



Computer Guided Implant Placement - **Why it's a Sound Investment For Dentists**

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Overview –

Meeting the Challenge of Patient Demands

The demand for dental implant treatment is increasing by around 500,000 per year in the US¹ yet, so too are patient expectations. Regardless of their oral condition, and based on populist, semi-scientific and commercial implant-related publications, patients expect implant-based restorations to be both highly functional and aesthetic – and with as little inconvenience as possible. That's a big challenge for an industry already under pressure to over deliver.

Dentists, of course, will seek better ways to deliver such clinical outcomes, but they also want clinical procedures to be effective and efficient. One answer might be computer-guided implant technology - which today has the capacity to allow precise and effortless implant placement into predetermined sites.

Since its introduction, computer-guided implantology has undergone many advancements and modifications. While some practitioners have been quick to adopt this technology, others, for multiple reasons ranging from price to clinical complexity, never did.

Although the accuracy, benefits and advantages of guided implantology have been proven in numerous scientific publications, in an article published in 2016 it was estimated that only 15,000 surgical guides were sold in the US. Given the fact that over 2.1 million implants were placed, it's possible to surmise that over 90% of dental implants were placed using non-guided, freehand techniques².

This paper examines the value that computer guided implant placement can bring and how it benefits both clinician and patient.

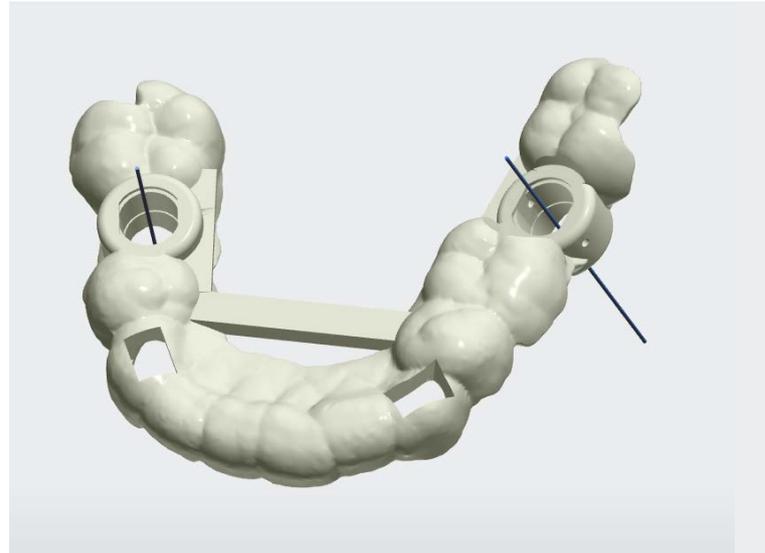
Free-hand Workflow vs Guided Workflow

At the beginning of the dental implant era, the focus was on placing implants into available bone. So factors such as esthetics, function, and the ability to clean and maintain restorations were somewhat pushed aside.

Doctors, of course, used radiographs and CT scans to deduce the actual shape and dimensions of available bone and to find out the whereabouts of critical anatomical structures. Then, implants were placed using a freehand technique into positions based on their best judgment.

In fact, the freehand implant placement technique is how most dentists are taught today. But although clinical studies show that survival rates using traditional techniques are commonly higher than 90%³, in many cases implants are not placed into their ideal positions.

This leads to treatment that is often compromised, usually because of malpositioned implants, resulting in clinical outcomes that are both frustrating and embarrassing for the clinician, and potentially harmful for the patient.



Unfortunately, little is known about the prevalence of implant misplacement and at present, although every implantologist knows these situations, there are no studies which highlight the extent of the problem. What is known and published however is that correct case planning, including the use of a preliminary wax-up, and the use of even simple surgical guides, can enhance outcomes significantly. The question, then, is why aren't dentists using these tools?

Conventional Surgical Guides vs Computer-Guided Surgical Guides

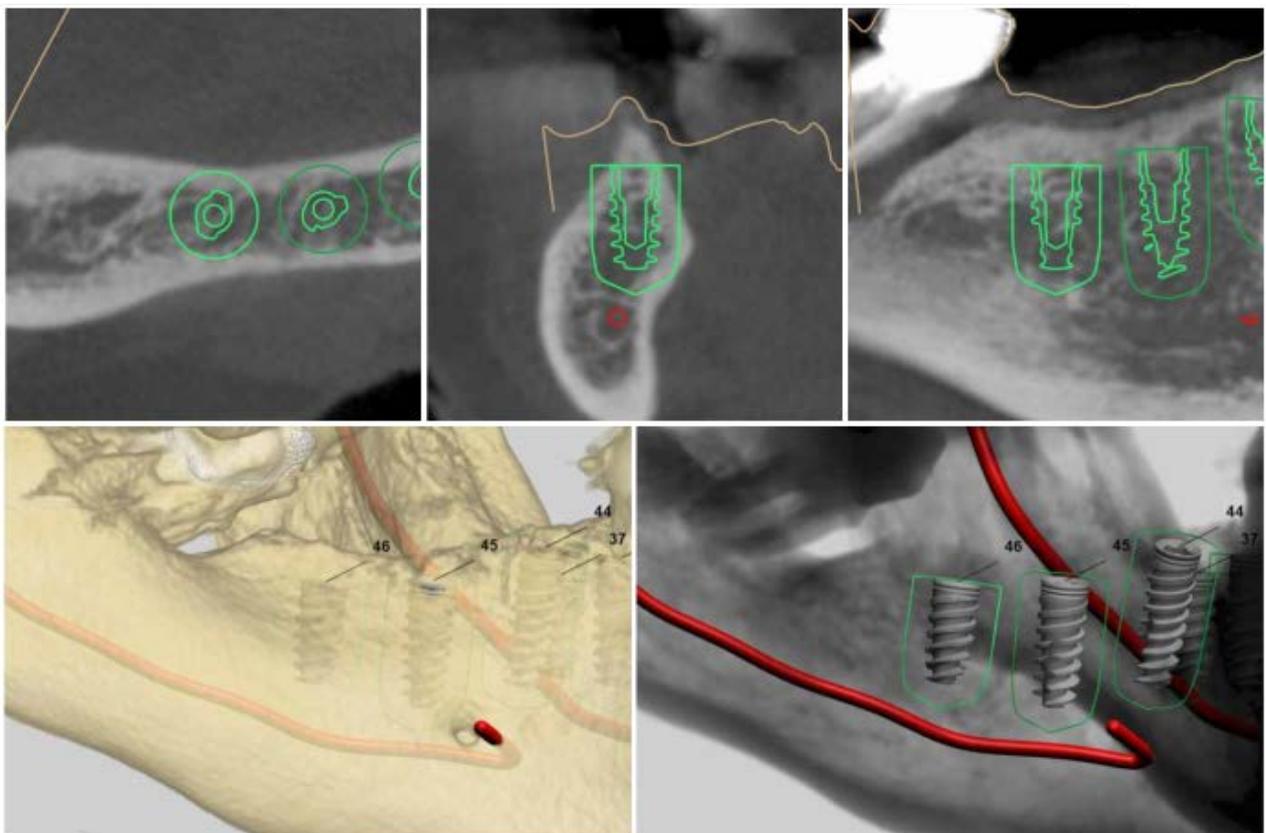
Free hand implant placement relies completely on the doctor's proficiency and best judgement to decide the implant's correct position, angulation, spacing (between other implants or teeth), and the anticipated shape and position of the final restoration.

Surgical guides (those based on pre-surgical prosthetic planning) are excellent tools to direct dentists towards ideal implant positioning and spacing. However, what dentists don't see is the visual relationship between the the bone and the prosthetic plan.

Ultimately, from a safety perspective, conventional guides fail to take into consideration the patient's anatomy such as nerves, maxillary sinus etc.

So, while conventional surgical guides may be used to assess drilling trajectory, they have no control of drilling depth – which means that they have significant but limited added value to doctors during the surgical phase.

Computer-guided technology, on the other hand, is based on the ability to superimpose and merge clinical data and CT data to enable 3D planning of optimal implant positions. The result is everything that standard surgical guides can deliver, plus the huge benefit of safety.



Computer-Guided Implant Planning – How the Process Works

Computer-guided implantology workflow follows best practices, combined with technological innovations and tools to ensure perfect implant positioning.

The workflow follows the “prosthetic driven implant placement” concept - which relies on a 'crown down' or "reverse engineering" approach. Using this method, the surgical plan starts by pinpointing the correct location of future artificial teeth and from there - a decision is made on the ideal positioning.

Aside from modern-day, computer-guided implant technology, getting implant positioning right relies heavily on a physical wax-up, mimicking the ideal position of the artificial teeth. Indeed, old computer-guided protocols also required that a wax up was the first step.

Although the clinical benefits of a physical wax up are clear, it remains a substantial undertaking by both patient and doctor, and at a significant cost. However, despite all the effort, time and cost - in some cases, implant therapy may not even be indicated!

Modern computer-guided surgery protocols overcome this problem in most cases by allowing any wax-ups to be carried out virtually. This revolution lies in the capabilities of the planning software to incorporate data from CT scans, along with data obtained from intraoral or 3D scanning, to create virtual wax-up models mirroring ideal teeth positions.

In doing so they give clinicians the ability to discuss treatment options with their patients, AND ONLY THEN - once a treatment plan is agreed upon, a surgical guide is fabricated and/or a physical wax-up is carried out. This places the doctor in complete control of the process.

Beyond standard implant placement, guided surgery today can take doctors one step further. It allows them to virtually (and later physically) remove or modify bone before implant placement, so that implants are placed in the best possible position relative to the planned restoration - even if bone conditions are not ideal.

Better and faster

Correct 3D positioning and spacing of dental implants is critical for function, esthetics and for long term maintenance of dental implants. So, provided the planning is right, implants can be placed better, and with a level of consistency and accuracy which is hard to achieve using conventional implant placement methods. In addition, clinical studies suggest that surgery time for implants placed using digital processing techniques are 16% faster on average⁵, while other studies suggest a cost saving of 18% vs conventional processes⁶.

The workflow

The diagram below explains the step-by-step processes that needs to take place after a decision is made for a treatment based on dental implants:

	Conventional (with no surgical guide)	Guided - for single and partial edentulism	Guided - for full arch cases
Visit 1	CT scan	CT scan + impressions	CT scan + impressions
Lab processes		Virtual wax-up, virtual planning, doctor's approval of surgical guide, guide fabrication.	Physical wax-up
Visit 2	Implant placement without a guide	Implant placement with the guide	Wax-up evaluation and approval
			virtual planning, doctor's approval of surgical guide, guide fabrication.
Visit 3			Implant placement with the guide

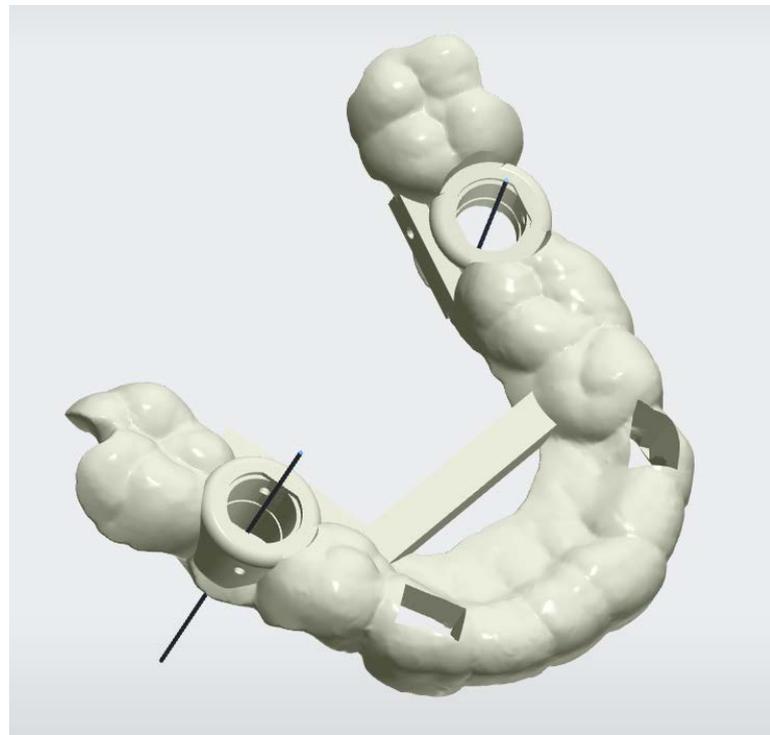
Computer Guided Placement – Early vs Recent Technology

Even though from its early days computer-guided placement allowed clinicians for the first time to surgically replicate a virtual plan with high levels of precision and accuracy, the technology was slow to catch on. The main reasons were:

Inefficient workflow – Early guided surgery workflow was not user friendly. A physical wax-up and a radiographic stent was needed even before a CT scan was obtained. This meant that a few preliminary visits were needed, including expensive laboratory costs to even evaluate the feasibility of an implant-based treatment plan. Only then, and only when applicable, was the surgical guide fabricated.

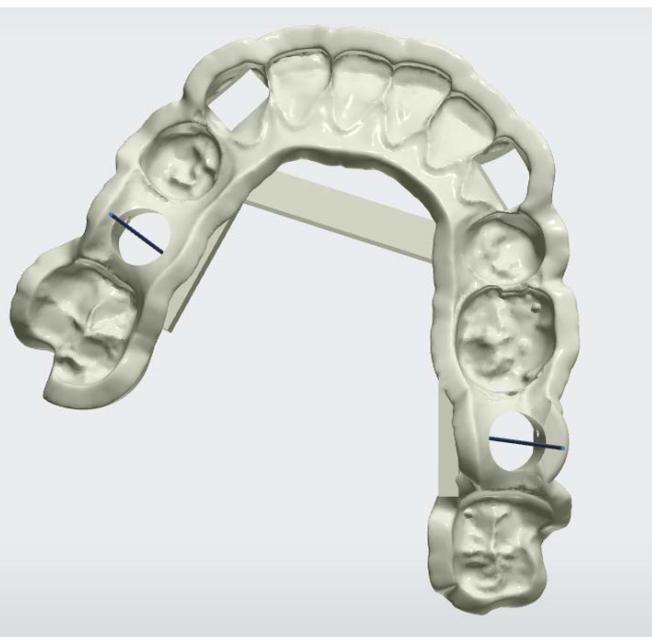
Habitual influences – Even today, dentists are trained to place implants freehand, without computer-guided aids⁷. It's understandable therefore that highly experienced practitioners did not see the benefits of changing the way that they placed implants, or straying away from proven techniques that were both familiar and comfortable to them. Any change in the way they worked needed to be significantly better than their "old ways". Unfortunately, older versions of the technology were not - or at least, not sufficiently so.

Initial outlay – Cost was a major factor in whether a dentist bought into computer-guided implant placement. Early computer guided systems were incredibly expensive to the point where dentists and patients could not justify the expense. In fact, the significant cost made this a non-viable option for most.



So what's changed?

Improved workflow - Huge advancements in 3D imaging, 3D scanners, and improvements in planning software allow the creation of a simple and manageable workflow that makes real sense to dentists. Today, with the ability to create and utilize virtual wax-ups that mimic the correct position of planned teeth (the most cumbersome aspect associated with guided surgery) the need to fabricate a physical wax-up is no longer needed, saving time, money and effort by both patients and dentists.



However, it is important to remember that computer guided surgery forces dentists to work "by the book". So while computer guided implant

surgery – in that sense - is not an easier way to place dental implants, it is a safer and more accurate way.

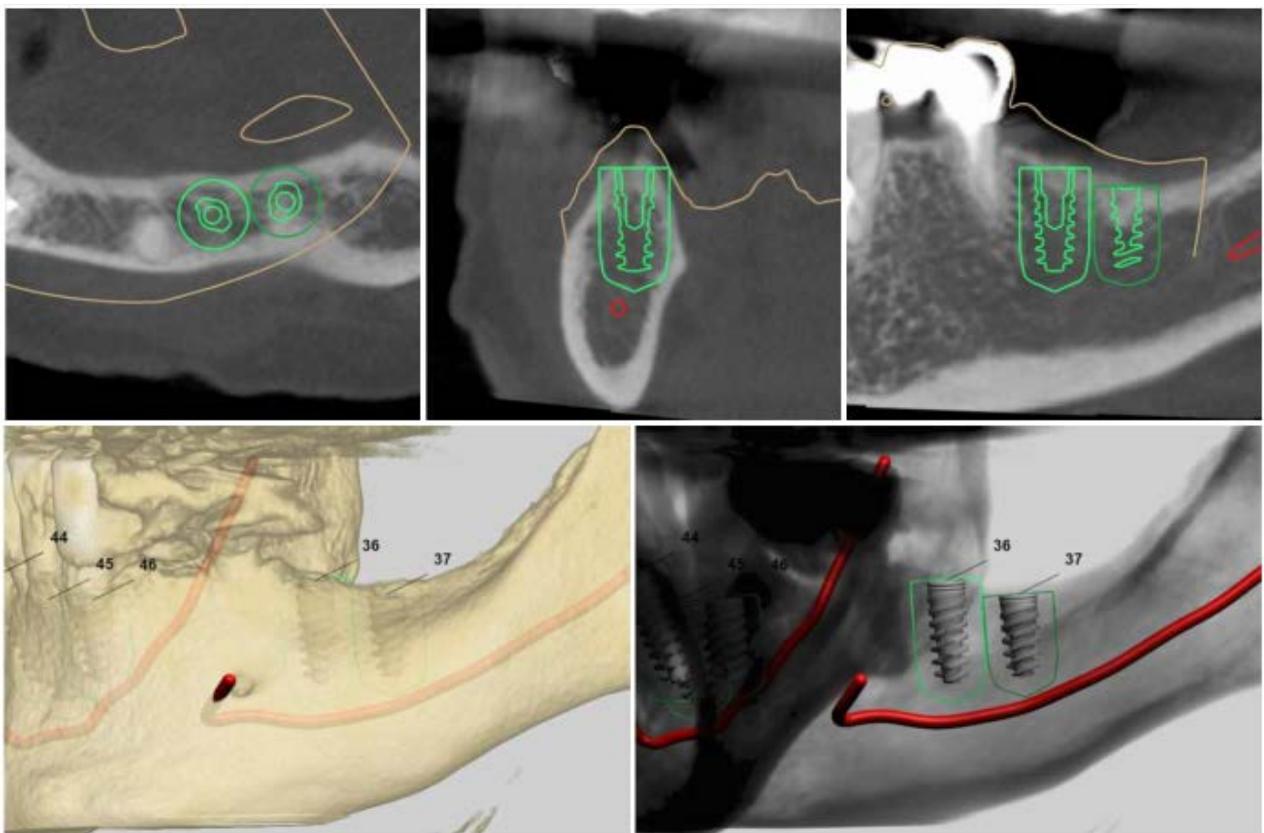
Since any subtleties in implant positioning and placement can be evaluated, analyzed, and decided upon during the treatment planning stage – the time spent in the planning process during surgery is dramatically reduced. Thus, any clinician who masters guided surgery techniques and instrumentation, should see an increase in chair-time efficiency, not only in full arch reconstructions but also in cases of partial edentulism or even in cases of single implants.

Decrease in costs – Old computer-based surgical guides were still fabricated based on handmade procedures. They were labor intensive and required the need for skilled technicians to spend a lot of time making them. Today, with the introduction of 3D planning and printing technologies, the fabrication of each guide is more computer-based than handmade, allowing laboratories to significantly reduce their price for each guide. This is a real game changer as it brings the costs down for dentists wanting to embrace the technology. Subsequently, these costs can now be easily incorporated into the standard implant treatment cost without having to make any notable changes to patient fees.

Seismic shift in habits – Dentists adhere to techniques that become habits. Thus, experienced clinicians who are used to placing implants without a guide, need to understand that incorporating computer-based surgery requires habitual changes. This understanding, along with the help of a simplified and structured workflow, are two major factors that may help to change perceptions.

The other significant viewpoint is that those who want to embrace computer-based surgery need to make it a new habit and use it frequently. Making an active decision to use a computer guide a few times every month is the best way to incorporate this technology into the “system” of the practice in order to get the best of it.

Technology as a practice booster - Clinicians are now looking for better ways to accurately place implants; Moreover, greater access to information means that patients too are seeking out the very same clinicians as they also look to take advantage of the latest technology. As a result, the adoption of computer-guided implant placement can be used to advertise practices as unique, technically advanced, and more patient-centered.



Computer-Guided Implant Placement - From a Patient's perspective

Already, it can be seen how computer-guided implant planning can help the clinician in several ways, but what about the patient? How does it help them?

Accuracy, safety, and comfort

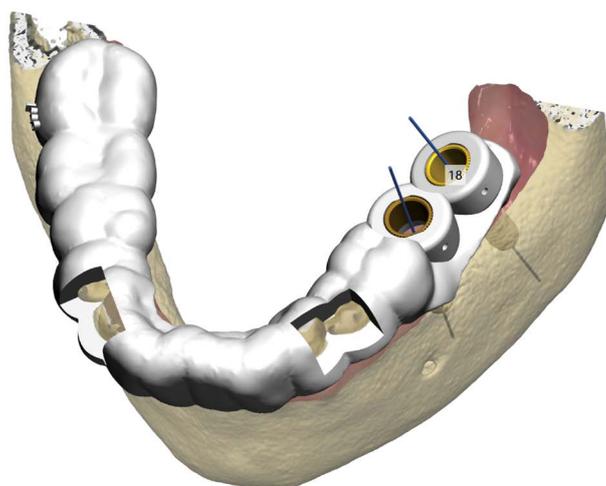
Beyond the obvious advantages of accurate 3D implant positioning, the fact that many guided surgery procedures are done flapless is a major benefit from the patient's point of view. Flapless surgery means a less invasive procedure (a relaxing term in any conversation with patients), which typically results in less swelling, pain, and postoperative discomfort. Naturally, this procedure type can only be performed using computer-guided surgical means.

The cost factor

Yes, computer-based surgical guides are an expense to dentists, but their price has dropped dramatically over the last few years. As a result, the actual price becomes a non-issue for patients. Some doctors have taken it even further and now incorporate this cost into their standard implant price,

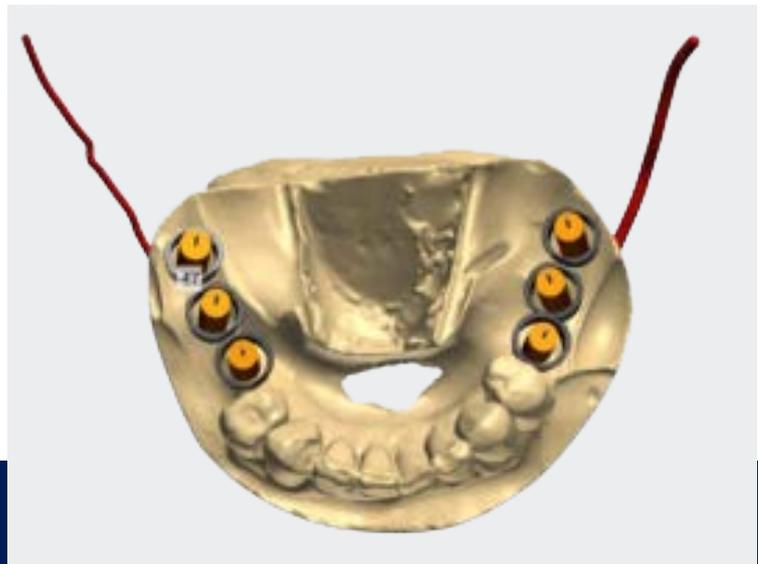
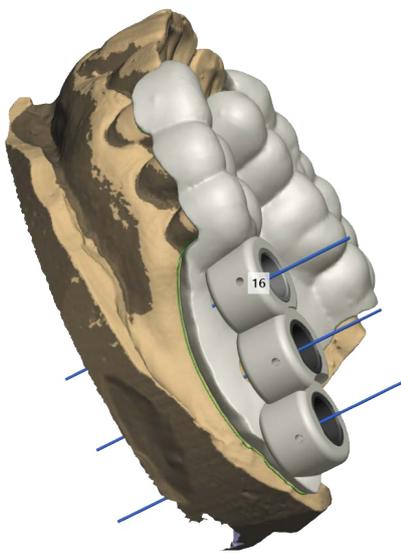
so the patient is blind to the actual price of the guide, meaning it is no longer a factor when considering its use.

Regardless of the pricing strategy the doctor chooses, in view of the significant benefits described in the previous paragraph, guided surgery becomes more and more appealing to patients, who understand the benefits and are willing to pay a premium to have their implants placed in the most secure and advanced way.



Shorter surgical procedures

Although computer-based guide technology require that doctors follow best practice protocols, at the end of the day they save time. The new and sophisticated planning software shifts the effort from the surgical operatory to a planning center. Once the guide is made to the specification of the surgeon, the surgical phase is shortened dramatically, especially when the flapless technique is used. And of course, the ability to utilize the virtual wax-ups for the fabrication of temporary restorations (also used for immediate loading) means that this phase is shortened too.



To conclude:

Computer guided surgery requires following best practice protocols and planning, but once mastered, it dramatically shortens chair time and effort by both patient and dentist, for a fee that is now both affordable and reasonable.

A little change in a habit may result in a significant boost to your practice.

Impact on Case Acceptance

Using Computer Guided Implant Technology

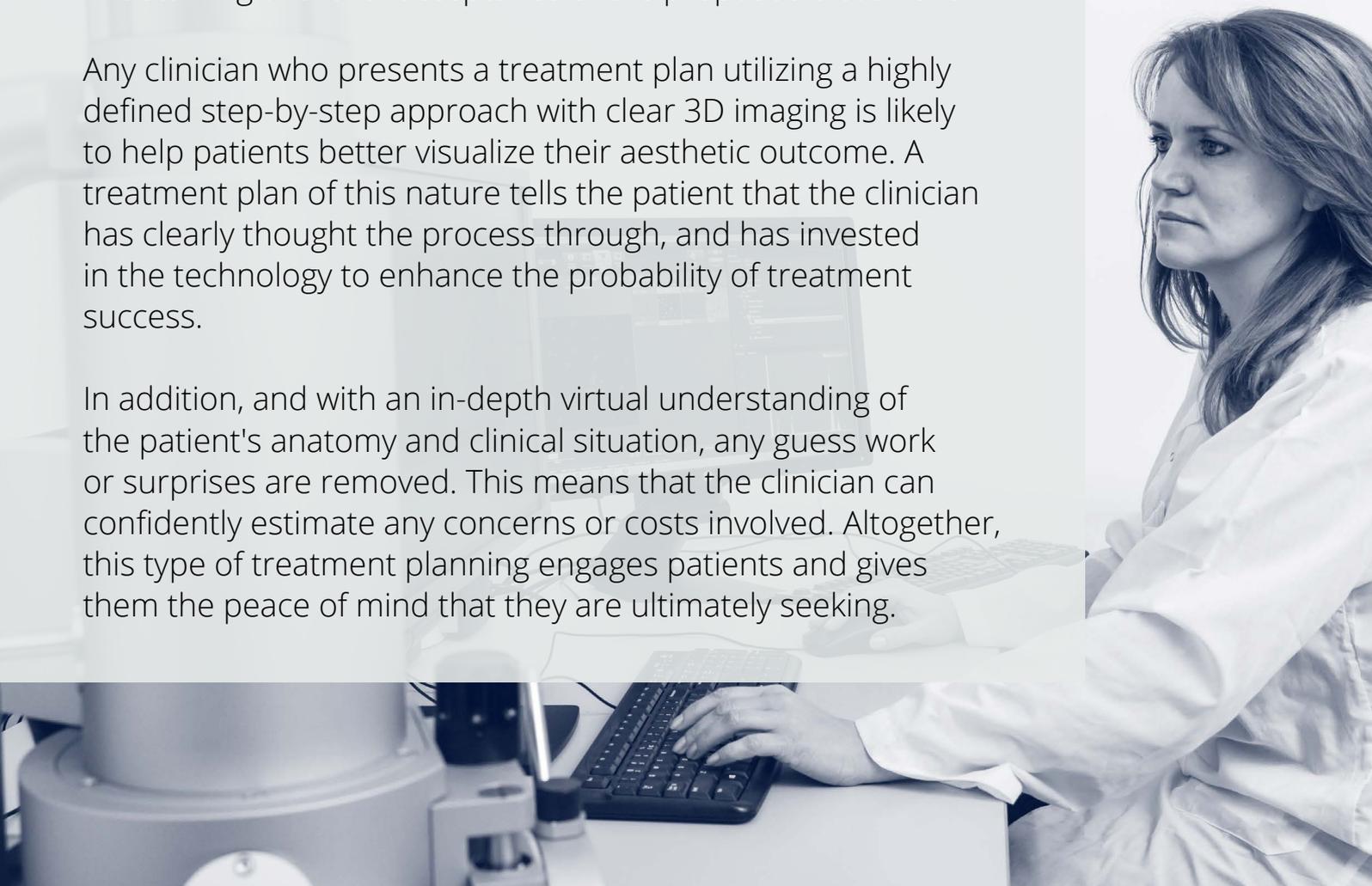
Typically before a patient undergoes any kind of surgical treatment they need to have:

- Confidence in the clinician and their diagnosis
- The clinician's ability to safely perform the surgery
- A good understanding of the associated costs involved

To this end, clear communication and education are essential in relieving any patient concerns and are also vital components in obtaining a level of acceptance of the proposed treatment.

Any clinician who presents a treatment plan utilizing a highly defined step-by-step approach with clear 3D imaging is likely to help patients better visualize their aesthetic outcome. A treatment plan of this nature tells the patient that the clinician has clearly thought the process through, and has invested in the technology to enhance the probability of treatment success.

In addition, and with an in-depth virtual understanding of the patient's anatomy and clinical situation, any guess work or surprises are removed. This means that the clinician can confidently estimate any concerns or costs involved. Altogether, this type of treatment planning engages patients and gives them the peace of mind that they are ultimately seeking.



Summary

Attitudes towards computer-guided implant placement are changing for the better. Improved and simplified workflow, cheaper costs, and habitual changes make computer-guided Implant (CGI) technology a viable option for both clinicians and patients.

When accurate implant positioning is critical for functional and esthetic outcomes, and when patients' expectations are getting higher and higher, any technology that can help doctors achieve these goals should be embraced and routinely used.

Efficiencies are built into the process enabling patient education and greater treatment plan acceptance on the one hand, and shorter surgical procedures, based on best practice methodologies incorporated into the planning process, on the other.

And finally - the reduction of costs of both virtual planning and the fabrication of a guide allow doctors to utilize different pricing strategies that enable patients to cover the expenses without dramatically altering the overall treatment cost.

References

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