Advances in implant dentistry

It usually is simple to place implants; it is often difficult to put them in the right place.

As concepts of implant dentistry have evolved, there has been an increased emphasis on placing the implant in the correct position relative to the final restoration. Our first advance in refining this process was the use of a surgical template. This device originally was used in conjunction with two-dimensional radiographs. A step forward, but not a perfect answer.

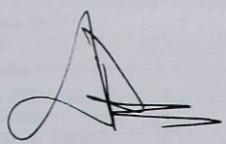
This approach was next fused with computerized tomograms. Specialized software makes it possible to manipulate digitized images of computerized axial tomography (CAT scans) in a computer. It is then possible to plan implant placement digitally. Individual implants can be created, dropped into place, and moved to the appropriate position. Complete digital inventories of most currently available implant systems are stored in the software. This allows those planning the case to see images of the proposed implants and study their relation to each other, the available bone, and contiguous structures.

The advantage of this combined approach is that the case can be preplanned before the case is operated, and in selected situations, the plan can be transmitted to a specialized laboratory that fabricates the surgical template based on the digital plan. There are usually several templates for each case starting with the smallest drill and ending with the largest, thus allowing the operator to be more precise in implant placement.

Anyone who has used either of these approaches knows that they represent an improvement over previously available ways to plan cases. There are, however, drawbacks, including the time and expense to purchase the software, learning its application, as well as the time needed to plan the case. Technical concerns include making sure that the original tomogram is taken in the correct plane and in a form that is compatible with the software of the planning system. Another serious drawback is found in individuals with metallic restorations, which can create scatter on the tomograms sufficient to make the fabrication of surgical templates using the computer impossible. But the most serious drawback is the operator's inability to "see" the drill inside the osteotomy site.

Thus, even in those cases planned using the software, the surgery is still done blindly. One way of overcoming this problem is the use of real-time imaging technology. This technology, currently in its infancy in dentistry, involves the use of a reference plate that is attached to the patient (usually the arch not receiving surgery) and a second reference plate attached to the implant handpiece. These two reference plates are detected by a "camera" that uses laser technology to relate the position of the patient to the position of the drill. This information is then fed back into a central processing unit that contains a copy of the patient's computerized tomogram. These tomograms are similar to those described above with the exception that a specific reference plate is worn by the patient while the tomogram is taken. This reference plate contains markers that will be used to relate the position of the patient's head and handpiece to the appropriate cut of the patient's CAT scan. It is then possible to see a real-time digital image of the relation of the bur to the patient's osteotomy site during surgery.

There are currently a few systems in the world that can perform these maneuvers, and much work needs to be done toward simplification of the process. Additionally, reduction of preparation time and cost involved will make it available to more patients, but this technology clearly is part of a trend that should open up implant dentistry to more and more patients by making surgery simpler for the surgeon.



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