Indications for Guided Implant Surgery: Safety, Predictability and Efficiency

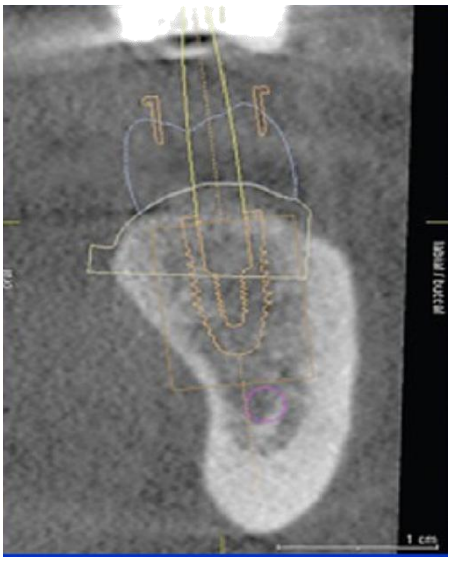
As a periodontist sensitive to the impact of social media, I am exposed daily to a myriad of opinions on dental implants and guided implant surgery. Within the dental profession, there are those who embrace new concepts and those who resist. The field of dental implant has not been immune to radical changes in concepts, technology and management protocols. In the close to 30 years that I have been actively involved in implant site development, bone and gum reconstruction and implant surgery, I have witnessed many such trends arise with great promise only to crash.

The above notwithstanding, resisting change and adhering to the *tried and true* can be equally problematic, limiting and in specific instances, equally as wrong as adopting the newest technological fads to surface. Dentistry as a profession has always been guided by a sense of artistry and innovative technology, but in the end, must be grounded by research supported science.

Guided implant surgery describes a technology that enables doctors the ability to plan all facets of implant surgery virtually and then *accurately* place implants predictably and efficiently. CT imaging technology can be employed not merely in planning, but in the coordination and fabrication of prosthetic (implant mesio structures-abutments, crowns and bridges) elements to thereby facilitate the entire implant treatment process.

Guided implant surgery requires three elements: a patient with a missing tooth (teeth), CT assessment generally involving a radiographic guide and a model -- either stone or virtual of the patient's mouth and jaw on which the surgical guide will be made. The first step involves a comprehensive oral and medical examination to determine whether the patient is an appropriate candidate for implants in general and if so, whether guided implant surgery would provide significant benefits for both the patient and surgeon. For certain patients, a fixed bridge or a removable appliance may represent a better *restorative choice*. Alternatively, specific medical and/or for anatomic factors may reveal that implant treatment is not a safe or predictable option. Specifically with respect to guided implant surgery, certain systems, length of the drills, surgical guides, handles, and required surgical hardware may be too large for a patient with limited opening. (Fig. 1)

Various proponents of guided implant surgery have suggested that the primary rationale for this technique is safety. Surgical guides can be fabricated to include stops that limit drill depth and thus limit the depth of implant placement. Dependant on the clinical situation, a surgical guide may be fabricated to rest on teeth, gums, or bone. Should there however be insufficient stable reference points (ie. teeth) to prevent the displacement of the implant surgical guide stent, a serious concern in such in-stances is the potential for significant surgical procedure errors. This would then negate the concept of precision guided surgery for primarily safety reasons.



A Position Statement from the American Academy of Oral and Maxillofacial Radiology states, "The AAOMR recommends that cross - sectional imaging be used for the assessment of all dental implant sites and that CBCT is the imaging method of choice for gaining this information." Patients in our practice can be reassured to know that throughout my now close to 30 years placing dental implants, I routinely employ CBCT for these very reasons. CBCT represents an invaluable diagnostic tool to maximize patient safety. A conventional dental X-ray is a 2-D representation of a 3-D object. Vital structures (ie. nerves, sinus, blood vessels etc.) maybe superimposed upon one another in a 2- D image. In addition, bone width cannot be accurately assessed with 2-D films. Cross-sectional images provided by CBCT can reveal nerve position, depressions in the bone along with the topography of the sinus floor. CBCT can also assist in defining optimal implant positioning relative to the bony crest, exist angulation of the implant head relative to the proposed restoration and often equally important bone density. (Fig. 2)

The secondary reason for employing CBCT defined guided implant surgery, dependent on the clinical situation, can be predictability. As the periodontist -surgeon, I must assess each patient's specific clinical situation and thereafter extrapolate how the patient will *look* once implants have been prosthetically restored. Without adequately assessing how much gum and bone the patient has lost, it's anyone's guess! An unwavering protocol that I follow is to personally sit down with all patients considering implant treatment and review in a comprehensive manner their CBCT scans. Should limitations in a patient's biology be revealed or their bone prove inadequate, this can be visualized in 3-D. With such an approach, patients gain an improved under-standing of the final result and whether it would be possible for their expectations to be met. In cases where bone and gum loss has occurred, grafting options to improve implant treatment predictability are fully discussed. Cur-rent CBCT software enables creation of virtual teeth so that patients can visualize the final result. As the treating surgeon, I am thus able to better approximate for patients the final outcome of their implant treatment by showing their CBCT scans over laid with virtual implants and teeth.

Finally, implants can in the appropriate case be precisely positioned via guided surgery. Treatment planning can define drill angulations, depths and these factors can be all determined prior to surgery. Shortened surgical time through guided surgery results in profound patient benefits that include reduced anaesthesia, trauma, swelling and pain along with often, faster recovery. The virtual age is here today! As with any technology, we must use it wisely.