The utility of cone-beam computed tomography in endo

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Following what seemed to be a root canal failure in tooth No. 14 based on clinical and radiographic diagnosis with a conventional two-dimensional periapical radiograph (Fig. 1), the patient was considered for referral for an endodontic consult. At this stage, several treatment options were contemplated: apicectomy and retrograde filling; palatal root amputation; and possible extraction. This diagnostic and treatment planning protocol is fairly common in dentistry.

However, although no clinical evidence was reached at this stage and periodontal disease is frequently the result of apical progression of periapical disease, at times it is derived from endodontic disease. A perio-endo lesion can have a varied pathogenesis, that is, a periapical lesion, root fractures and/or root canal perforation. Although perio probing surrounding tooth No. 14 was done in this case, there was no evidence for furcation or apical progression of periodontal disease.

As a matter of fact, already in 1997 it was found that only one out of 14 furcation defects in the maxillary molars was seen on periapical radiographs because of overlapping roots, whereas medical CT scans were able to identify all furcation defects. Moreover, in 2008 it was found that CBCT showed significantly more lesions than periapical radiographs. Given the recent CBCT extended diagnostic capacity as it pertains to endodontics, the treating dentist made a decision to take advantage of this three-dimensional diagnostic modality and the patient was referred for a CBCT.

As is described in this case report, some root canal treatment failures sometimes go unnoticed, and therefore it behooves us to familiarize ourselves with the diagnostic capacity of CBCT as it pertains to endodontic complications vs. conventional periapical radiographs.

Dentists’ ability to assess the anatomical area of any tooth utilizing conventional periapical radiographs that are known for superimposition of anatomical structures is very limited, whereas their ability to assess the anatomical area of interest utilizing a three-dimensional CBCT is almost unlimited. After performing a CBCT utilizing an i-CAT™ 5D CBCT (Imaging Sciences International, Hatfield, Pa.) to evaluate tooth No. 14 and its surrounding anatomy, it was determined that there was an endo-perio lesion on the mesio-lingual aspect of the palatal root.

The CBCT study included cross-sectional slices of tooth No. 14 at 0.5 mm intervals, revealing endo-perio communication and demonstrating that the periapical disease extended toward the sinus and into the tri-furcating area, and caused bone resorption extending up to the palatal gingival margin (Figs. 2, 5).

The patient was then referred back to the referring dentist in order to re-probe the mesio-lingual aspect of tooth No. 14. During the initial examination, the periodontal probing depth was only 5 mm. After the i-CAT was reviewed, the patient was re-probed in an attempt at communication with the endo lesion.

The periodontal probe was inserted from the lingual aspect in a buccal direction to about 5 mm and then re-directed to a palatal direction reaching a depth of 11 mm.

This indicates that on routine periapical probing, an endo-perio lesion may not be diagnosed because the osseous defect does not always occur in a perfect matching path to the long axis of the tooth. A pre-curved gutta-percha point size 40 was then inserted in the same direction and a new periapical radiograph confirmed the osseous endo-perio defect (Fig. 4).

Once the endo-perio communication was confirmed, a referral to oral surgery was generated for extraction of No. 14 with bone grafting in preparation for a future dental implant.

Conclusion
As was described in this case report, some root canal treatment failures and associated dento-alveolar pathologic defects sometimes go unnoticed and/or misdiagnosed. Therefore, it is essential for us to familiarize ourselves with the diagnostic capacity of CBCT as it pertains to endodontic lesions diagnosis and associated complications vs. the use of conventional diagnostic periapical radiographs.

This would certainly lead to better diagnosis and treatment planning. This is besides the fact that CBCT offers considerable scan-time and radiation dose reduction compared to a medical CT.

Fig. 1: Based on clinical and radiographic diagnosis with a conventional two-dimensional periapical radiograph, the root canal in tooth No. 14 seemed to be failing.

Fig. 2: By utilizing the i-CAT 5D CBCT (Imaging Sciences International, Hatfield, Pa.), an axial view of tooth No. 14 was obtained that demonstrated a mesial lingual bony defect.

Fig. 3: The CBCT study includes cross-sectional slices of tooth No. 14 at 0.5 mm intervals, and revealed endo-perio communication demonstrating that the periapical disease extended toward the sinus into the tri-furcating and buco-incisally.

Fig. 4: Conventional periapical radiograph with a gutta-percha point in the mesio-lingual aspect of tooth No. 14, demonstrating an 11 mm endo-perio communication. In this case, the periapical disease is occurring secondary to the endo lesion.

Fig. 5: Cotton TP, Geisler TM, Holden DT, Schwartz SA, Schindler WG. Endodontic applications of cone-beam volumetric tomography. J Endod 2007;33(9):1121-32.

References

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