IMPLANTS
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Using Digital Guides to Replace a Missing Tooth with an Implant

By Jeff Lineberry (/spear-review/author/jeff-lineberry/) on December 20, 2017 | (/bookmarks/bookmark/39240)

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Having practiced dentistry for over 17 years now, dentistry has changed a lot! And the technology revolution (not evolution!) has been a huge part of the change. One of the most evolving and thought-provoking pieces of dentistry is our overall ability to capture digital images radiographically, scan intraorally with a digital scanner (as well as with photography) and digitally develop treatment plans that are accurate and predictable.

One area that has benefited tremendously in this aspect is implant (https://www.speareducation.com/spear-review/category/implants) dentistry. Having been involved with restoring implants for over 17 years and placing and restoring them for over 10 years, treatment planning and how we place implants has evolved rapidly.

Traditional methods of dental implant planning

Early on, it was not uncommon to take a PA or panoramic film or maybe even a tomogram and go into a surgery for the placement of dental implants only to find that there was insufficient bone, and bone augmentation was needed. Or maybe the patient went in for placement of a dental implant to your surgeon and came back after it healed, only to find that the implant was in the bone, but it was going to be challenging (if not impossible) to restore in its current position. As technology has evolved, gone are the years of simply taking panoramic X-rays or even tomograms for dental implant planning. Enter the years of 3D CBCT scans.

In the beginning, we could take 3D images and see anatomy like we haven't been able to see before and thus, we could plan more appropriately. We could avoid the dilemma of going into an implant surgery only to find that bone augmentation was a necessity or avoid key anatomical structures. But there was still a disconnect between the bone, the implant and the final restoration desired. Dental implant placement and planning evolved from putting the biggest, longest implant into the bone we had available to dental implant placement being what we now term as being "restoratively-/prosthetically- driven."

In the beginning of this "new" paradigm, we took models, completed wax-ups of the final restorations or duplicated final dentures in clear acrylic and made surgical guides in the lab to help us place the implants in the correct position. Most "guides" during this time were nothing more than a clear stint that we placed over the adjacent teeth and surgery site before, during and after placement to assess the final implant placement. This was a huge step in the right direction, but there was still a lot of room for error in the implant angulation, and the outcome could still be less than ideal.

Uses of technology and digital design for implant dentistry

All of this helped drive technology to evolve and change to what we have now: taking 3D CBCT scans along with a digital scan of the mouth, the model or prosthesis, completing the diagnostic work up and then digitally treatment planning the final implant placement. We can then create a surgical guide that fits accurately in the mouth, has guide sleeves for proper angulation and is designed to help the surgeon place the implants precisely and accurately so they can support the final restoration that was designed. This is now mainstream implant dentistry. Wow!

Now that dentistry has all this awesome technology for treatment planning and designing a surgical guide, we have to ask ourselves: do we need to do all of this for a simple, single tooth dental implant? I mean, how hard could it be to place an implant between two equidistant teeth?

As someone who has done it both ways, I can tell you that once you have used a guide to help you in the placement of dental implants, your confidence and the ease with which you can complete the surgery is well worth the time and investment in the guide, and it's hard to go back! It is not until you have done it both ways that you start to understand how things can become "off" in implant placement when we "freehand" the surgery and the real value of having to complete a digital workup in the implant placement to support the digital treatment plan and create a surgical guide!

I want to share a recent case that I completed on a lower left first molar. When we look at the initial scan, there appears to be adequate bone height and thickness in the area where we desire to replace the missing tooth. (See Figure 1)

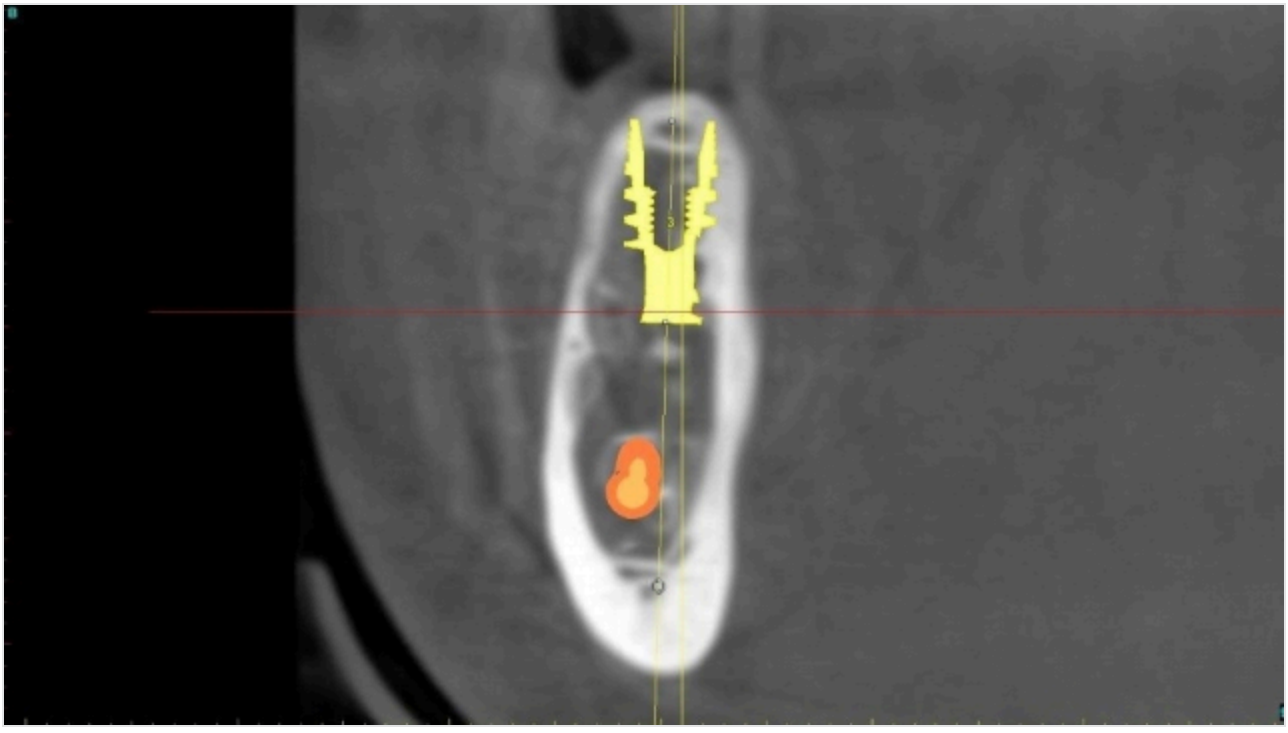

Figure 1

In this situation, we should be able to measure the distance between the two adjacent teeth, make a mark in the middle, align the buccal-lingual position and simply place an implant in this position.

In this case, I measured this exactly in the middle and placed the implant digitally in what appears to be the best possible position in the bone. Since it is in the middle of a first molar, then we should be pretty close to the middle of the desired restoration. (See Figures 2 and 3)

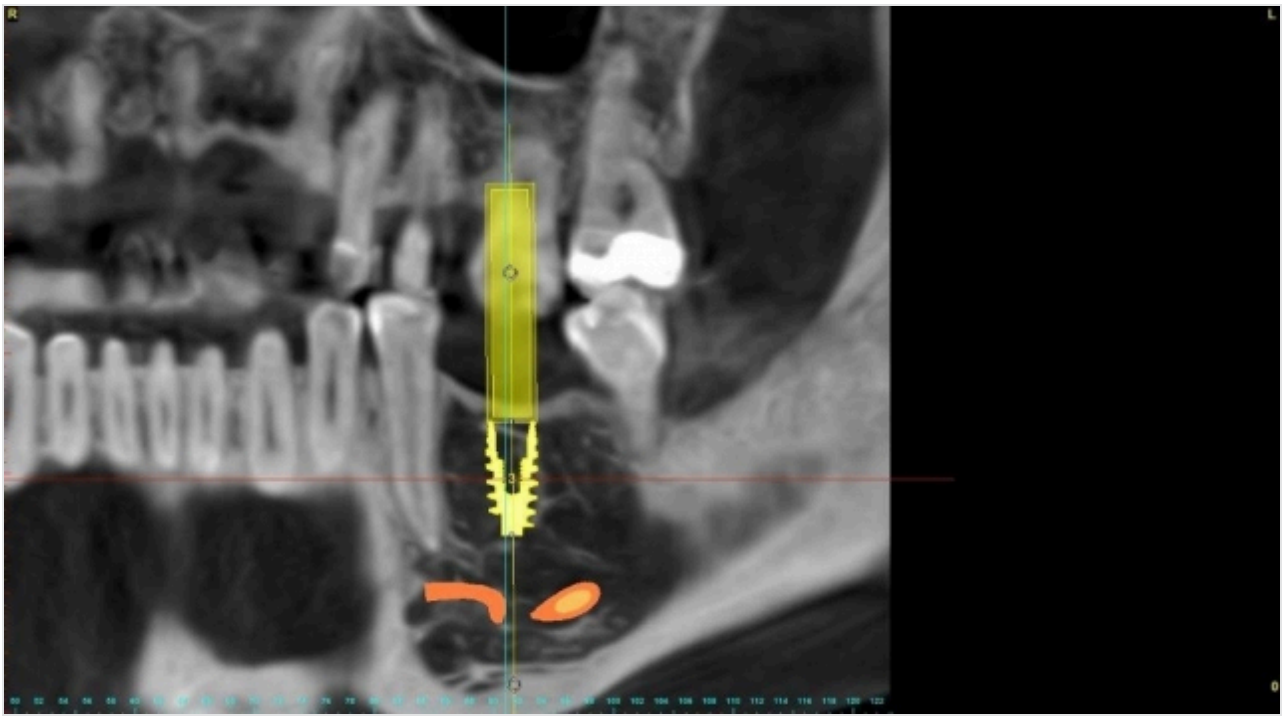

Figure 2

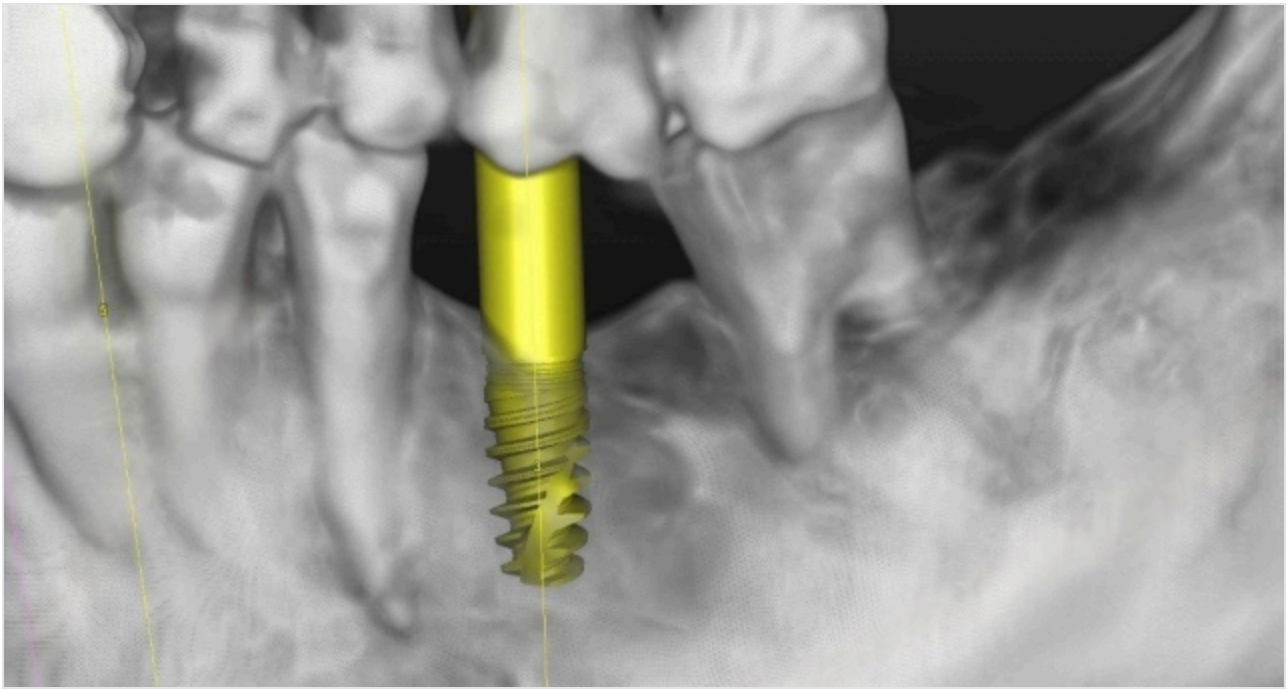

Figure 3

However, once we take the digital workup of the desired tooth in the lower left first molar position and overlay it onto the current implant site (see figures 4 and 5), we can see that the restorative access is lingually placed, leading to a difficult design to the final restoration or one where we have to attempt to compensate to correct the poor placement. Not only that, it will be more challenging for the patient to maintain now and in the future.

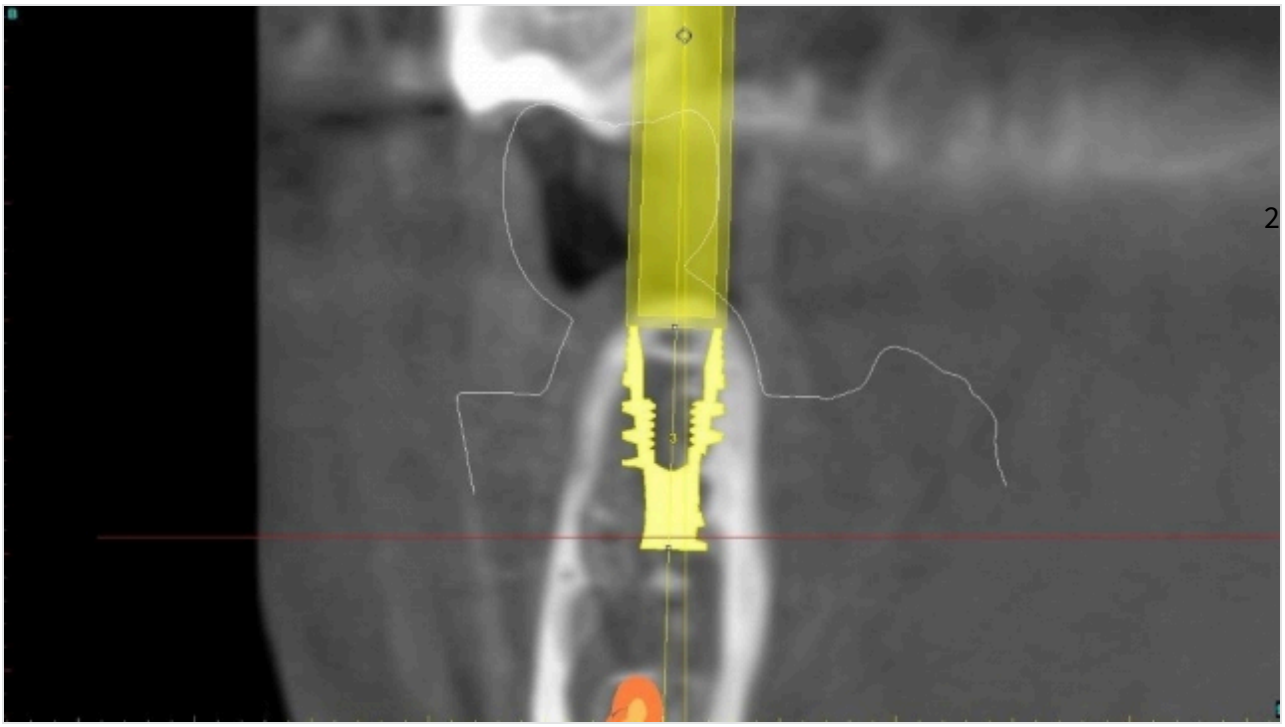

Figure 4

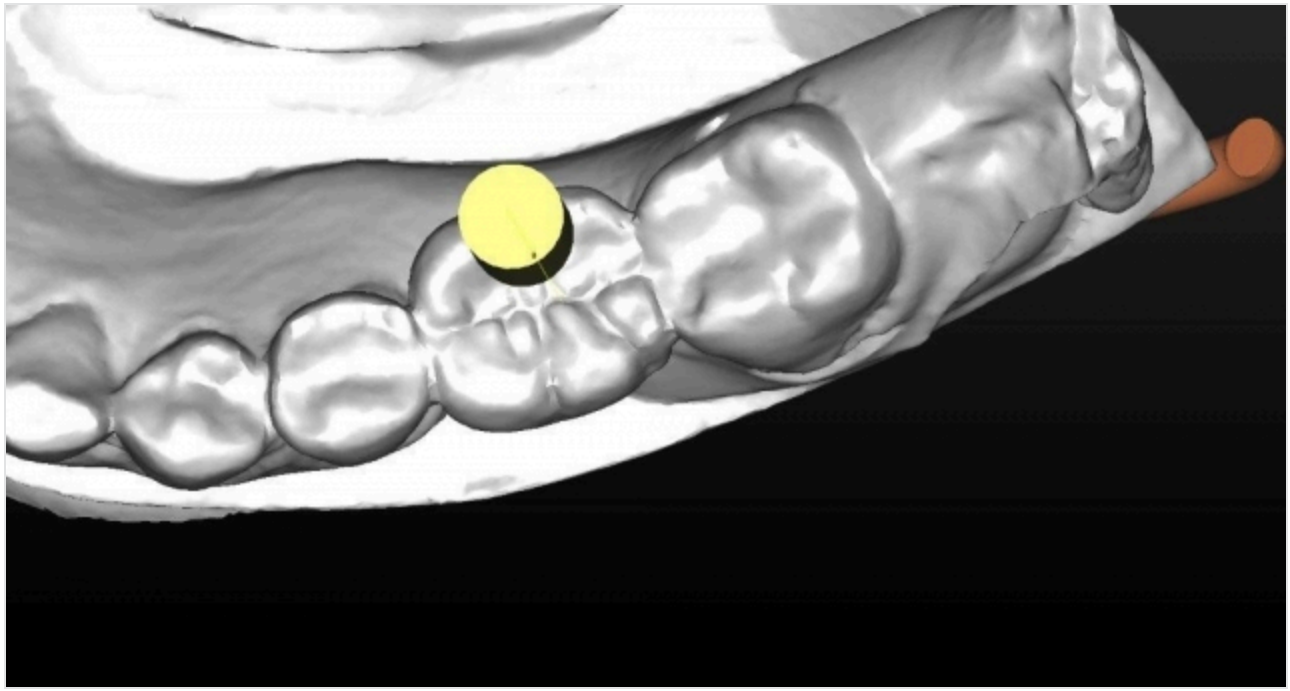

Figure 5

Now, if we now take the same possible implant site and overlay the proposed final tooth restoration, we can now reposition the implant in the proposed surgical site based off the desired end restoration. (See Figures 6 and 7). It is well within the bony architecture without completing any additional grafting, and the restorative space is in a more central location, which is more favorable for the desired end restoration.

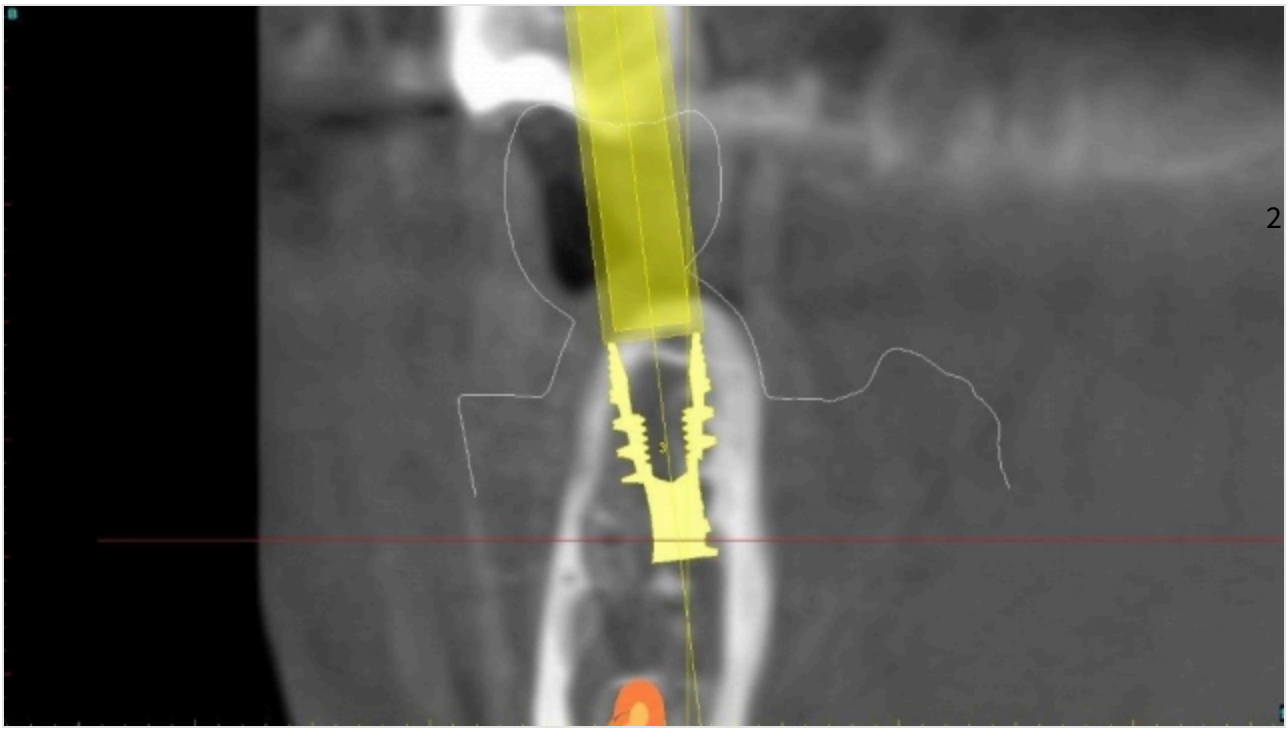

Figure 6

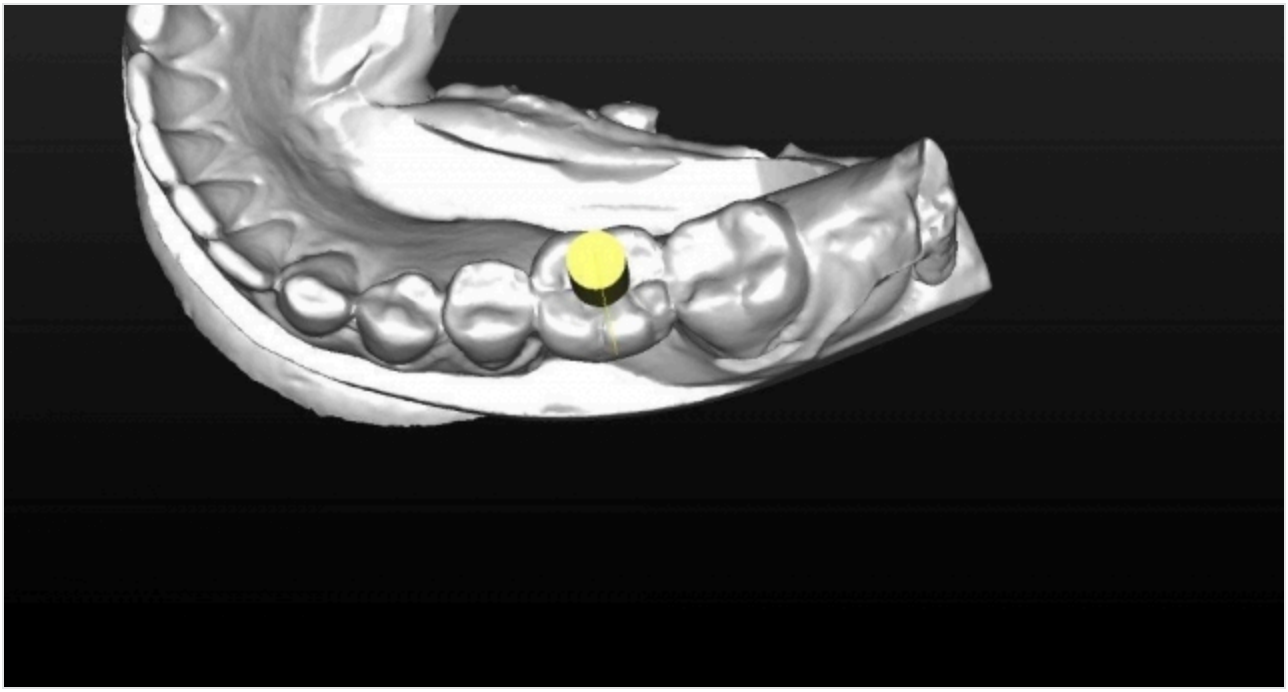

Figure 7

As we look at this case review, we can definitely see the value and need to do a 3D restoratively-driven treatment plan, even in the case of a single missing tooth. It allows the restorative and surgical clinicians to visualize the desired end result. The restorative dentist can create, with the help of his or her dental laboratory, the ideal final restoration for the patient, merge the data with the 3D CBCT scan and share this with the surgeon. This allows the surgeon the ability to look at prospective surgical site/sites and how they relate to the placement of the final restoration and to determine if bone augmentation is needed or not to achieve the ideal placement. Once all of the factors are considered, then the final surgical guide can be designed and used to guide the surgeon in placement of the implants.

Challenges when using digital workflows for implant dentistry

So what is the downside to all of this? One factor is the learning curve for the lab, restorative dentist and surgeon to embrace the technology, learn it and use it. It can seem like a lot of work in the beginning, but with the use of a digital workflow, it can be very streamlined and easy to share and use.[2]

Another big factor is the cost of the technology and equipment to do the 3D CBCT scans, the digital scanners and the digital software to manipulate all the data. Then we add in the additional cost of the surgical guide as well as the surgical kits needed to work with the surgical guides, and this can impact the overall costs for our patients.

Like so many things in dentistry and healthcare, as technology becomes more mainstream, cost can and will play a part in how we incorporate it into our daily practice. The good thing is that with the advent of smaller milling units, the use of 3D printers in the digital workflow, and multiple companies getting involved in this technology, we are yet again bringing change to this process. As we add more competition into the digital workflow world, the overall costs will come down.

Is this the future of dentistry? No! It is dentistry *today*! We have roared into the digital age of dentistry where we can look at and treatment plan things like never before! The ability to scan, design the final restoration, mill a surgical guide, and place the implant and abutment in a single visit is now possible!

As we move forward, there will be continued innovation in the area of digital treatment planning and design in dentistry. More importantly, it will allow collaboration between the restorative dentist, the dental lab and the surgeon, which can allow us to be very clear in helping achieve success on everyone's part and ultimately, providing the very best end results for our patients!

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Ready to ensure your practice stays ahead of the curve? Implants are rapidly becoming part of everyday dentistry. Attend this this two-day course to explore the essentials of treatment planning, placement and restoration of dental implants in both simple and complex implant reconstructions.