Precision Guided Implant Treatment

As with all forms of dental treatment, from the simple to the complex, predictability of outcome is largely dependent on accurate diagnosis and detailed treatment planning. This predictability can also be further enhanced by the careful utilization of advances in dental technologies.

The use of surgical guides in implant dentistry has taken many forms, from simple pre-fabricated implant placement keys to lab made acrylic appliances replicating a pre-surgical wax-up of a desired restorative outcome, which may have been employed as a radiographic template in the planning stage. All of these guides are inherently inaccurate in replicating what we plan in the pre-surgical wax-up and radiographs into the actual surgical site in three dimensions. That is accurately replicating implant position, depth, angulation and rotational indexation, as planned radiographically, into the surgical situation.

A unique combination of three technologies – Cerec, Galileos and Sicat Optiguide - allows for implant planning, placement and restoration with a high degree of accuracy, safety and predictability of the final restorative outcome [1-6]. This case is a demonstration of how these technologies inter-relate in the diagnosis, treatment planning and implementation of precision guided implant treatment.

References:

1. Dreiseidler T, Neugebauer J, Ritter L, et al, 'Accuracy of a newly developed integrated system for dental implant planning', *Clinical Oral Implants Research*,Volume 20, 2009, Issue 11, pp 1191–1199,

2. Ganguly R, Ruprecht A, Vincent S, Hellstein J, Timmons A, Qian F, "Accuracy of linear measurement in the Galileos cone beam computed tomography under simulated clinical conditions', *Dentomaxilllofacial Radiology*, Vol 40, 2011, pp 299-305.

3. Dreiseidler T, Tandon D, Kreppel M, et al , 'CBCT device dependency on the transfer accuracy from computer aided implantology procedures', *Clinical Oral Implants Research*,Volume 23, 2012,Issue 11, pp 1089-1097

4. Behneke A, Burwinkel M, Behneke N. 'Factors influencing transfer accuracy of cone beam CT-derived template-based implant placement'Clin. *Clinical Oral Implants Research* 23, 2012, pp416–423

5. Behneke A, Burwinkel M, Knierim K, Behneke N. 'Accuracy assessment of cone beam computed tomography-derived laboratory-based surgical templates on partially edentulous patients', *Clinical Oral Implants Research* 23, 2012 137–143
6. Horwitz J, Zuabi O, Machtei EE. 'Accuracy of a computerized tomography-guided template-assisted implant placement system: an in vitro study', *Clinical Oral Implants Research* 20, 2009; 1156–1162.

Figure1:
A unique combination of three technologies allows for implant planning, placement and restoration with a high degree of accuracy, safety and predictability of the final restorative outcome.

Figure 2:
Patient presents with 17, 16, 15 and 14 in varying debilitated states of restorative and periodontal ill health.

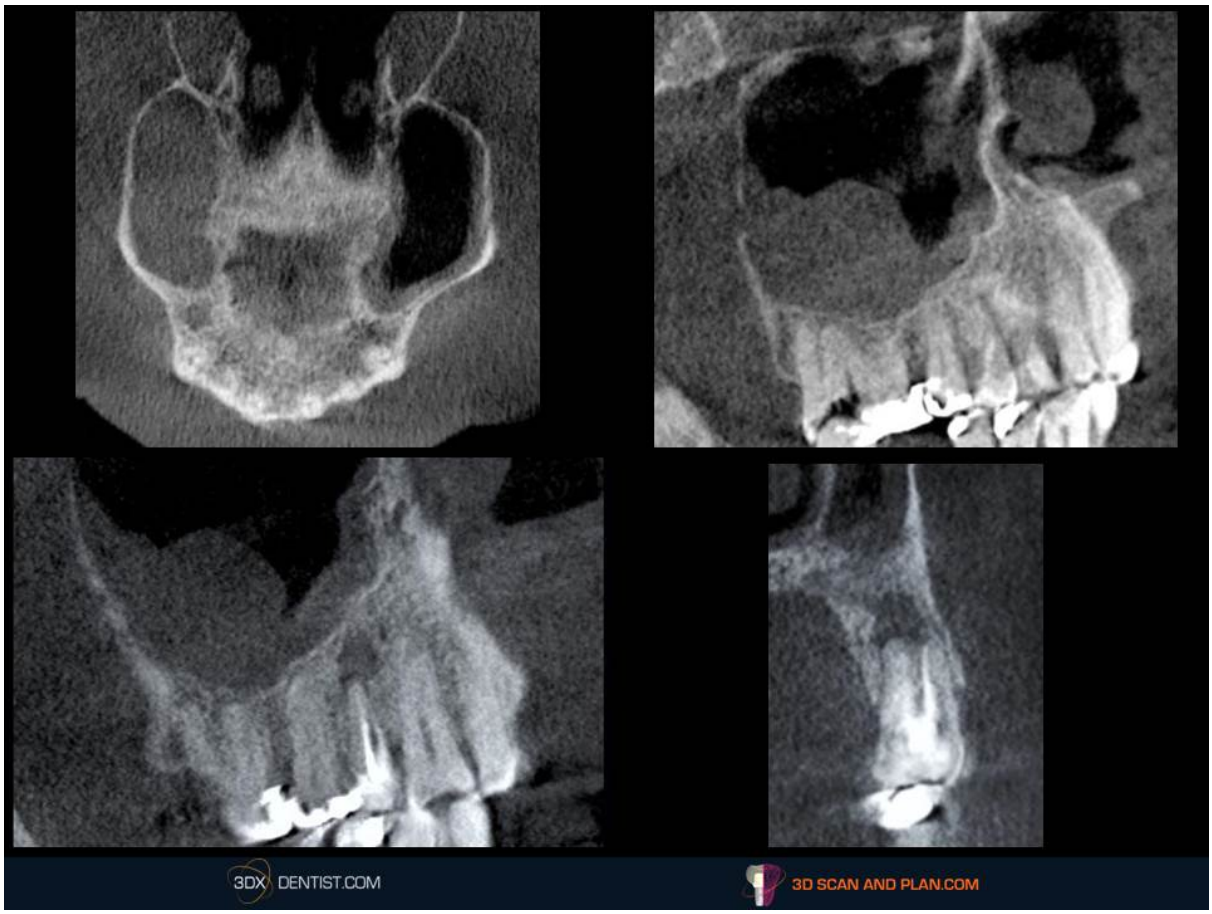

Figure 3:
Subsequent CBCT assessment reveals:

- 50 % right maxillary sinus opacification
- sinus opacification more than likely odontogenic in origin stemming from non-vital 17 and recurrent apical periodontitis 14.

Patient treatment planned for:

- Extraction of both 17 and 14
- Endodontic treatment of 16 followed by post core/Cerec e.max CAD restoration 16
- Cerec-Vita Mk 2 cad restoration 15
- Implant supported crown restoration of 14 employing:
    - Galileos CBCT scanning and Galaxis implant planning
    - Cerec Galileos integration
    - Pre-surgical provisional crown manufacture
    - Sicat Optiguide/Biomet 3i Navigator precision guided implant surgery and immediate provisionalisation
    - BellaTek Encode abutment scanning and file export via Cerec Connect
    - Biomet 3i BellaTek custom zirconia abutment design and manufacture
    - Cerec scanning and e.max CAD crown manufacture and final restoration

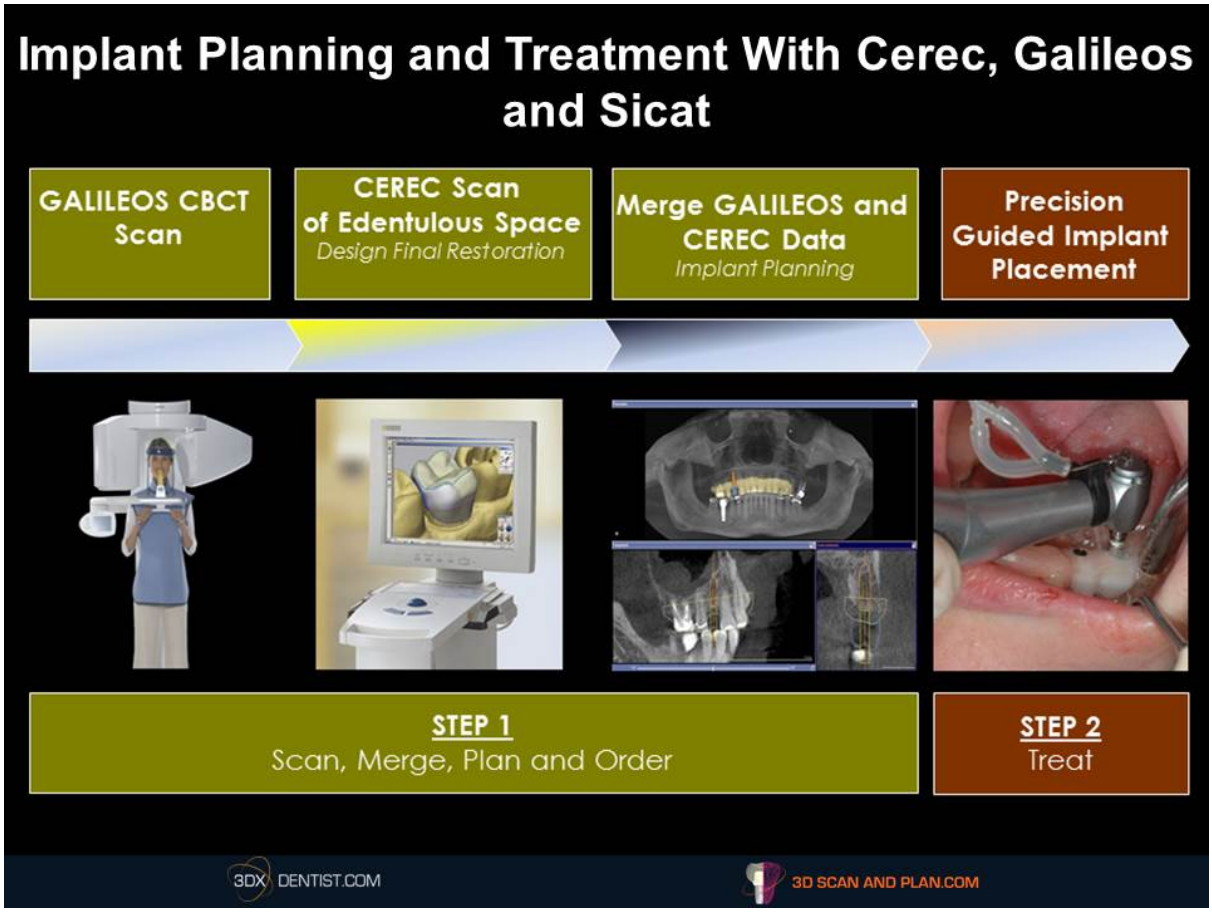

Figure 4:
Following definitive endodontic and restorative treatments of the surrounding teeth the two step Cerec Galileos integration - Sicat Optiguide/Biomet 3i Navigator precision guided implant surgery process is then employed in the treatment of the 14 edentulous region.

Figure 5:
CBCT scan of patient is taken and preliminary measurements of the proposed implant site are performed.

Figure 6:
14 edentulous site is then scanned with Cerec and the proposed final implant crown is designed.
This design is then exported from Cerec and imported into the Galileos CBCT scan to allow for implant planning relative not only to the underlying anatomy but also the position of the proposed implant supported crown.

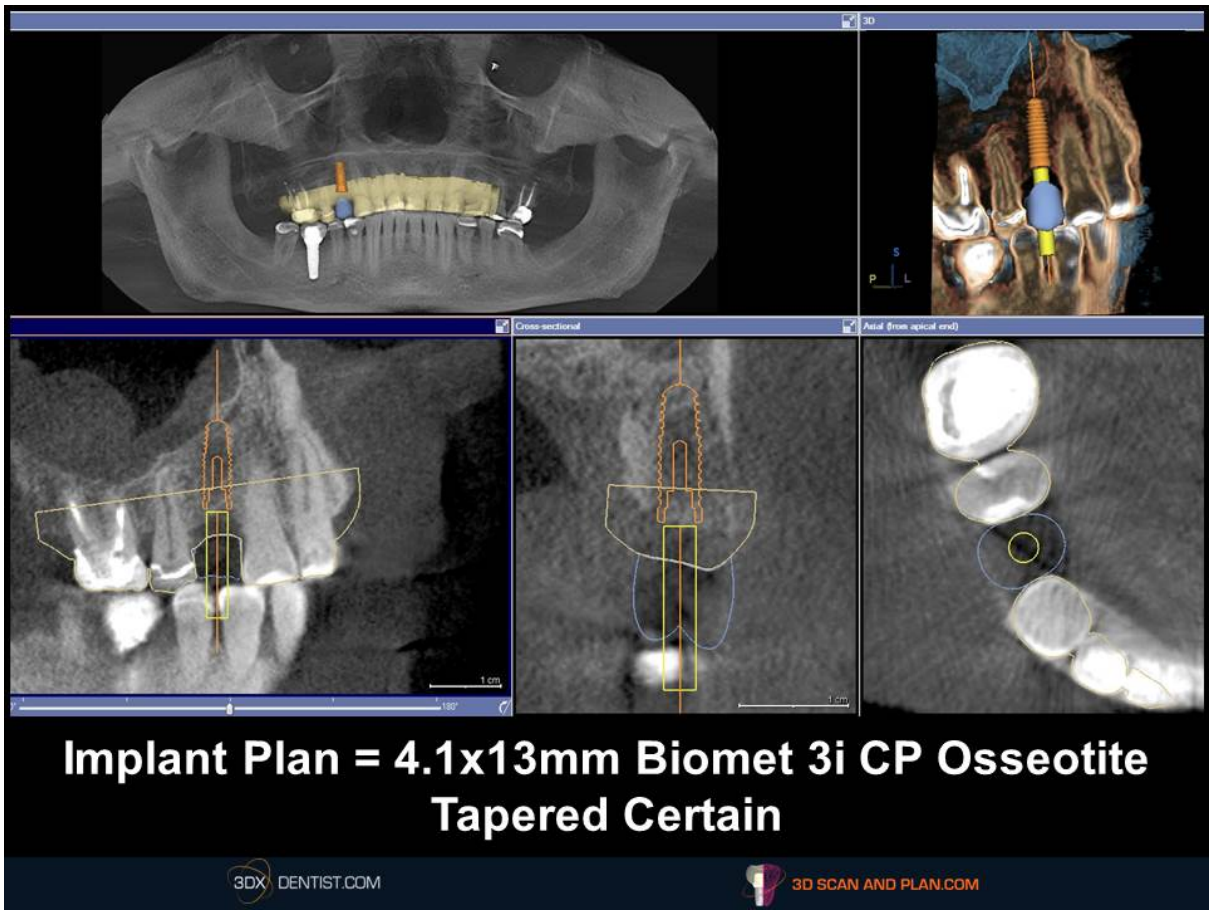

Figure 7:
Implant planning done within Galaxis Implant Planning software relative to:

- anatomy
- bone contour and profile
- soft tissue contour and profile
- position of final crown
- desired emergence profile of final crown
- form of final fixation (screw or cement)
- healing and final abutment design

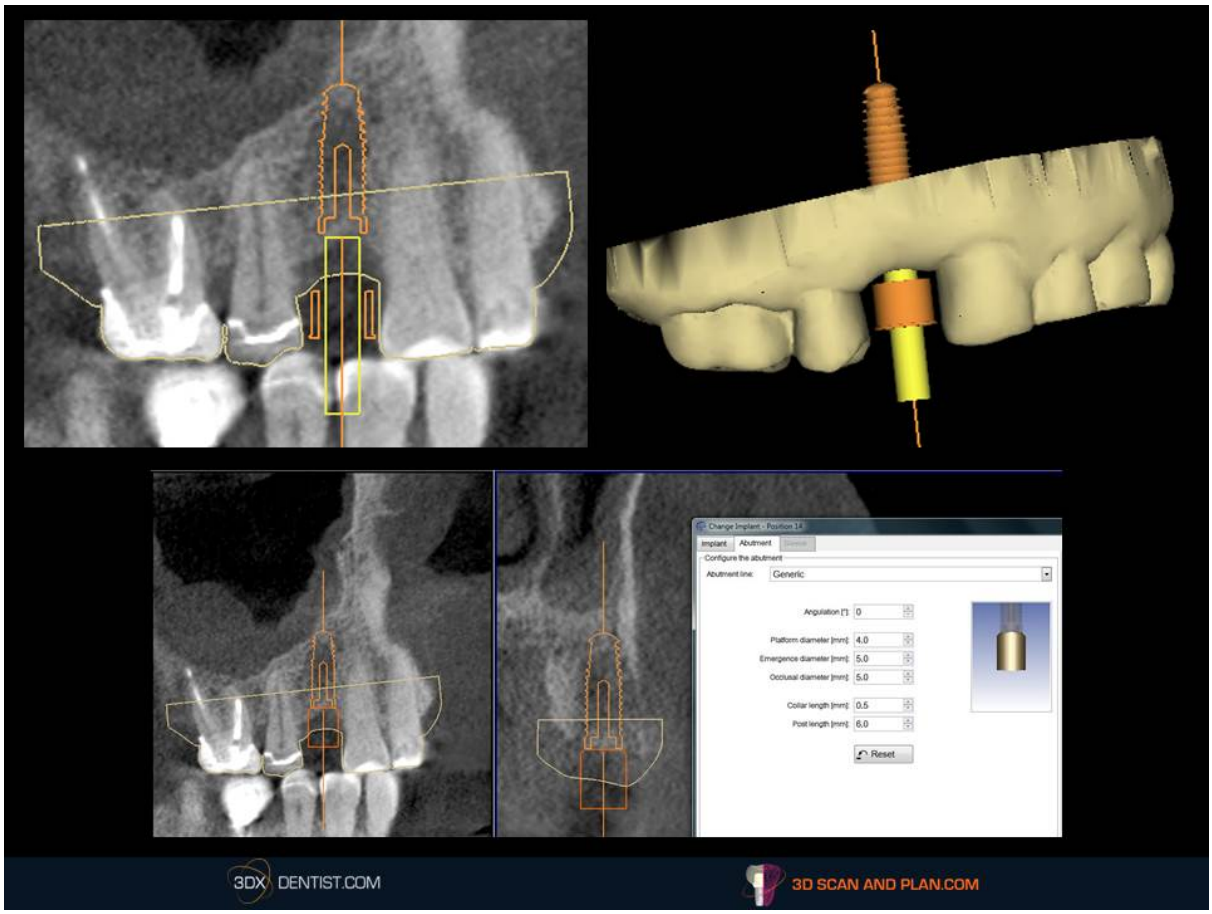

Figure 8:
Guide sleeve positioning is checked and healing/scanning abutment selection can also be done within the Galaxis implant planning software.

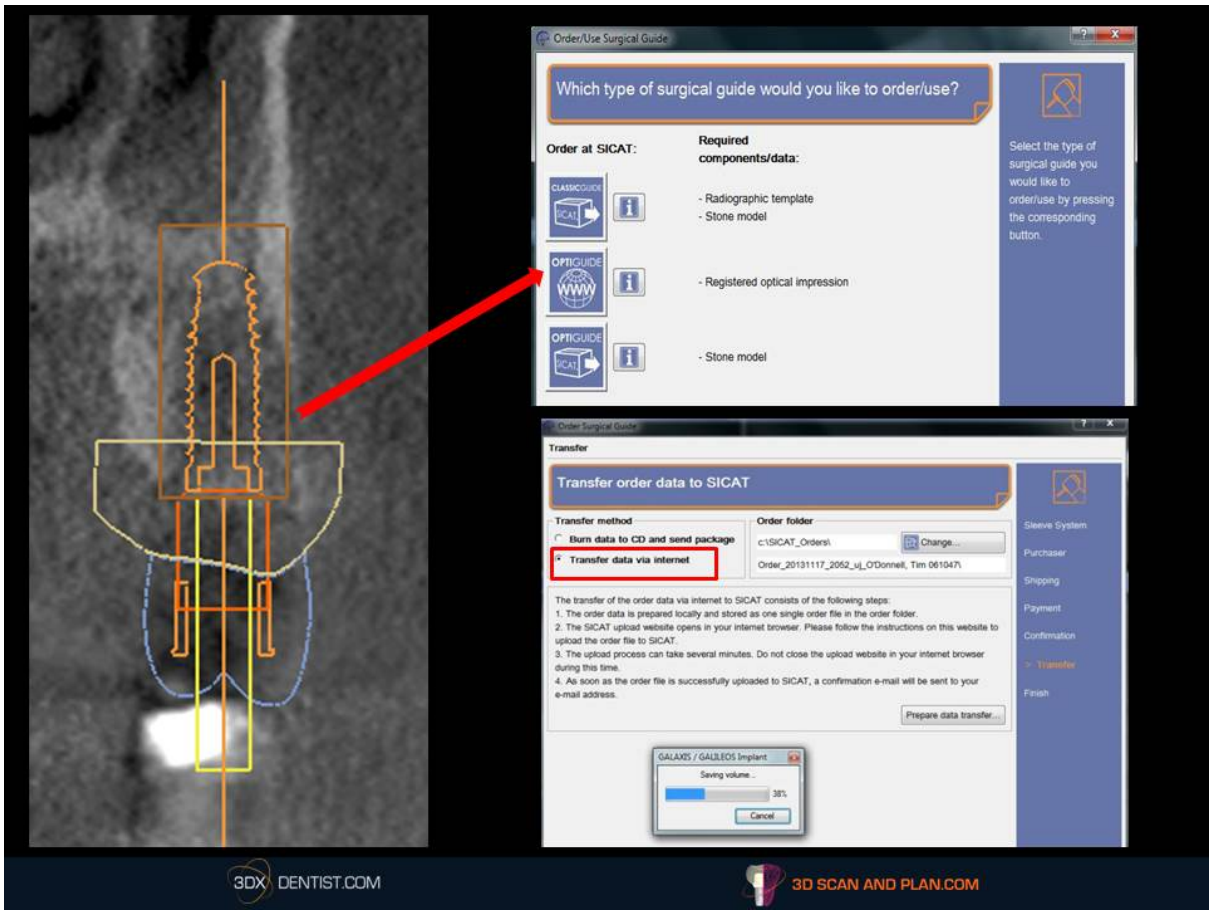

Figure 9:
Optiguide precision surgical implant guide plan is then uploaded to Sicat via internet transfer.

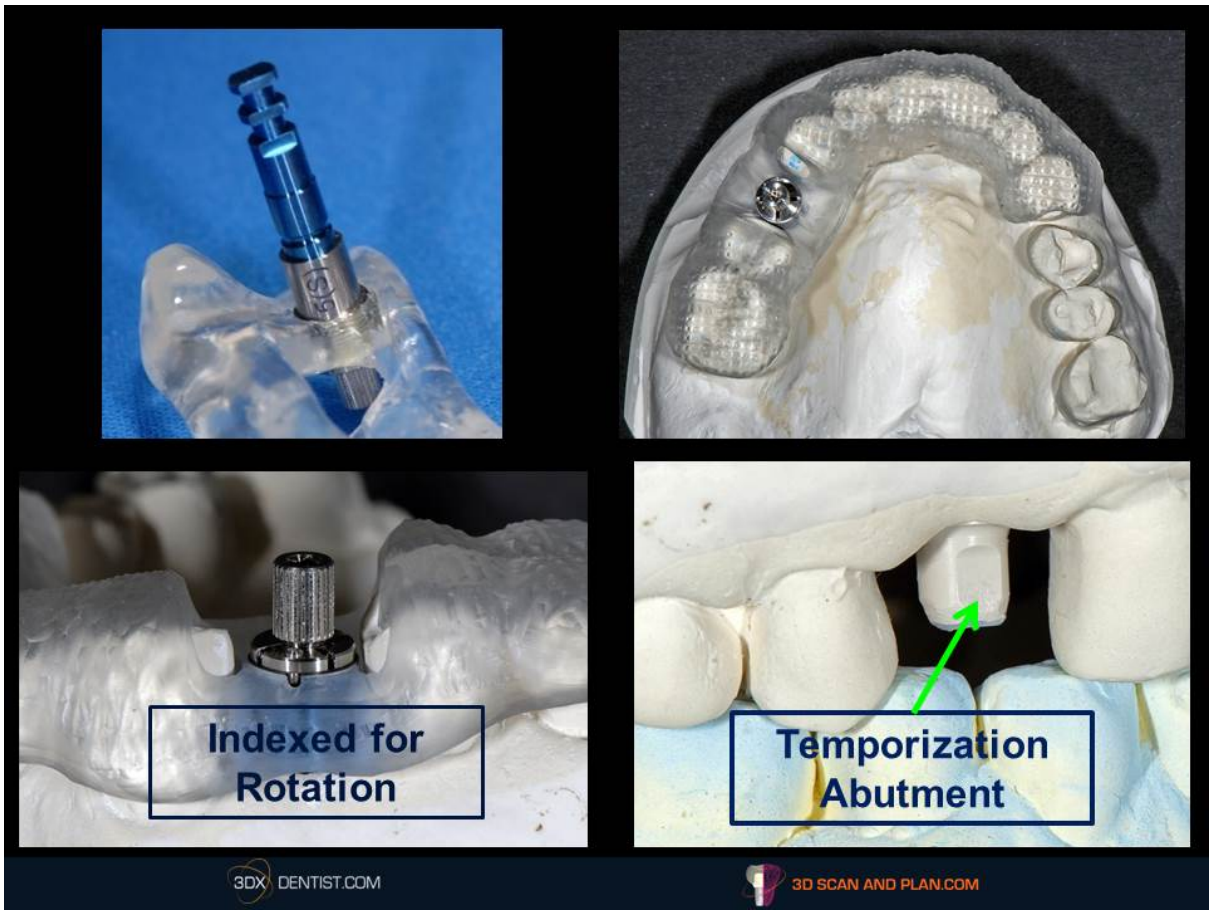

Figure 10:
Sicat Optiguide precision surgical guide returns within 8 days and is employed as template for model reconstitution to enable construction of immediate provisional crown prior to surgery:

- Implant analogue attached to fixture carrier through guide sleeve of Optiguide
- Optiguide with analogue attached is seated on model and indexed for implant rotation
- Analogue plastered in situ
- Temporization abutment attached for scanning and provisional crown construction.

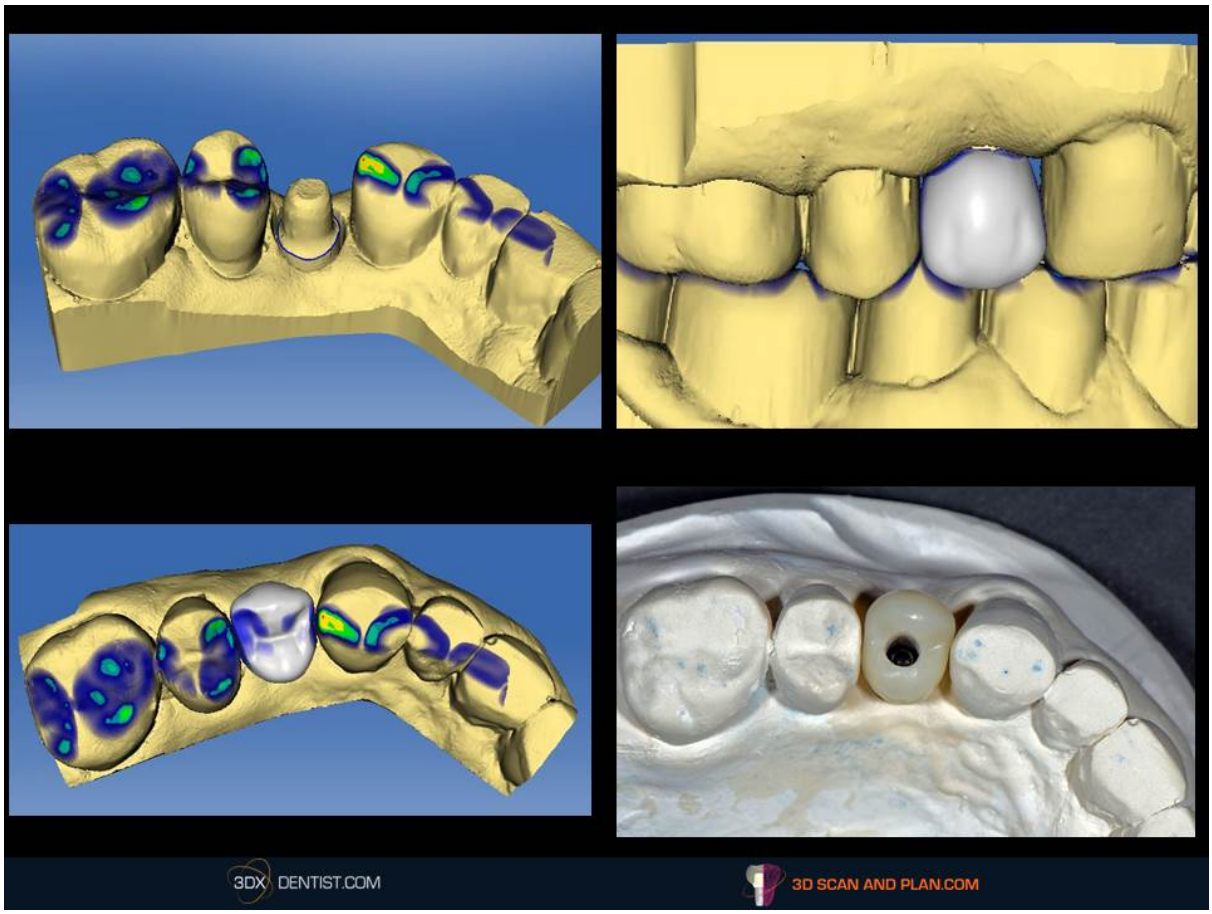

Figure 11:
Provisional crown abutment is scanned and the provisional crown is designed, milled out of Cad Temp material and bonded to provisional abutment.
In this way a provisional crown is manufactured to coincide with the exact same three dimensional position and rotation as the planned implant.

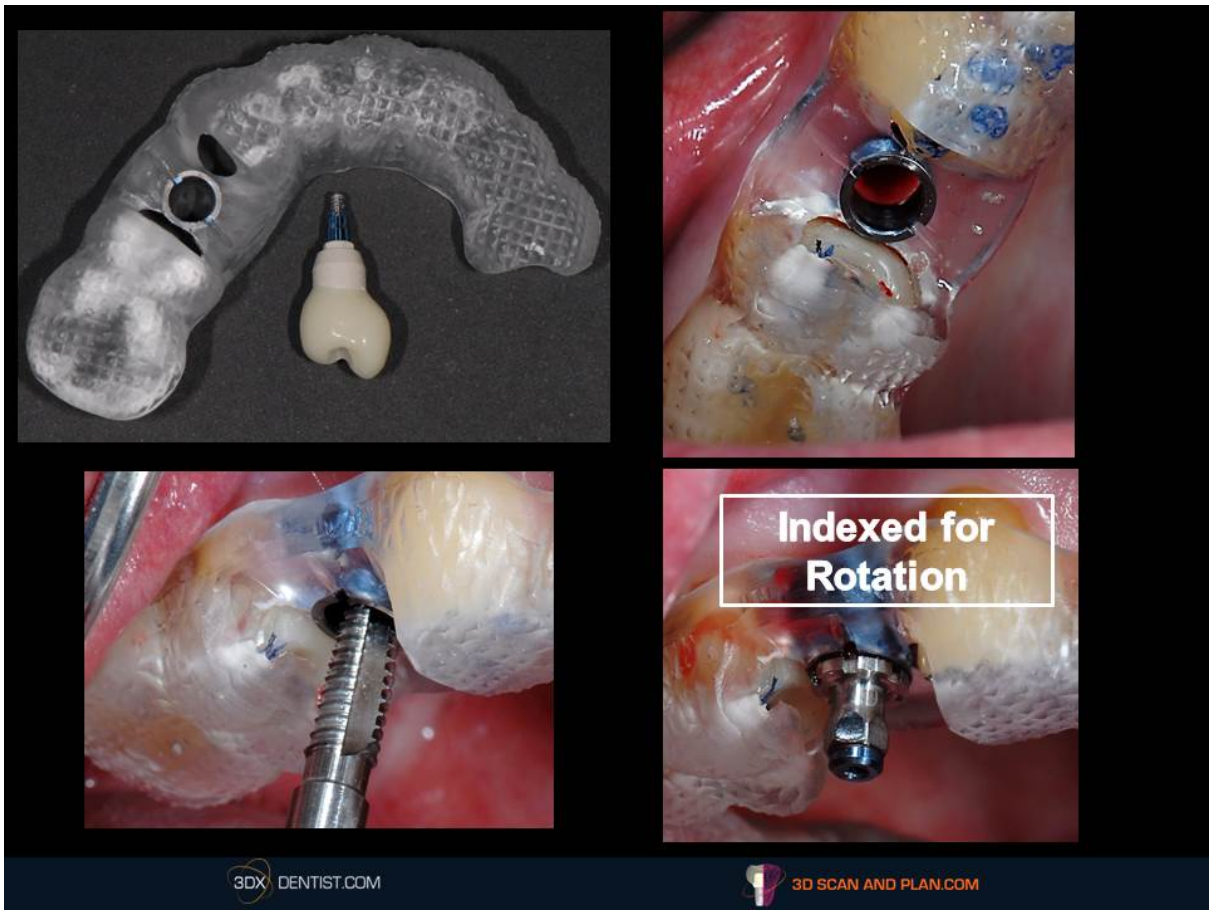

Figure 12:
Optiguide precision surgical guide and provisional crown are employed during implant surgery.
All osteotomy preparation and implant placement is performed in a flapless technique, through the precision surgical guide, employing the Biomet 3i Navigator guided surgery implant kit.
In this way surgical time and patient morbidity is greatly reduced.
The implant is indexed for rotation as per the manufacture of the provisional crown.

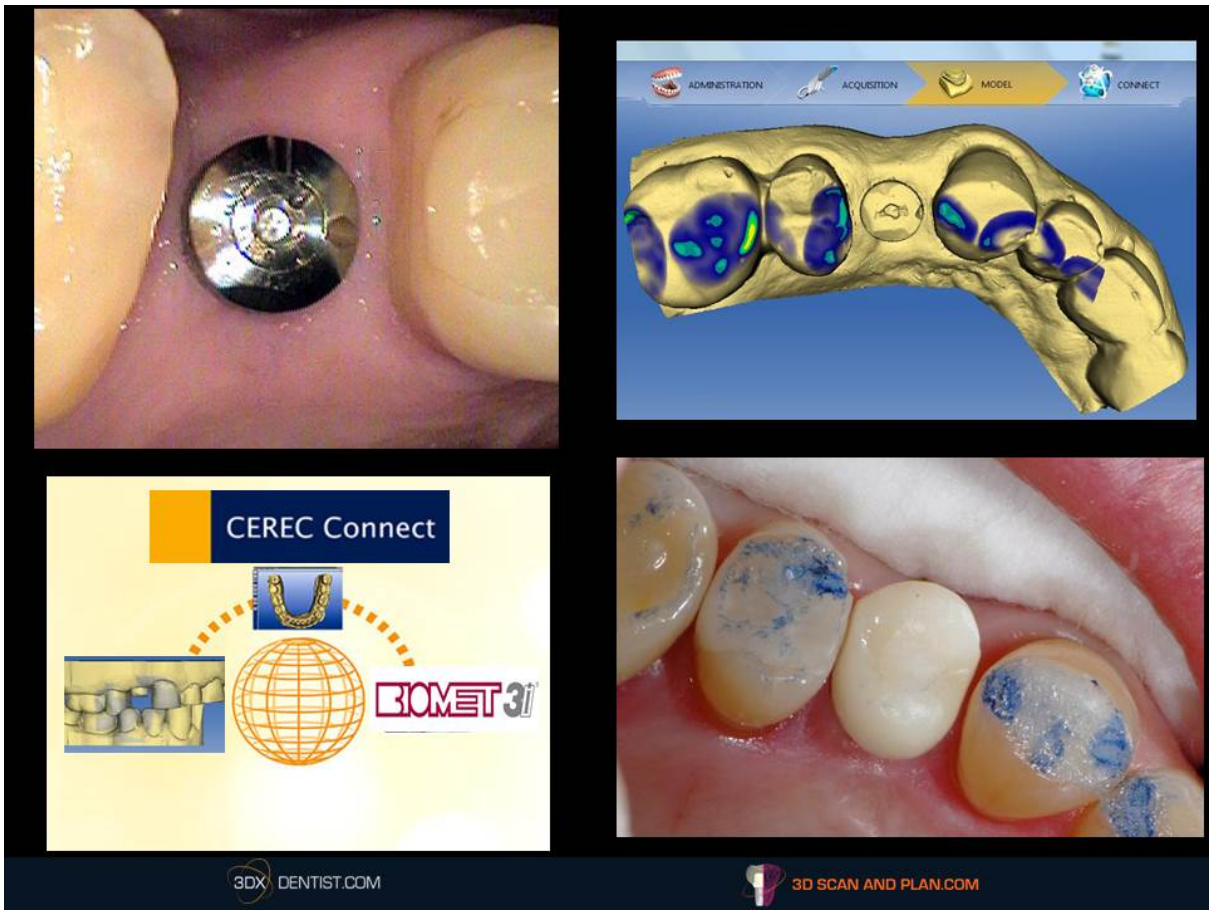

Figure 13:
BellaTek Encode scannable abutment attached to implant at time of surgery, scanned and file exported via Cerec Connect to Biomet 3i Laboratory in Florida for manufacture of final prosthetic abutment.
The pre-fabricated provisional crown is then attached and adjusted completely out of occlusion and free of proximal contacts.
The final zirconia abutment is manufactured during 4 month osseointegration period.

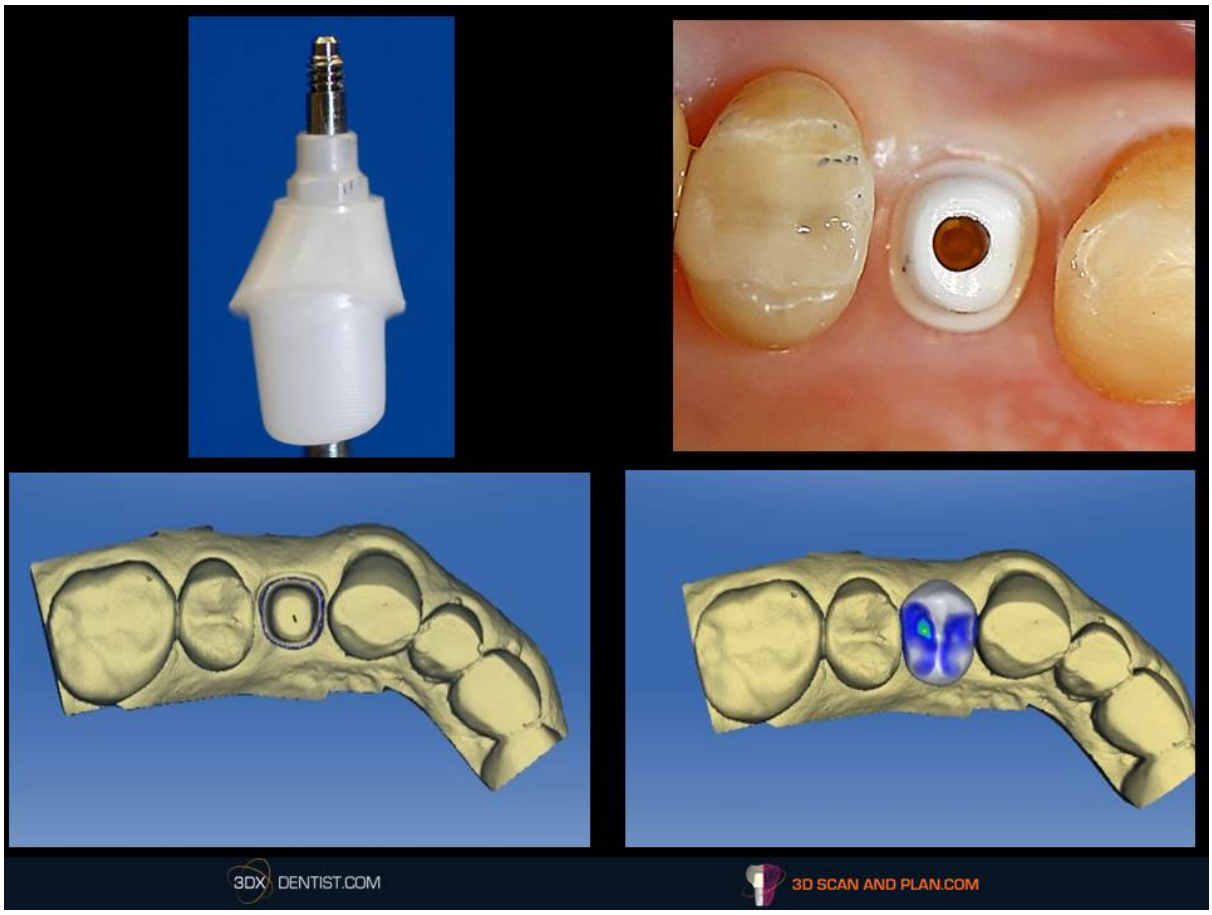

Figure 14:
Following 4 months osseointegration the final Biomet 3i BellaTek custom zirconia abutment is attached to the implant.
The abutment is scanned and the final IPS e.max CAD crown designed, milled, crystalized, stained and glazed chairside.

Figure 15:
After torqueing of abutment screw and sealing of screw access hole with Teflon tape, final e.max CAD crown is bonded to the zirconia abutment.

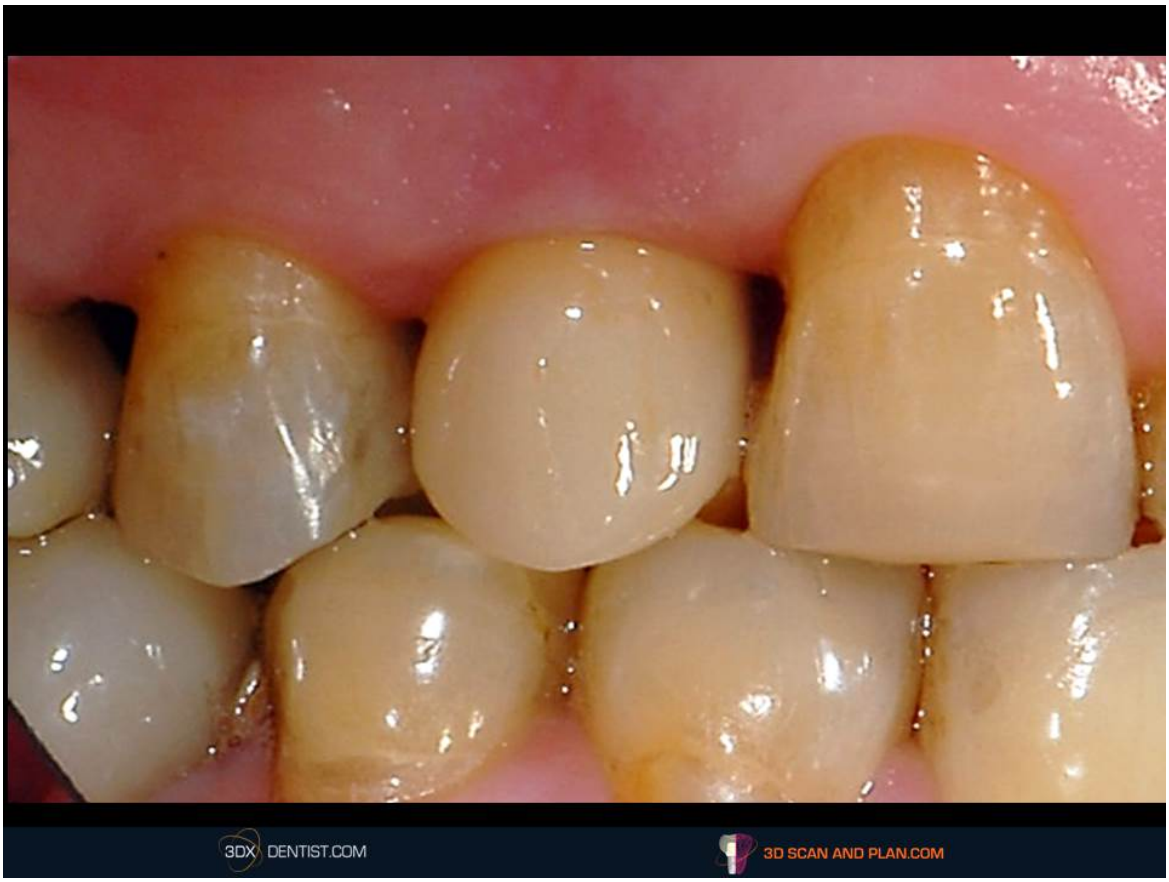

Figure 16:
After torqueing of abutment screw and sealing of screw access hole with Teflon tape, final e.max CAD crown is bonded to the zirconia abutment.

Biography Dr Hugh Fleming

Bachelor Dental Surgery
Graduate Diploma in Clinical Dentistry (Oral Implants)
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Dr Hugh Fleming (BDS, Dip Rad, Grad Dip Clin Dent - Oral Implants) is the founder and director of 3DXDentist.com. Dr Fleming first studied diagnostic medical radiography at Charles Sturt University attaining a Diploma in Diagnostic Medical Radiography in 1981. He worked as a medical radiographer in several major Sydney hospitals while completing his Bachelor of Dental Surgery (BDS) at Sydney University in 1986. His dental practice has a strong emphasis on cosmetic dentistry, complex restorative care and oral implants. He has been surgically placing and prosthodontically restoring dental implants since 1987. He also holds a Graduate Diploma in Clinical Dentistry from Sydney University and has lectured at the University of Sydney both to the undergraduate course, as Associate Lecturer in Implantology, and as Prosthodontic Mentor for the Graduate Diploma in Clinical Dentistry (Oral Implants). Dr Fleming is a regular presenter for Sirona Australia in the integration of GALILEOS and CEREC technologies in patient diagnosis and dental implant planning and the use of precision surgical guides in dental implant placement.

3DXDentist specializes in the education and training of dentists in 3D dental imaging technologies and the use of these technologies for the diagnosis, treatment planning and performing of 3D dental treatment procedures. 3DXDentist regularly runs Mentorship programs for clinicians wishing to train in the areas of Galileos and XG3D Cone Beam x-ray imaging, and the integration of Cerec, Galileos and Sicat technologies in the treatment planning and performance of precision guided implant surgery.
