Implant PRACTICE·US

Clinical

Implant placement aided by CBCT

Dr. John Russo illustrates how CBCT facilitated decisions for bone grafting and implant placement

A 63-year-old, healthy woman was referred for a localized 7-mm pocket on tooth No. 4. She had undergone previous orthodontic treatment involving upper bicuspid extractions. The preoperative periapical radiograph revealed a radiolucency where tooth No. 5 had been previously extracted. On the 2-D x-ray, no bone loss was visible on tooth No. 4 (Figure 1), but the clinical exam showed that tooth No. 4 had a localized 7-mm pocket on the facial. This tooth had already undergone endodontic therapy and had received a post and crown.

The clinical impression was that tooth No. 4 had a vertical fracture. The treatment plan entailed extraction of tooth No. 4 with particulate grafting of the socket and, at the same time, removing the retained part of the root in the No. 5 area. If the patient had not chosen to receive an implant, the remaining root may have been left in place, but in light of the possible complications during the implant process, it was decided to remove the retained root. The patient could have opted for a bridge; however, the anterior abutment is a virgin tooth and a cuspid. When I explained that an implant would be a good option to avoid preparation of this virgin tooth for future hygiene and dental care, she chose to proceed with the implant. With the combination of the data derived from my CBCT scanner (Figures 2 and 3) and the proper grafting materials, we embarked on the implant process, with all of the information necessary for a successful outcome.

The i-CAT® (Imaging Sciences International) 3-D scan, collimated and taken at 8.9 seconds (scan time), was integral in defining how to remove the retained root. Based on the data obtained by a cross-sectional view, it was determined that the retained root tip was located in the center of the bone. This provided two options: attempt to access the root tip through the socket of tooth No. 4, but, to be more definitive, it was decided on the second option—to make two vertical-release incisions, reflect a full-thickness flap, and extract tooth No. 4. Then, remove all the granulation tissue to create an apicoectomy-type hole in the bone, and through that apico access, the root could be directed through the socket of tooth No. 4 (Figures 4-6). Half of the bone at the apex of tooth No. 4 was left, and a strut between the extraction site of tooth No. 4 and the apical access for tooth No 5 was left intact.

Figure 1: Pre-extraction periapical radiograph showing tooth No. 4 (endo/fractured) and retained root tip No. 5

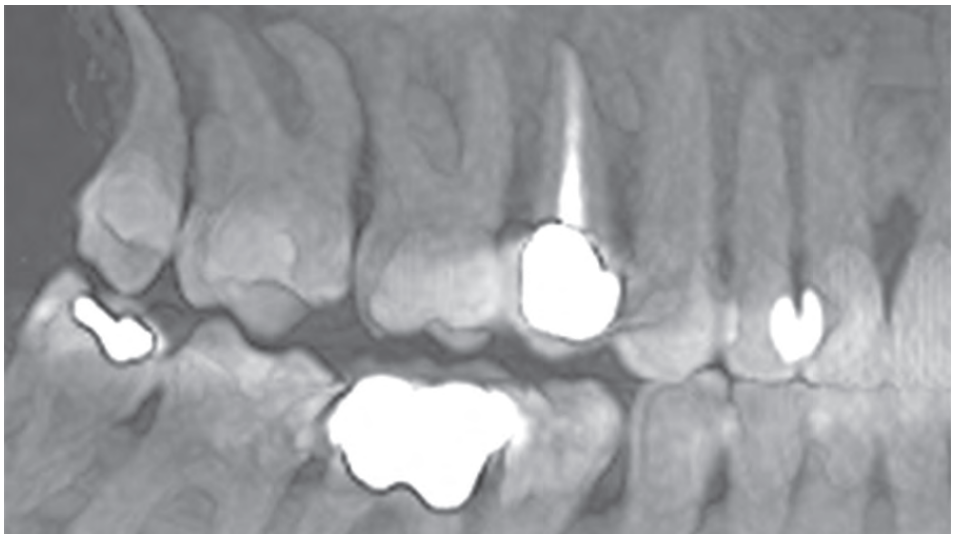

Figure 2: The CBCT panoramic view of the upper right quadrant

With the cross-section from the CBCT (Figure 3), the ability to measure the width and height of the root tip and determine the proper plan of action to access that root tip simplified the treatment. The cross-section gave me the precise measurement from the buccal-cortical plate to the root tip, steering the access in the best direction for safe, effective, and less-invasive access. There is no comparison to a 3-D view in this instance. Upon viewing the 2-D periapical x-ray, the image had the author wondering, is it artifact? Is it root tip? There was no question about this diagnosis in 3-D.

The 3-D information helped to avoid

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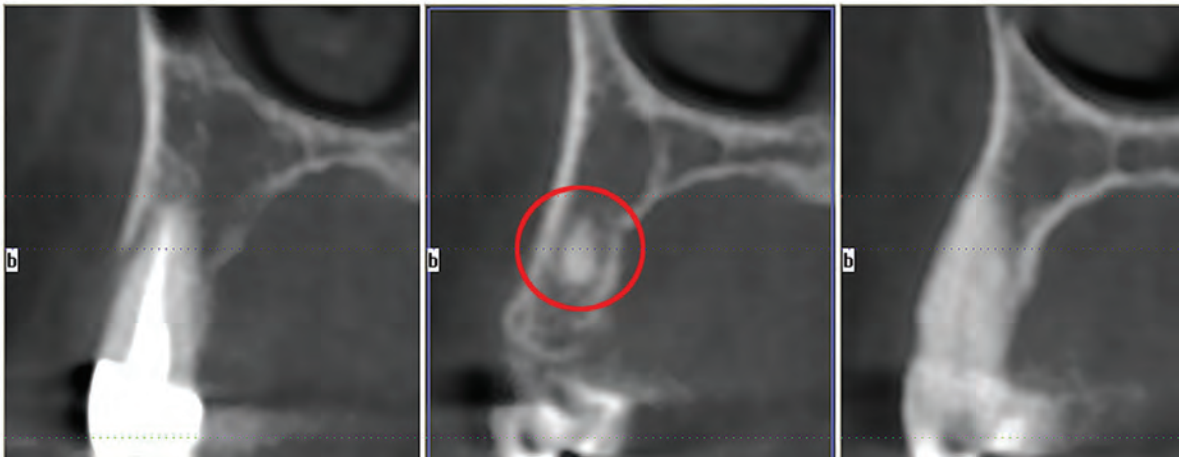

Figure 3: Cross-sectional CBCT slices showing retained root tip from previously extracted tooth No. 5, along with adjacent teeth. Note the lack of bone on the buccal of tooth No. 4

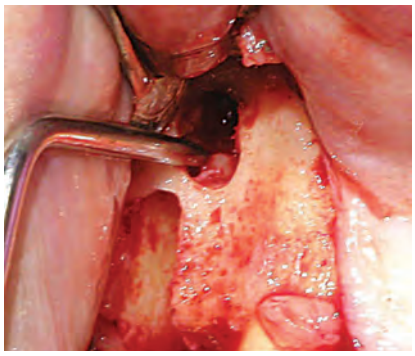

Figure 4: After removing the granulation tissue to create an apico access, the root tip was directed through the socket of tooth No. 4

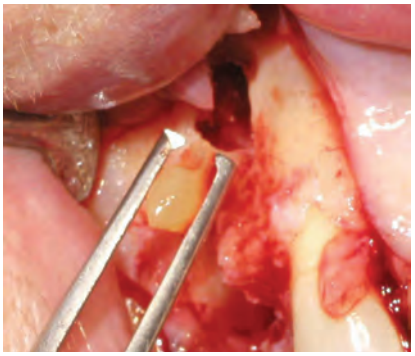

Figure 5: Removing root tip

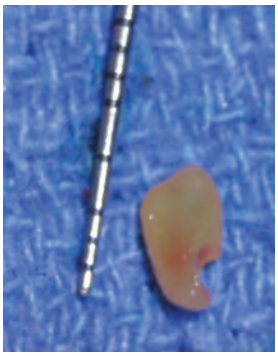

Figure 6: Root-tip size in relation to periodontal probe

possible complications. One of the keys to grafting is space maintenance. The interproximal strut of bone is an integral part of space maintenance to support the buccal cortical plate and prevent collapse of the site. Without this, the tissue will cave into the graft, and the patient can lose bone volume. That potential loss may force the patient to have a second, costly, and time-consuming bone graft. Knowing the exact location of the root tip allowed for exact planning and bone preservation, a big advantage for the implantologist. It is much less stressful to know the exact location of the root tip before surgery, as opposed to searching for the root tip while not knowing if is palatal or facial and losing more bone in the process.

This also allowed for preparation for the bone graft using the 3-D scan as a guide to the best option for grafting that area. With the goal of doing the bone graft only once, MinerOss® (BioHorizons®) allograft, a mineralized cancellous and cortical-bone combination, and a Mem-Lok® (BioHorizons®) membrane were placed over the graft before primary closure (Figure 7). The treatment plan called for several months of healing with a follow-up CT scan scheduled to ensure proper healing prior to implant placement.

Discussion

3-D imaging provides safety for my patients and confidence that the clinician is formulating a good diagnosis before developing a surgical treatment plan. This is especially necessary when measuring width of bone and for sinus grafts, when looking for polyps, septa, mucous retention cysts, and in the mandible making an accurate measurement from the crest of bone to the neurovascular bundle. Before acquiring a 3-D scanner, the author hardly ever placed implants in the mandibular second molar site, but can now calculate the mylohyoid concavity, the depression on the posterior lingual of the mandible, accurately defining the height, and with the help of 3-D imaging software, do a virtual implant placement before surgery. Often, the clinician can place a wide-diameter 9- or 10-mm long implant into that space, without "guessing" the location of the inferior alveolar nerve,

Figure 7: MinerOss® allograft in place

and risking possible permanent parathesia or other long-lasting negative outcomes for the patient.

A surgical implantologist needs the total picture of the many surprises that could be waiting after surgery has already started. Knowing the dimensions of bone and location of teeth and roots are advantageous to both the dentist and the patient—saving the doctor guesswork and the patient the additional time, implant preparation, and implementation. IP