioning and light microscopy revealed normal-looking dentin and cementum. At a one-year follow-up, the patient was asymptomatic and a periapical radiograph showed healing of the periapical region [Figure 1C].

Discussion

Radiographically, the accuracy of detection of the number and morphology of root canals greatly depends on the angulation of the incident X-ray beam and the superimposition of any adjacent structures. Conventional radiography merely displays a two-dimensional (2D) image of a three-dimensional (3D) structure; as such, intra-oral periapical radiographs only highlight features in the mesiodistal plane and it is often difficult to visualise the buccolingual dimension of the tooth. However, with the advent of volumetric computerised tomography or CBCT, visualisation of a tooth in all dimensions is possible. These newer imaging modalities provide faster results and greater image resolution, making diagnosis and treatment planning easier.

The current case described a patient who presented with pain in the right upper canine. On periapical radiography, the root of the canine appeared extremely short and blunt, with the apical third seemingly superimposed by the crown of an impacted...
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Conclusion

Conventional intra-oral radiography reveals an image of a tooth in two dimensions, with limited information regarding its spatial relationships with other anatomical structures in the third dimension. This may potentially result in inaccurate diagnoses and unnecessary or inappropriate treatments. For endodontic patients, treatment planning should be based on a comprehensive evaluation using all diagnostic modalities available, including newer 3D imaging techniques, particularly in cases where conventional imaging is inconclusive.

References