CBCT For The GP

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With the advent of cone beam computed tomography (CBCT), a new imaging world has opened up. Dentists are now able to assess bone structure, bone composition, root canal configuration, and oral pathologies to a degree never before attainable. In the recent past, this imaging capability has mainly been utilized by specialists but is now within reach of the general practitioner.

With the recent explosion of the dental implant market and the arrival of Nickel Titanium endodontic files, many general practitioners have been performing more complex procedures. As such, it is imperative that we have the proper tools to provide for a successful treatment outcome. A CBCT machine provides the dentist with the necessary diagnostic capabilities to confidently treat and manage cases by understanding the anatomy in greater detail. Three cases are presented which show the range a CBCT machine offers in a general practice dental setting.

Case 1: Wisdom Tooth Removal

A 27 year old male presents for removal of wisdom tooth #17. The tooth was mesially inclined and causing decay in the distal of tooth #18. Radiographic examination revealed that the mesial roots of the tooth were in close proximity to the inferior alveolar nerve. A CBCT scan was taken to properly evaluate the relationship of the tooth to the mandibular canal before surgery (fig.1).

Upon review, it was confirmed that the roots of the tooth were adjacent to the mandibular canal. The scan was then viewed in the tangential, cross sectional and axial slices to establish the exact distance between the roots and the canal. The mesio-buccal root was lying very close to the superior aspect of the canal, but not in communication with the canal.

Based upon the information obtained from the scan, it was determined that the tooth could be removed safely without impinging on the nerve. The CBCT provided information that otherwise would be difficult to ascertain utilizing a traditional radiographic approach. By utilizing the CBCT scan, the exact relationship of the tooth and nerve was established in advance. The tooth was carefully sectioned and successfully removed with no post-operative complications (Fig. 2).

Case 2: Root Canal Therapy

A 29 year old female presented complaining of thermal sensitivity, pain on biting and eating hard foods on tooth #31 that she had for six months. A clinical exam revealed a fracture of the distal marginal ridge with underlying decaY (FIG. 3). The application of cold produced a lingering pain and the patient had pain upon biting. A standard radiograph revealed no periapical abnormalities.

The patient was informed that there was a crack in the tooth and the prognosis was guarded. Treatment choices were discussed in length. After the patient had time to deliberate the options, she wished to proceed with root canal therapy and a temporary crown, and would allow approximately six months time to evaluate healing.

Upon accessing the tooth, it was noted that the traditional Y-Shaped canal system was missing. The tooth appeared to have a C-Shaped configuratioN (Fig. 4). To insure that no anatomy was missed and the entire root canal system would be properly cleaned and obturated, a CBCT was taken.

The axial view of the scan shows a clear difference in root canal configuration between tooth #30 and #31 (Fig. 5). The tooth exhibits a Class II C-shaped classification at the coronal aspect and diverges into a Class III-D (based on Melton). The entire canal system can be visually inspected millimeter by millimeter slice with the aid of CBCT, thus allowing the dentist to confidently treat the case. Once the anatomy was discerned, the root canal procedure was able to be completed to a satisfactory result (Fig. 6).

Case 3: Implant Placement

A 35 year old male presented requesting an implant to replace tooth #31. The tooth was extracted seven months ago. The patient reported that bone grafting had been performed and was now ready for implant and restoration.
A CBCT was taken to determine the position of the mandibular nerve and to assess the bone quality (Fig. 7).

The scan demonstrated the position of the mandibular canal, the density of the bone and the successful, yet immature placement of bone graft material. The scan yielded far more information than a two dimensional radiographic survey and allowed for a more comprehensive pre-surgical planning which included the selection of the implant site and hardware. The site analysis included inspecting the thickness of bone at the reception site. The scan demonstrated good bone contours of both the lingual and buccal plates thus reducing the chance of a dehiscence or fenestration during implant placement. Nerve mapping to determine the distance from the height of the bone to the nerve was also easier and was accomplished with greater confidence. It was determined that the bone quality was still slightly immature, and that there was approximately 12 mm distance from crest of the ridge until the canal (Fig. 8). Given that the bone was still undeveloped, an underprepared osteotomy approach was taken. Knowing the exact location of the nerve allowed for safety measures to be taken not to impinge on the nerve. From the CBCT a surgical stent was fabricated to provide for the exact placement of the implant. A 5.2x10 mm implant (Legacy III, Implant Direct) was subsequently placed with good primary stability (Fig. 9). Post operative healing occurred without event.

As general dentists we have the ability to perform many diverse procedures in our office. A CBCT machine is versatile and can play a role in many aspects of dentistry. By utilizing this valuable technology, we are able to decrease the uncertainty associated with the procedure while enhancing our treatment outcomes, thus providing a better standard of care to our patients.