Isaac D Tawil DDS MS

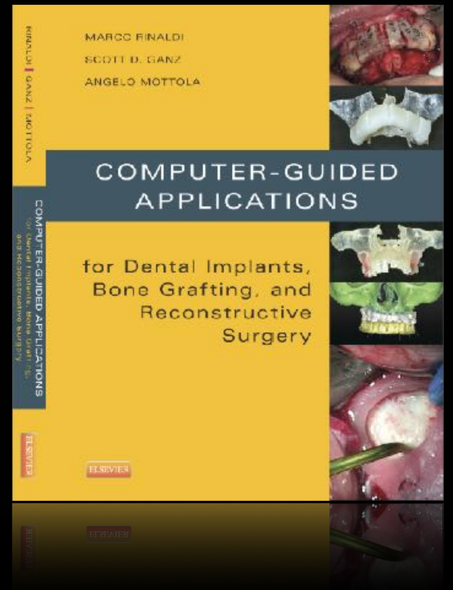
- Partner TBS instruments, Universal Shapers
- New product consultant for Megagen America, IDS-Biotech, 3DISC, Henry Schien, Benco, Megagen Korea, MEDIT, Quickscan, Carestream, Rayscan

ICOI

STAY ON TARGET

- Diplomat International Academy Dental Implantology
- Diplomat International Academy for Dental Facial Esthetics
- Fellow International Congress of Oral Implantology
- MINEC Ambassadors (Megagen International Network of Educators and Clinicians
- MINEC USA board of directors
- Digital Dental USA society board of directors
- Dentistry Today top 225 CE providers
- Faculty Osseodensification Academy
- Brighter way Educational Director Phoenix, Arizona
- Digital Director Guided Smile
- Ambassador SlowDentistry
- Pierre Fauchard award for outstanding achievements
- Fellow Advanced Dental Implant Academy
- Presidential Service Award Outstanding Achievements
- Private Practice, Brooklyn, New York
- Founder and Co-Director and of Advanced Implant Education

- **Diagnostic - Freehand**
- **Template-Assisted**
- **Full template-Guidance**



- Diagnostic - Freehand
- Template-Assisted
- Full template-Guidance

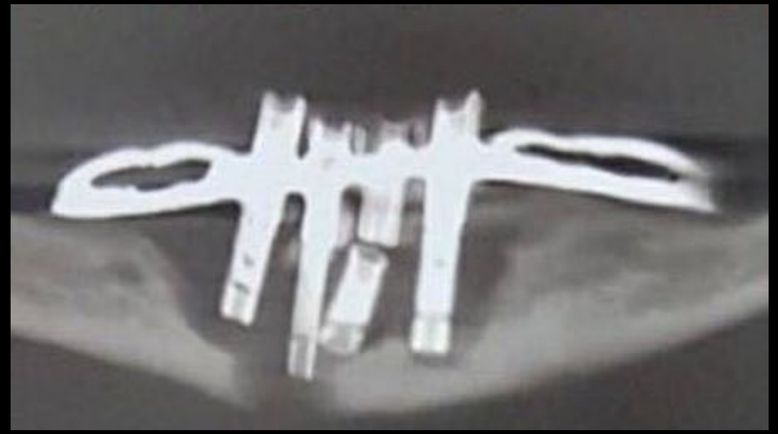
All roads lead to Rome

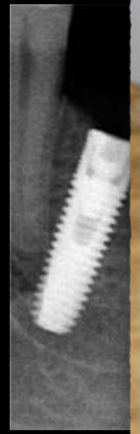
Some may be bumpier than others


Some may be bumpier than others

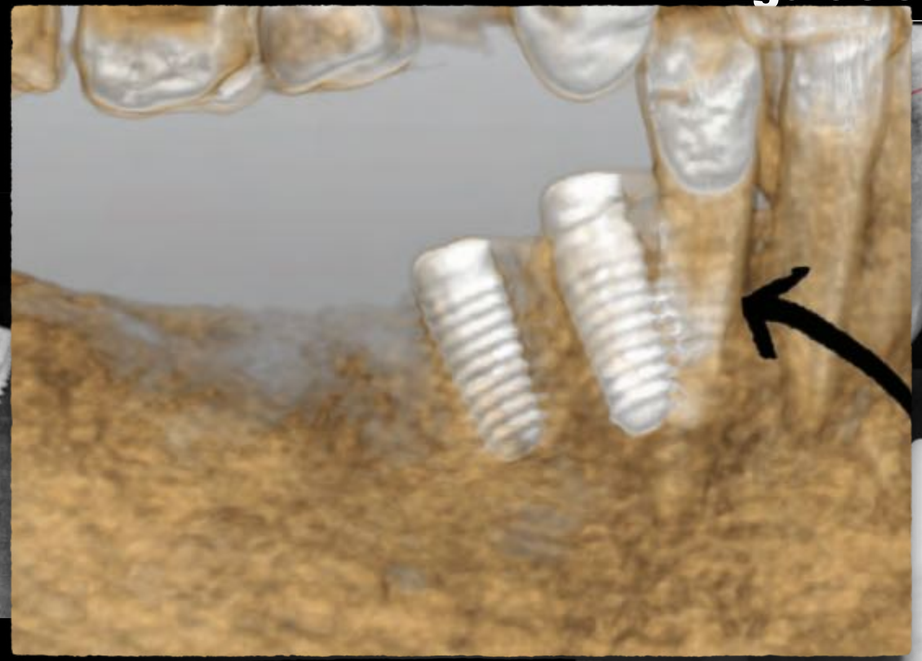
- Diagnostic - Freehand ?

Complication

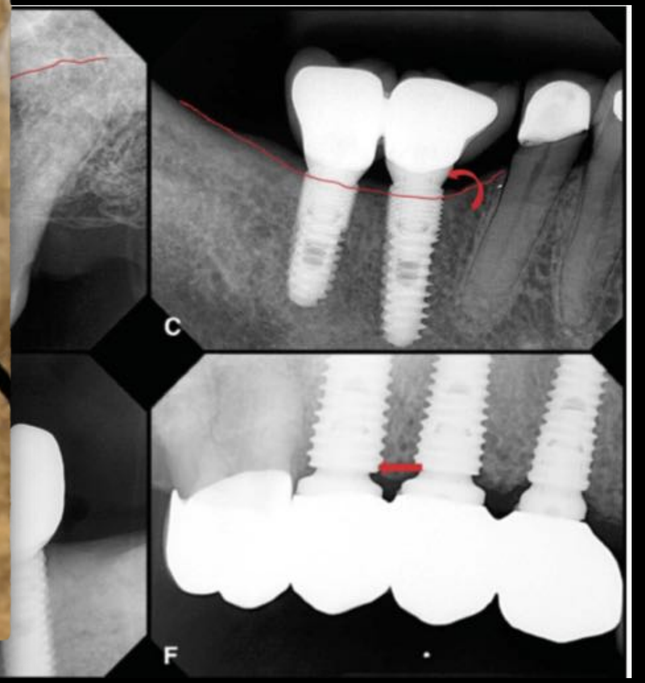


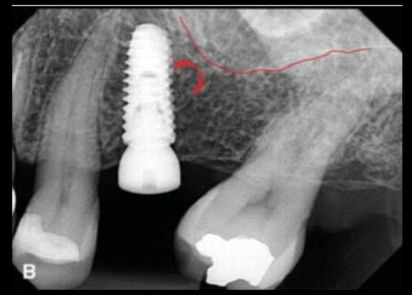


Angulation



Spacing



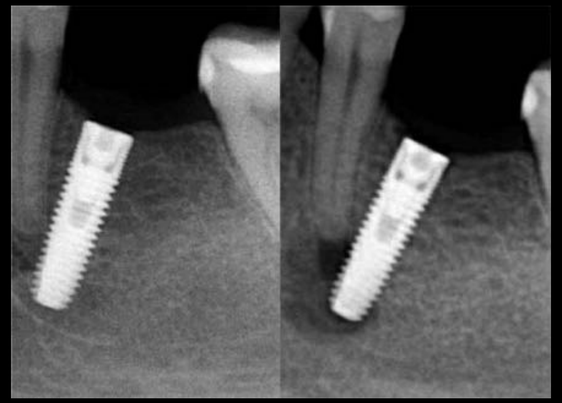


Angulation

- Diagnostic - Freehand ?

Spacing

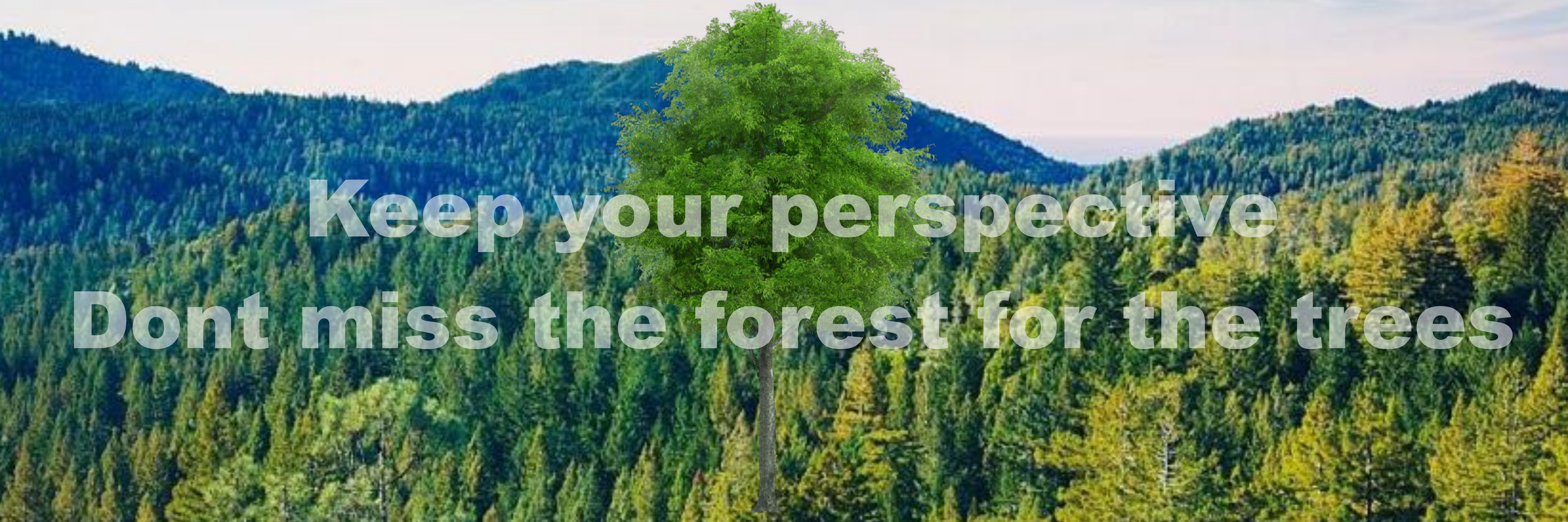
Complication



• Diagnostic - Freehand ?

Larger cases can loose orientation

Prosthetic Gymnastics


Keep your perspective
Dont miss the forest for the trees

• Full-G

88% positiona

Freehand Versus Guided Surgery: Factors Influencing Accuracy of Dental Implant Placement.

Choi, William DMD; Nguyen, Bao-Chau DDS; Doan, Andrew DMD; Girod, Sabine MD, DDS, PhD; Gaudilliere, Brice MD, PhD; Gaudilliere, Dyani DMD, MPH

Implant Dentistry: Post Author Corrections: July 20, 2017
doi: 10.1097/ID.0000000000000620
Basic and Clinical Research: PDF Only

Int J Oral Maxillofac Implants. 2013 Jan-Feb;28(1):190-204. doi: 10.11607/jomi.2691.

Implant positioning errors in freehand and computer-aided placement methods: a single-blind clinical comparative study.

Arisan V[1], Karabuda CZ, Mumcu E, Özdemir T.

J Clin Periodontol. 2018 Apr 2. doi: 10.1111/jcpe.12897. [Epub ahead of print]

A randomized controlled study on the accuracy of free-handed, pilot-drill guided and fully-guided implant surgery in partially edentulous patients.

Younes F[1], Cosyn J[1,2], De Bruyckere T[1,2], Cleymaet R[1], Bouckaert E[2], Eghbali A[1,2].

1. Rosenfeld AL, Mandelaris GA, Tardieu PB. Prosthetically directed implant placement using computer software to ensure precise placement and predictable prosthetic outcomes. Part 2: Rapid-prototype medical model-ing and stereolithographic drilling guides requiring bone exposure. Int J Periodontics Restorative Dent. 2006; 26:347–353.

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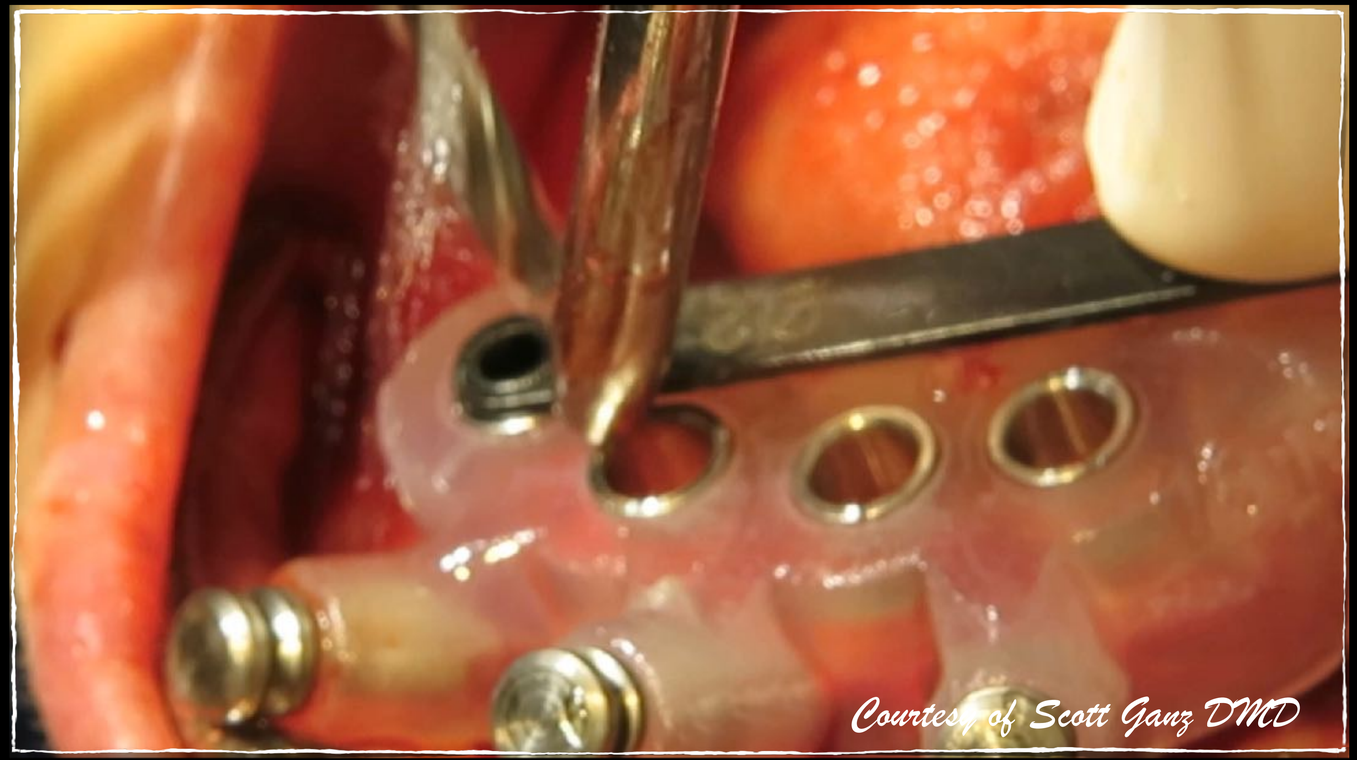
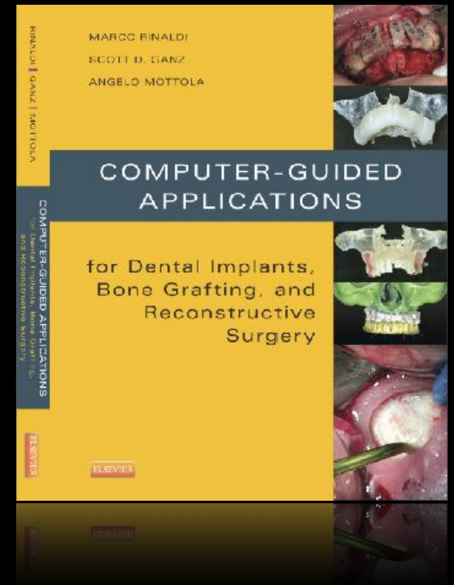
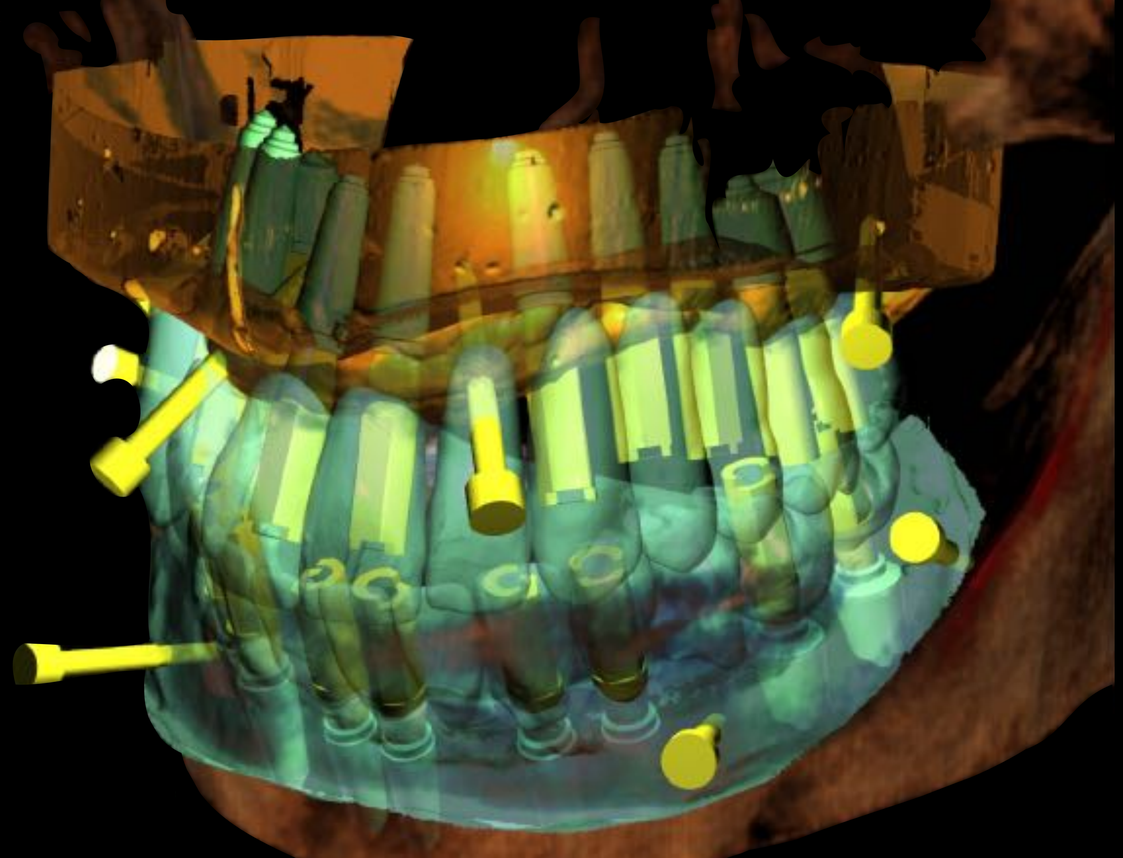
- Diagnostic - Freehand
- **Template-Assisted**
- Full template-Guidance

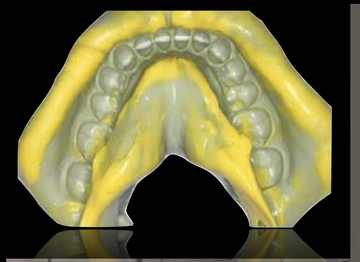




- Diagnostic - Freehand
- Template-Assisted
- **Full template-Guidance**

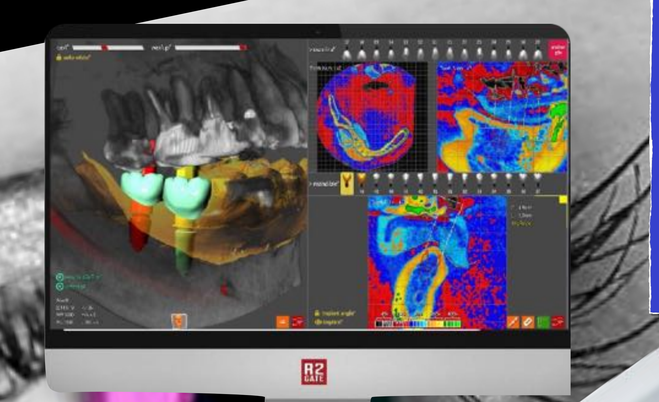


ANALOG → DIGITAL



Essential technologies for Guided Implant placement *AND* restoration:

- CBCT
- iOS/Impression
- Software
- RFA - ISQ

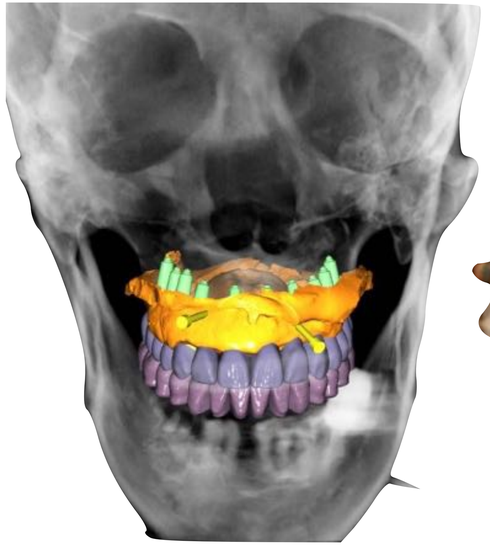


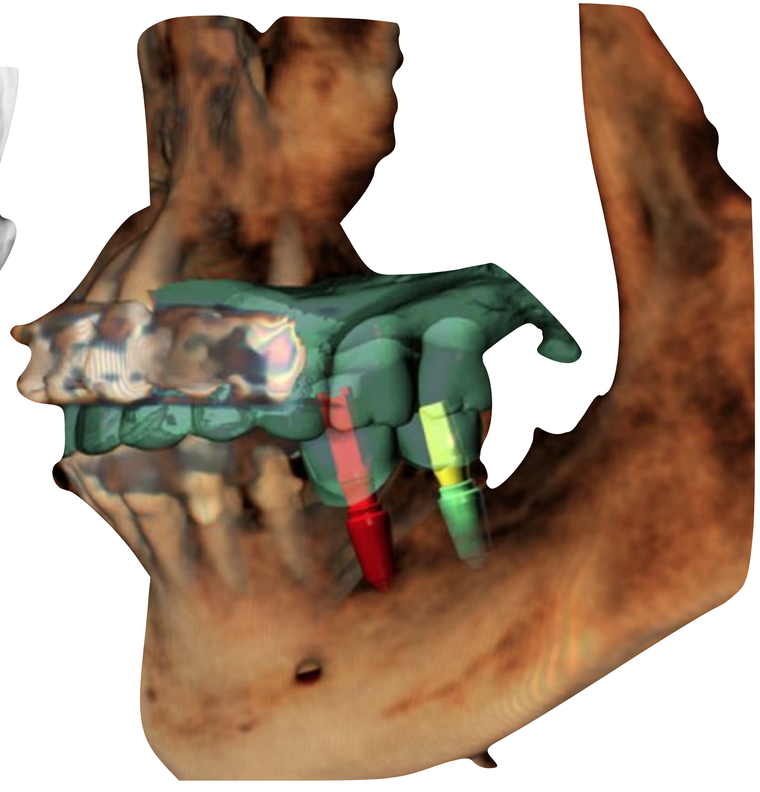
I place Implants

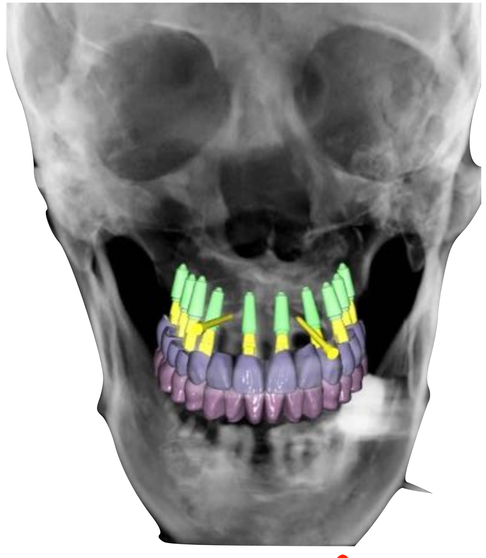
Why do I need an Intraoral Scanner ?


Scan
Plan
Trace
Place
The digital Handshake


IOS
3shape
LAUNCA
VOCO
WOW
Carestream
R2iOS
R2iOS
Virtuo Vivo
SHINING3D
3M
iTero
Primescan
ADigital







Reality

CBCT

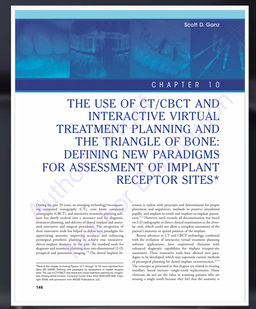
The Standard Of Care

Defining New Paradigms for Assessment of Implant Receptor Sites

The Use of CT/CBCT and Interactive Virtual Treatment Planning for Congenitally Missing Lateral Incisors

Cone Beam Computed Tomography–assisted Treatment Planning Concepts

Position statement of the American Academy of Oral and Maxillofacial Radiology on selection criteria for the use of radiology in dental implantology with emphasis on cone beam computed tomography



Scott D. Ganz

CHAPTER 10

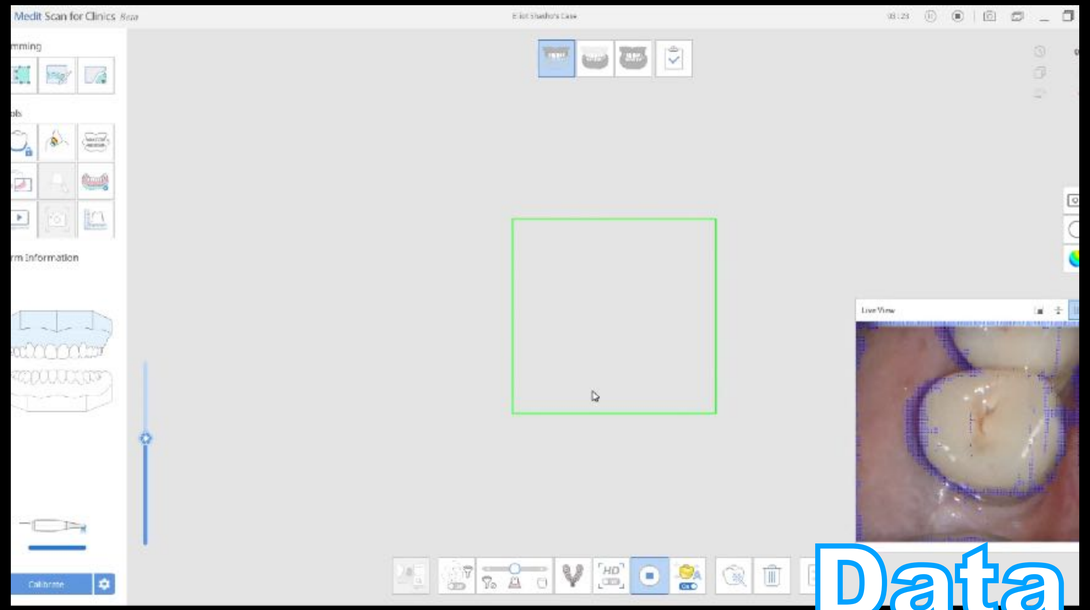
THE USE OF CT/CBCT AND INTERACTIVE VIRTUAL TREATMENT PLANNING AND THE TRIANGLE OF BONE: DEFINING NEW PARADIGMS FOR ASSESSMENT OF IMPLANT RECEPTOR SITES*

Use of Cone Beam Computed Tomography in Implant Dentistry: The International Congress of Oral Implantologists Consensus Report

Improved CBCT diagnostic acuity with the 'Lip-Lift' technique

Author Dr Scott D. Ganz, USA

IOS

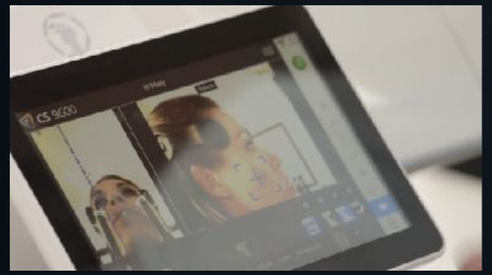


CBCT

Data Collection

PLAN

Radiopaque Scanning Appliance

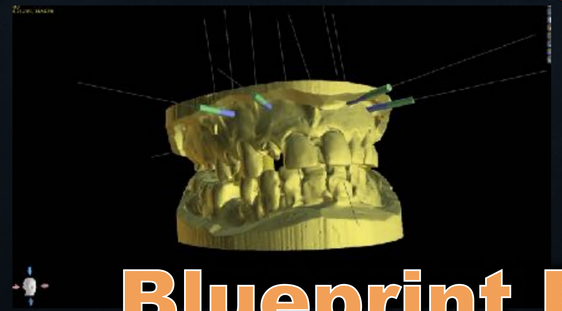


CT/CBCT Scan

DATA-MERGE

Study Cast / Optical Scan

Intra Extra-Oral Optical Scan



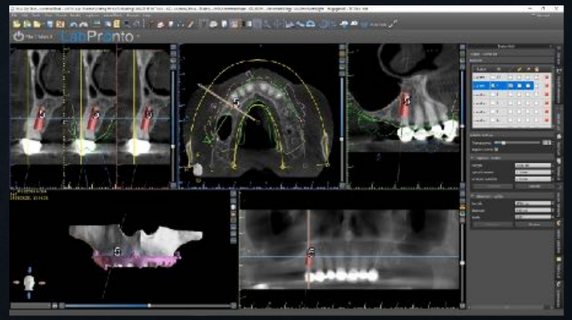
Use of CBCT Native Software

DICOM DATA

Use of Interactive Treatment Planning Software

CT-derived Surgical Template Fabrication

Surgical Intervention

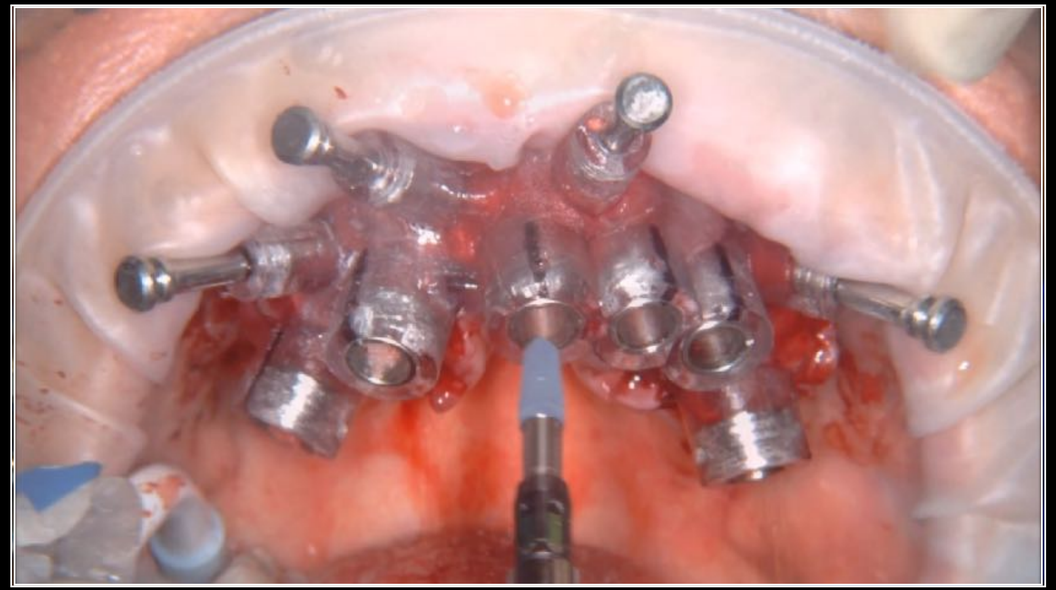


Blueprint For Success

Static Template

- **Full template-Guidance**

Dynamic Virtual Template




DIGITAL STATIC SURGERY

Stackable Tooth Guide

Isaac D Tawil DDS MS

AIE

PET

SG

Partial Extraction Therapy

Full Template Surgical Guidance

PET

SG

Full Template
Surgical Guidance

Prefabricated
Final abutment
& Provisional

Digital Static Shield

Partial Extr
Therap

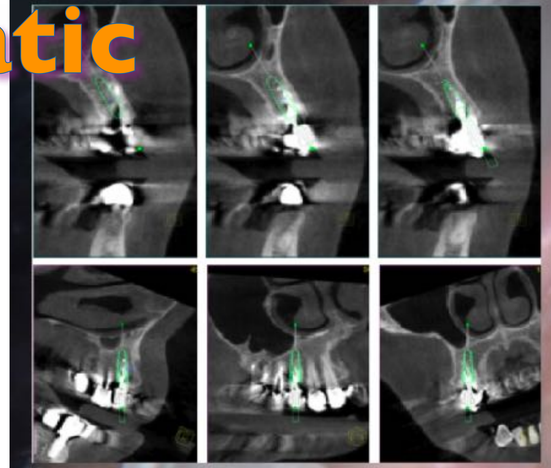
PET

Digital Static Shield

Partial Extrac Therapy

SG

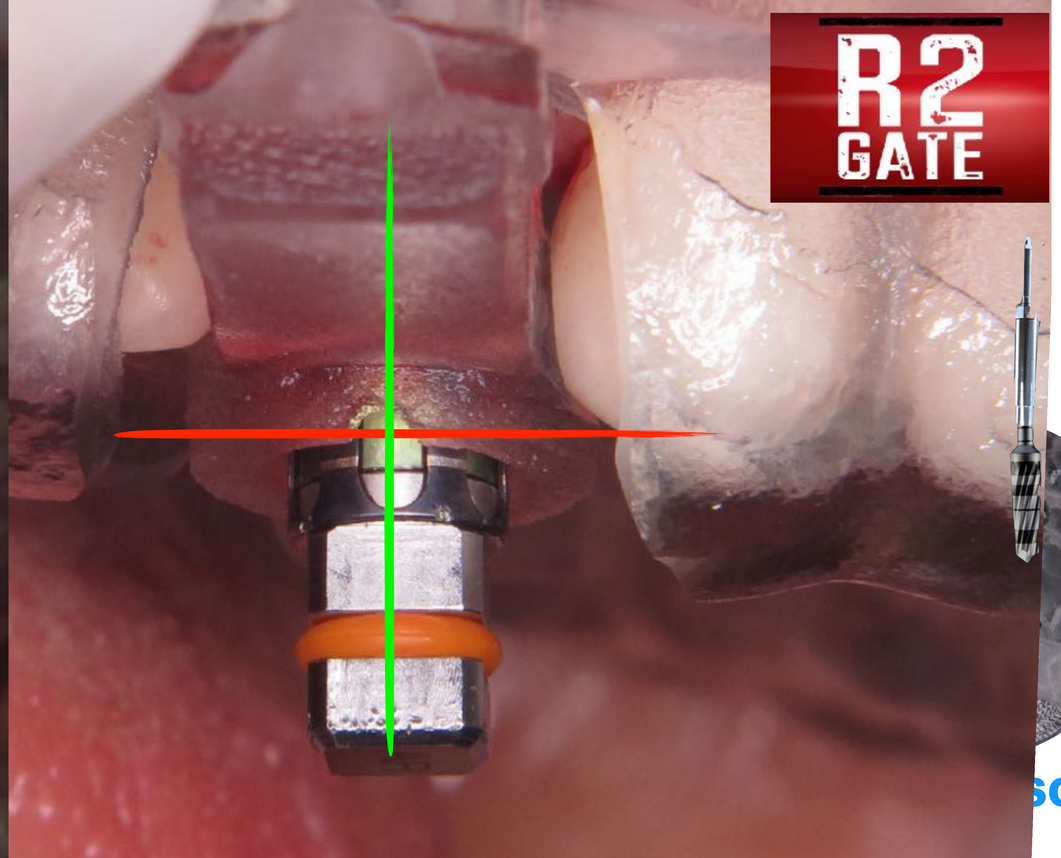
Digital Static Shield

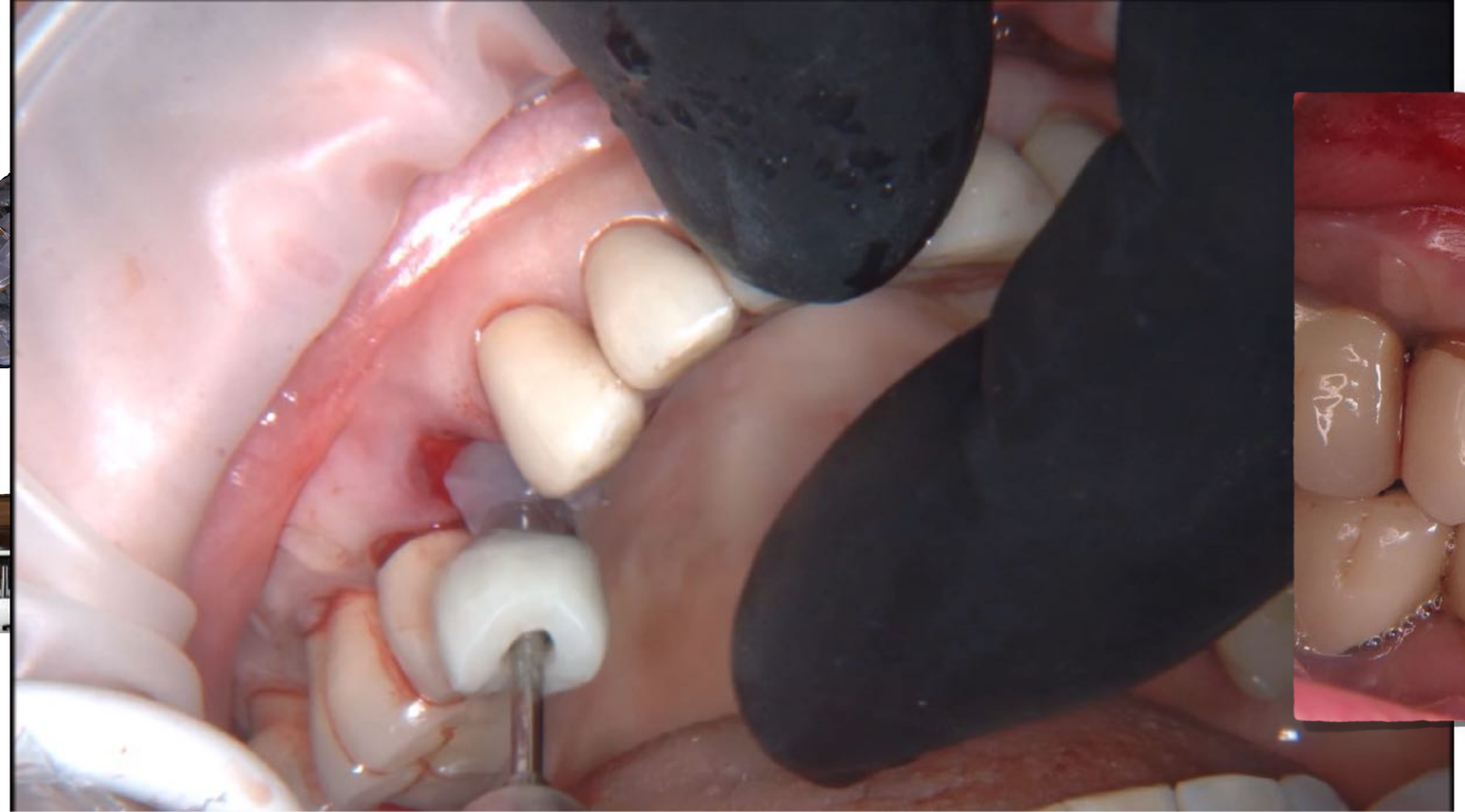


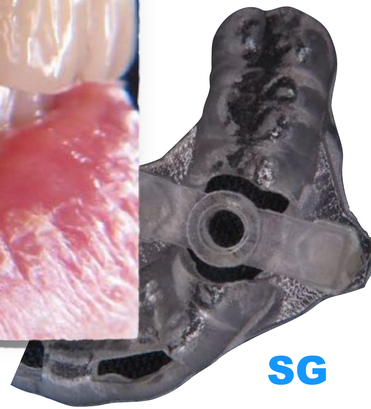
Part E

T

SG

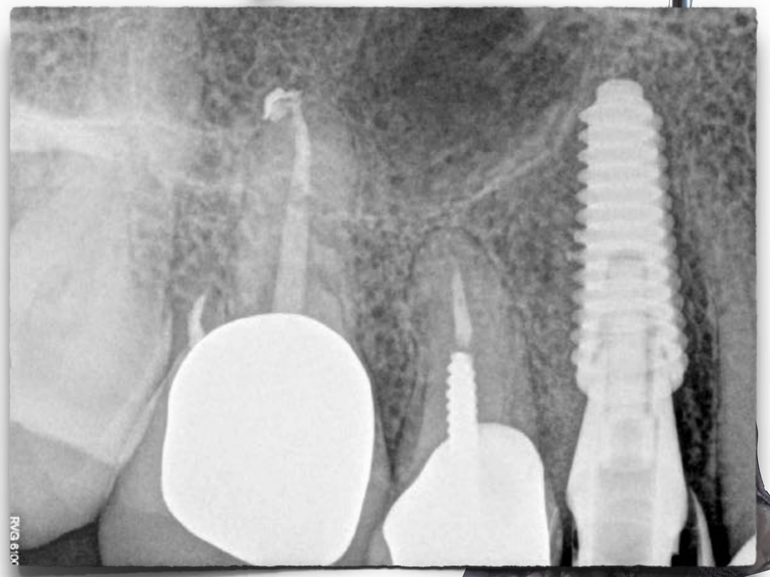

R2
GATE





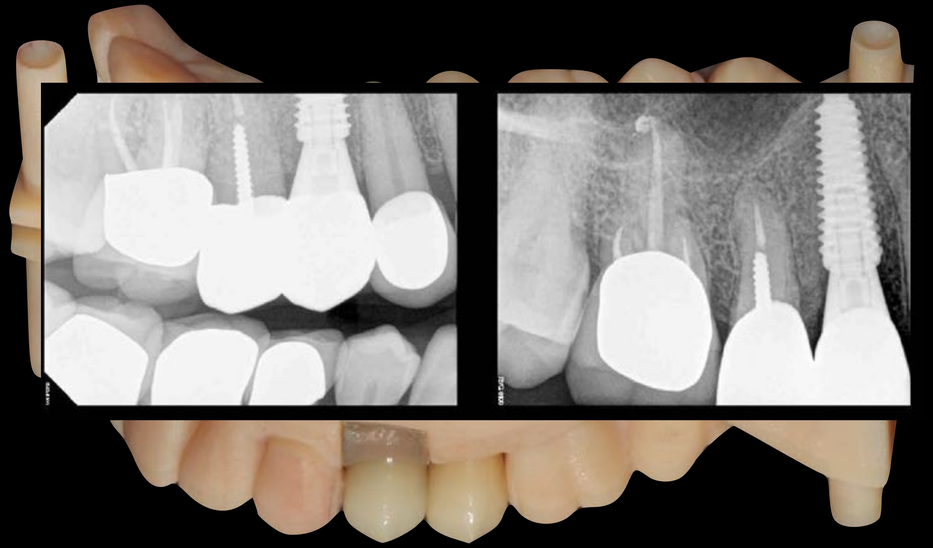
SG

3 Week Post Op

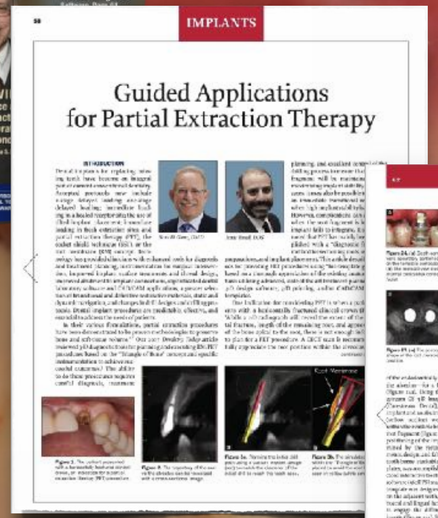


SG

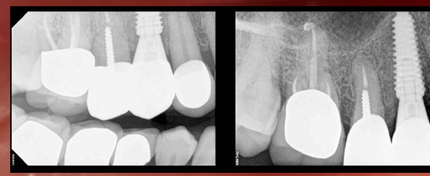

2 Month
Post op



Final Crown

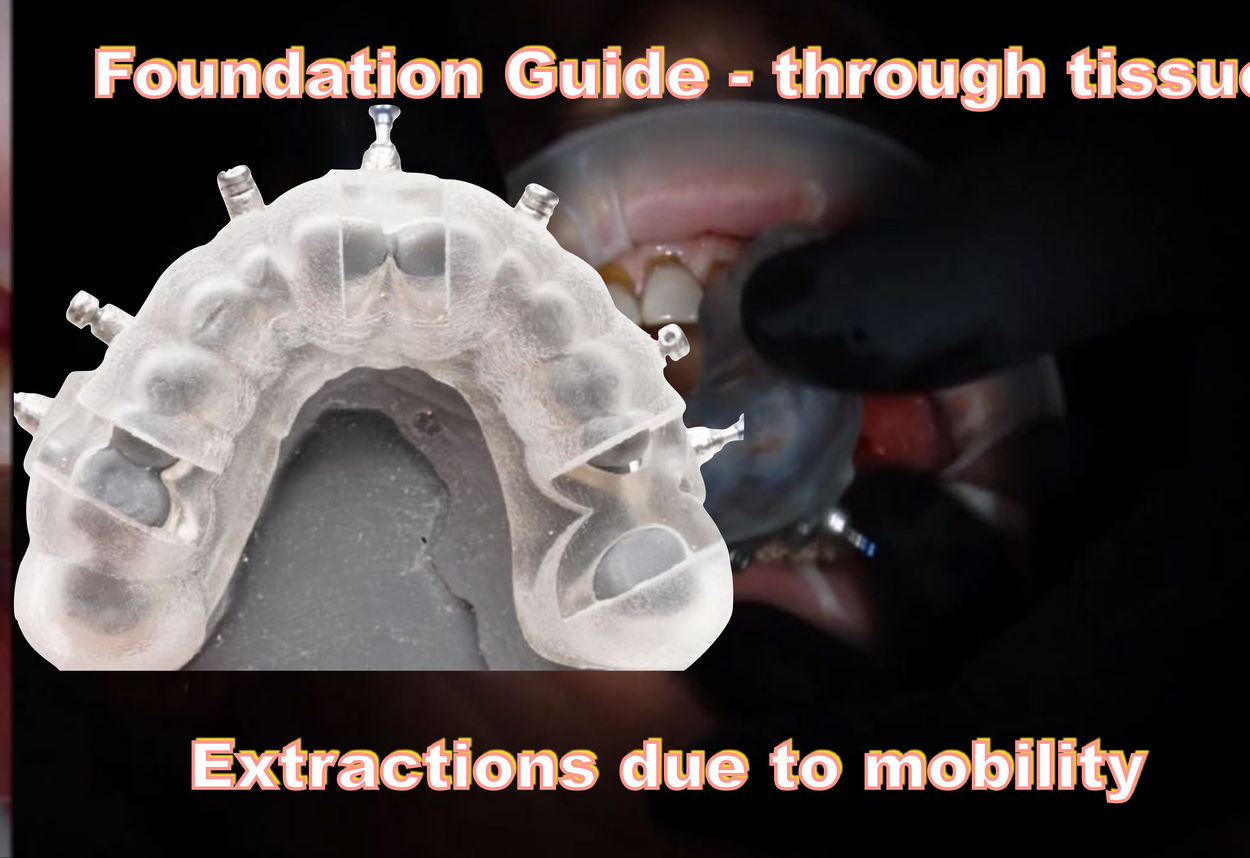


SEPT 2020



Full Arch Surgical Guidance


Partial Extraction Therapy
Flap to reduce to bone level


Foundation Guide - through tissue
Extractions due to mobility

Partial Extraction Therapy

Flap to reduce to bone level

Scalloping with guide

Scalloping Freehanded

The "Scalloped Guide": A Proof-of-Concept Technique for a Digitally Streamlined, Pink-Free Full-Arch Implant Protocol

Maurice A. Salama, DMD[1]
Alessandro Pozzi, DDS, PhD[2]
Wendy Audair Clark, DDS, MS[3]/Marko Tadros, DMD[4]
Lars Hansson, CDT, FICOI[5]/Pinhas Adar, MDT, CDT[5]

Inadequate restorative space can result in mechanical, biologic, and esthetic

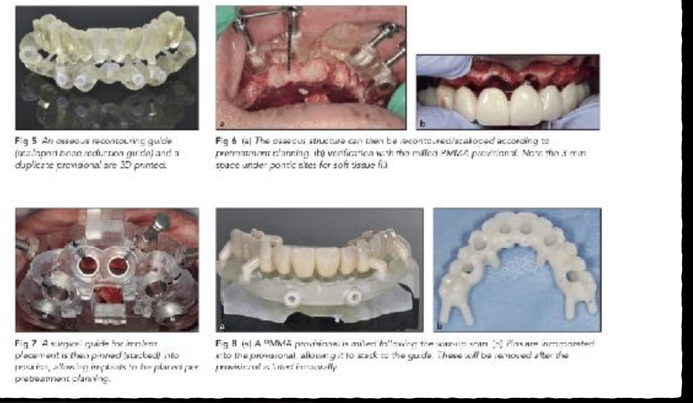


Fig 5 *An osseous recontouring guide (scalloped/osseous reductive guide) and a duplicate provisional are 3D printed.*

Fig 6 (a) *The osseous structure can then be recontoured/scalloped according to predetermined planning. (b) Verification with the milled PMMA provisional. Note the 3 mm space under pontic sites for soft tissue fill.*

Fig 7 *A surgical guide for implant placement is then pinned (stacked) into position, allowing implants to be placed per predetermined planning.*

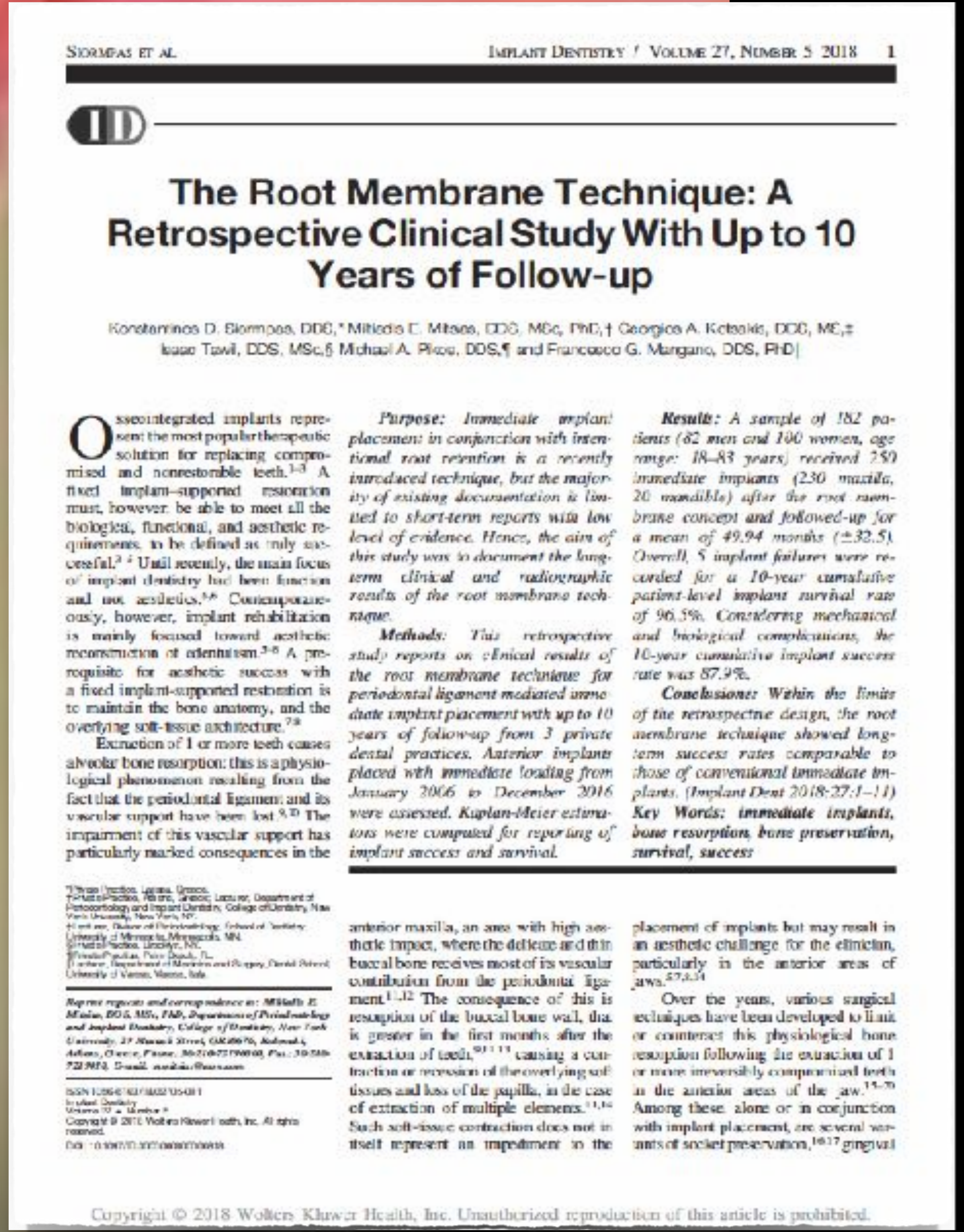
Fig 8 (a) *A PMMA provisional is milled following the wax-up scan. (b) Pinsare incorporated into the provisional, allowing it to stack to the guide. These will be removed after the provisional is luted intraorally.*

Scalloping

Surgical Guidance

FP1

Floating Foundation Guide - on Bone



Siormpas et al. Implant Dentistry / Volume 27, Number 5 2018 1

The Root Membrane Technique: A Retrospective Clinical Study With Up to 10 Years of Follow-up

Konstantinos D. Siormpas, DDS,* Miltiadis E. Mitsias, DDS, MSc, PhD,† Georgios A. Kotsakis, DDS, MS,‡ Isaac Tawil, DDS, MSc,§ Michael A. Pikos, DDS,¶ and Francesco G. Mangano, DDS, PhD‖

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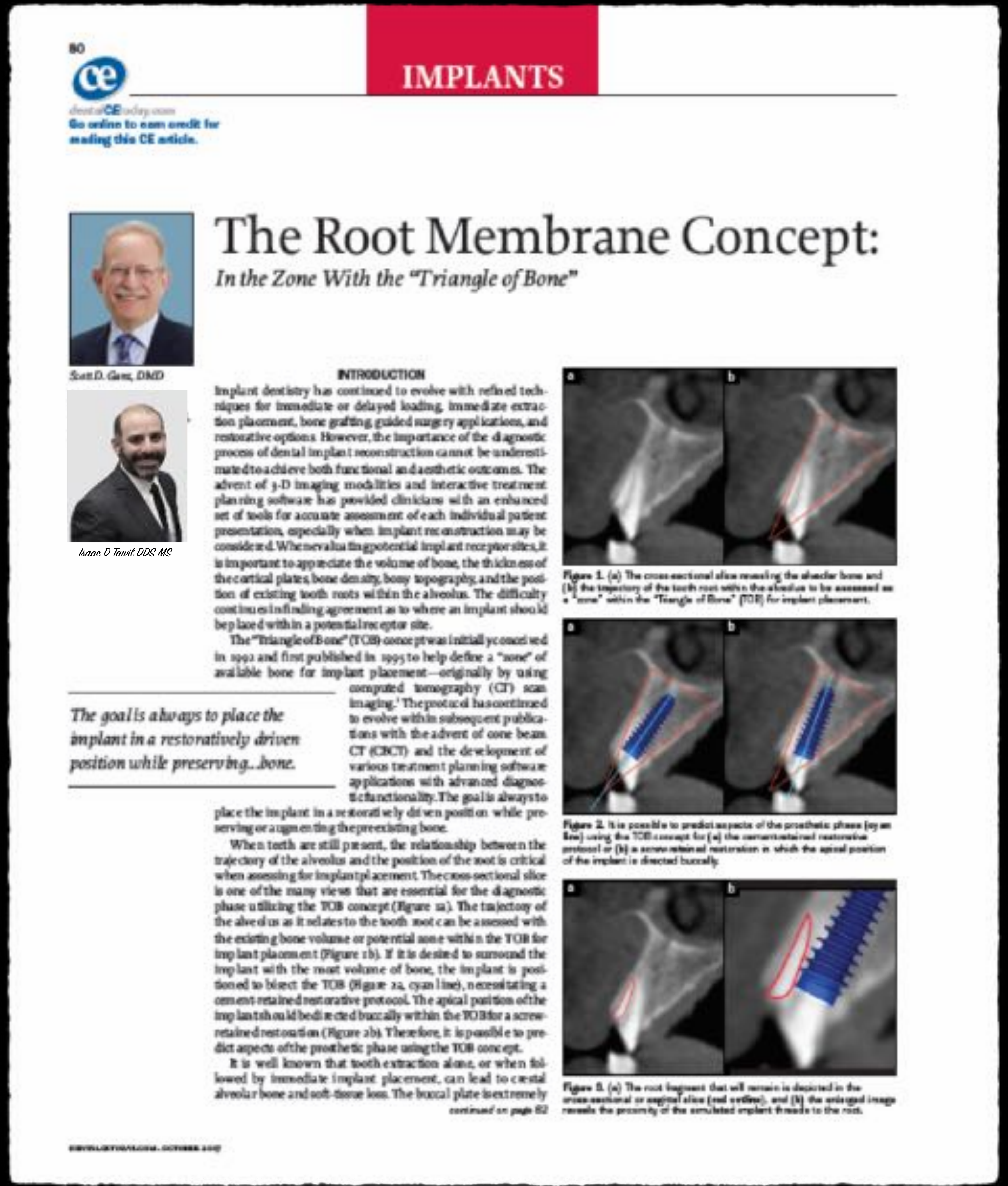
Longitudinal Soft Tissue Changes During Periodontal Ligament–Mediated Immediate Implant Placement with the Root-Membrane Technique

Miltiadis M. Mitsias, DDS, MS, PhD[1]/Manuel Bratos, DDS, MS[2]/Konstantinos Siormpas, DDS[3]/ Michael A. Pikos, DDS[4]/Root Membrane Group[5]/Georgios A. Kotsakis, DDS, MS[6]

The International Journal of Oral & Maxillofacial Implants 1



IMPLANTS

Go online to earn credit for reading this CE article.

The Root Membrane Concept:

In the Zone With the "Triangle of Bone"

Scott D. Ganz, DMD

Isaac D Tawil, DDS MS

INTRODUCTION

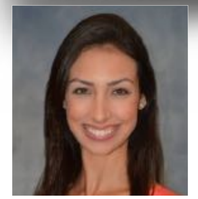
The goal is always to place the implant in a restoratively driven position while preserving...bone.

Osseodensification

Sinus Elevation

Clinical Evidence

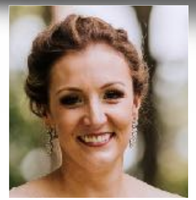
Multi-Center Retrospective 5-year follow up of 253 implants Implants with Six Different Thread Design Placed in 184 Patients with Osseodensification



Bruna Tanello, DDS
2nd year Resident
Center For Advanced Periodontology
and Implant Surgery
University Of Florida
Collage of Dentistry

Paul Rosen, DMD, MS
Clinical Profesor
Department of Periodontics
University Of Maryland
School of Dentistry
Private Practice, NY, Pennsylvania

Isaac Tawil, DDS, MS
Fellow ICOI
Co-director of Advanced Implant
Education Institution
Private Practice, Brooklyn, New York

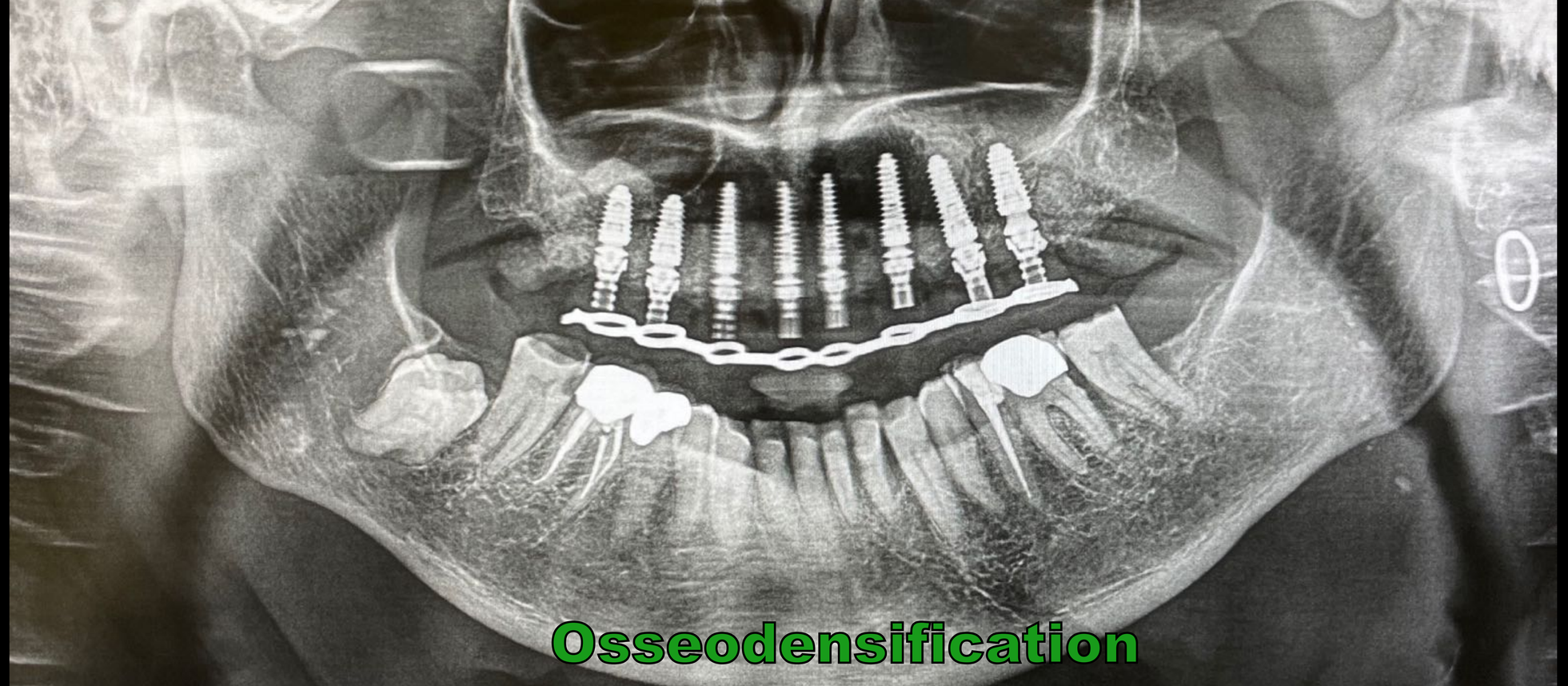


Dr. Erin (Johnson) Westmeyer, DDS
Clinical Assistant Professor of Implant Dentistry
Division of Prosthodontics
Dental Implant fellowship Program
University of Minnesota
School of Dentistry

Salah Huwais, DDS
Adjunct Assistant Clinical Profesor
Dental Implant Fellowship Program
University Of Minnesota
School of Dentistry
Private Practice, Jackson, MI

Rodrigo Neiva, DDS, MS
Director of Graduate Program
Department of Periodontology
University Of Florida, School of Dentistry

Tanello, Rosen, Tawil, Johnson, Huwais, Neiva


Osseodensification

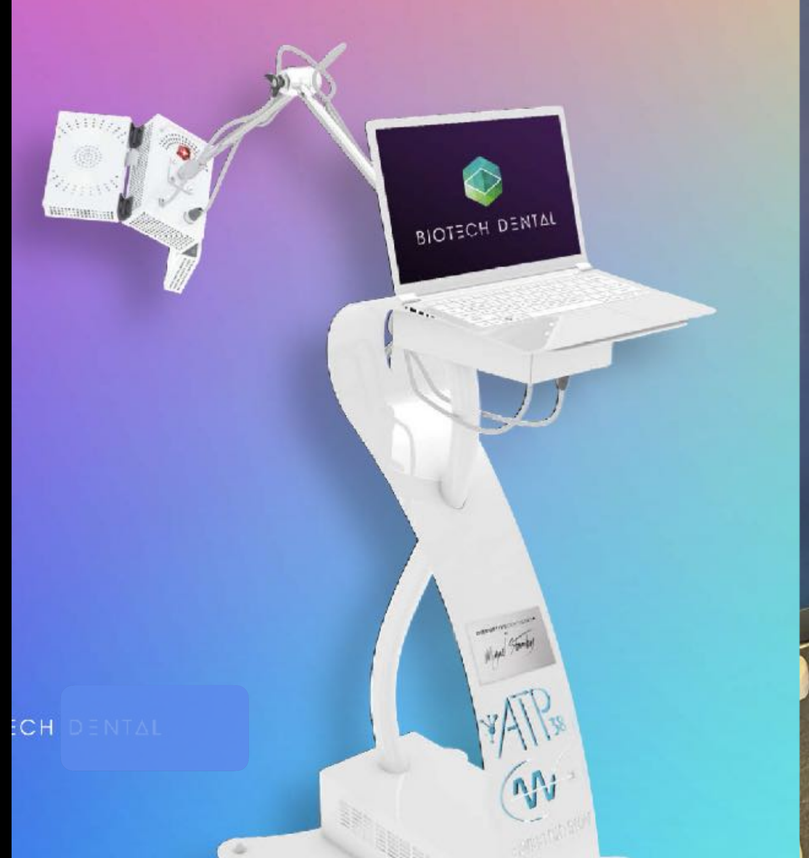

Sinus
Elevation
Osseodensification


Immediate Loading
MEGA ISQ
74
ISQ

Immediate Loading

FP1

ФОТОБИОМОДУЛЯЦИЯ



ФОТОБИОМОДУЛЯЦИЯ


Scalloped
PET
Extraction

Reverse analog scan

iJig

IMPLANTS

Full-Arch Implant Surgical and Restorative Considerations:

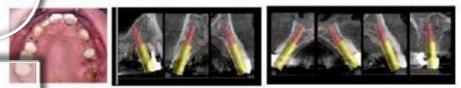
Innovations in the Digital Workflow with iJIG

Introduction:

When a patient presents with a failing dentition there are several different treatment options available when a fixed prosthetic result supported by dental implants is contemplated. This could include extraction and bone grafting allowing the ridge to heal before implants are placed, or extractions and immediate placement of implants with concurrent bone grafting to fill any voids in the remaining bony architecture. These two examples would usually leave the patient with a removable complete denture during the healing phase prior to loading of the implants for either a fixed or removable restoration. A treatment alternative was presented in the September 2019 (Ganz-Tawil) issue of Dentistry Today which described the necessary steps to achieve restoratively-driven surgical planning for full arch implant reconstruction where implants were loaded the day of surgery with a pre-fabricated fixed provisional restoration.

Immediate loading of dental implants offers many advantages over delayed treatment alternatives including, (1) the surgical phase is generally completed in one visit; (2) the pre-established occlusion can be planned in advance to achieve an immediate functional and esthetic result; (3) reduced overall treatment time to definitive restoration; and (4) a reduction in the number of patient visits. As technology continues to evolve, so do the variations in protocols that have been developed to enhance the process of delivering both presurgical and post-operative treatment. This current article presents innovations that can improve the workflow essential to improve efficiencies and achieve success with single and dual full-arch implant reconstruction.

A 58 year old male presented with a failing dentition. The pre-operative intra-oral panoramic view illustrates missing, broken, fractured, and decayed teeth, plaque and calculus accumulation, with severe soft tissue inflammation (Figs



Dentistry Today - January 2020 Ganz & Tawil

Dentistry Today - January 2020 Ganz & Tawil

Fig. 9a

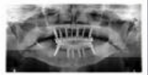


Fig. 10

Fig. 11a

Fig. 11c

Fig. 12a

Fig. 12c

Dentistry Today - January 2020 Ganz & Tawil

Fig. 13a

Fig. 14

Fig. 15a

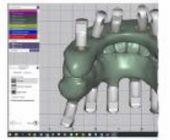


Fig. 15b

Fig. 18a

Dentistry Today - January 2020 Ganz & Tawil

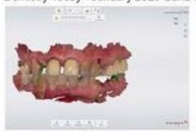


Fig. 17

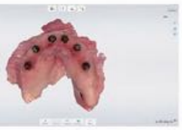


Fig. 18a

Fig. 18b

Fig. 19a

Fig. 19b

Fig. 19c

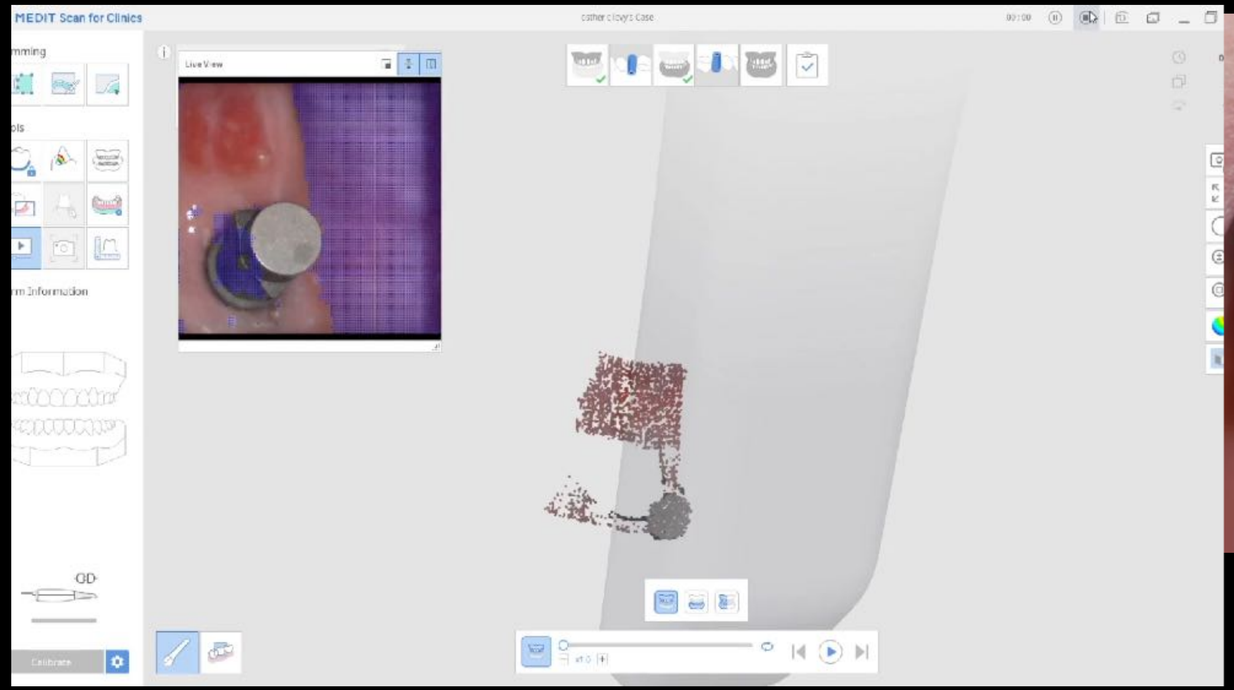
Fig. 19d

iJIG

Jan 2020

Photogrammetry

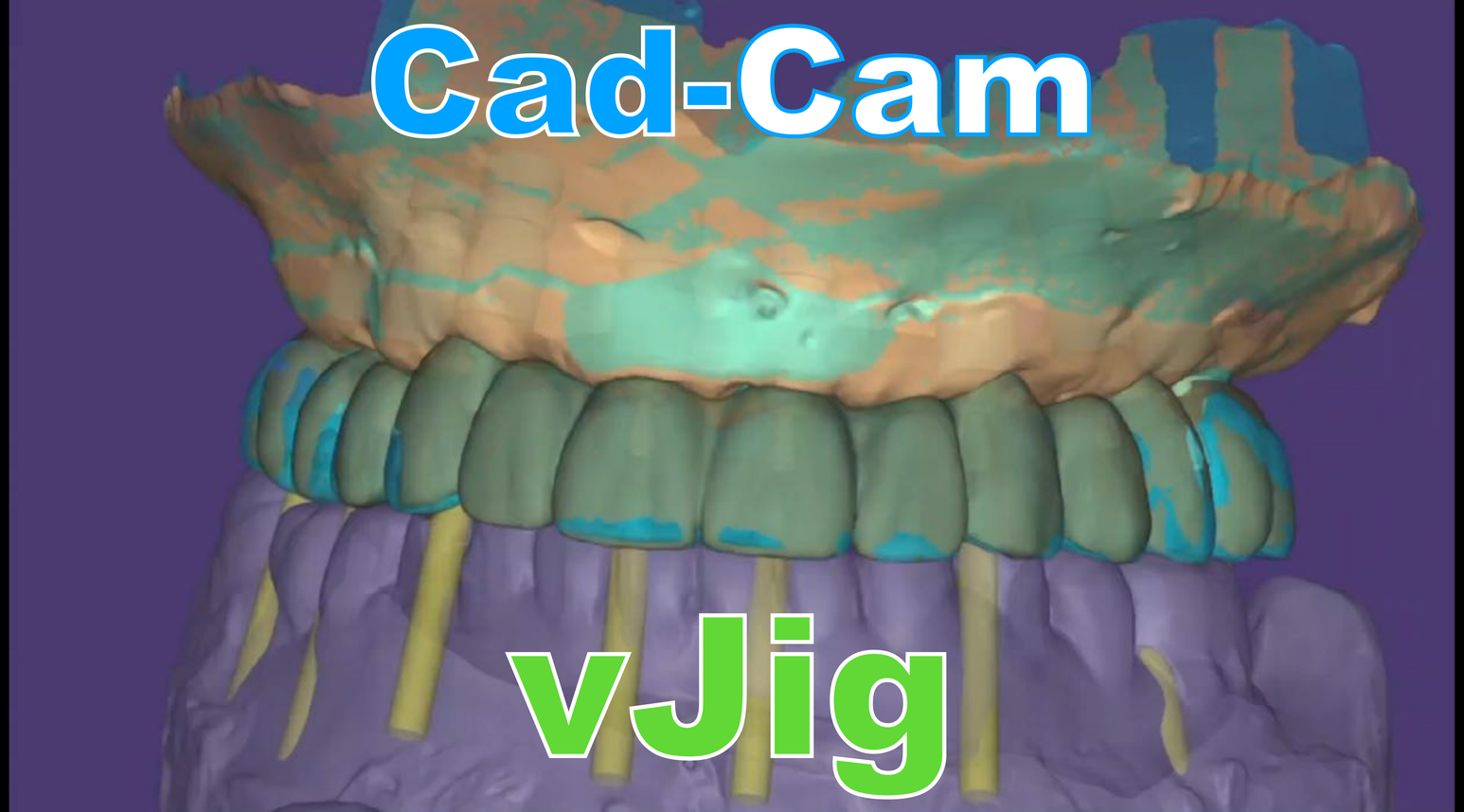
Photogrammetry



iOS

Design

Cad-Cam



vJig

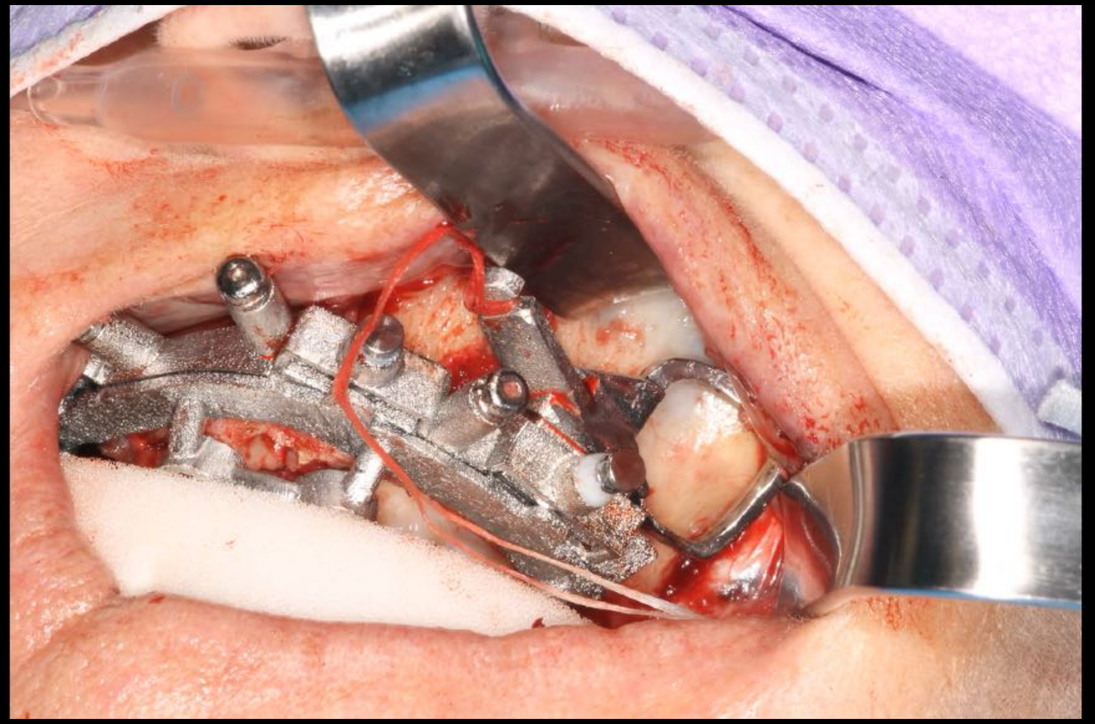
MILL

Deliver

FP1

Changing lives one smile at a time

ZYGO



Static Template

- **Full template-Guidance**

Dynamic Virtual Template

Dynamic Virtual Template

Dynamic Virtual Template - Evidence (navident.com)

– 2019 Computer-aided dynamic navigation – a novel method for guided endodontics. Chong et al. Quintessence Int 50 2_2019

– 2017 Dynamic Navigation for precise implantation in cases of critical anatomy. Burgess. Implants Magazine 1_2017

– 2017 Current state of the art of computer-guided implant surgery. D'Haese et al. Peridontology 2000 73_2017

– 2017 Flapless implant placement with an internal sinus lift using dynamic guided navigation. Mohamed. Implants Magazine 5_2017

– 2017 Dynamic navigation in fully edenulous maxilla. Uysal et al. Implants Magazine 3_2017

Dynamic Virtual Template

Dynamic Virtual Template - Evidence (navident.com)

Accuracy of a Dynamic Dental Implant Navigation System in a Private Practice

Stefanelli et al IJOMI 2018

Table 2 Key Deviation Statistics of All Implants Inserted (n = 231)

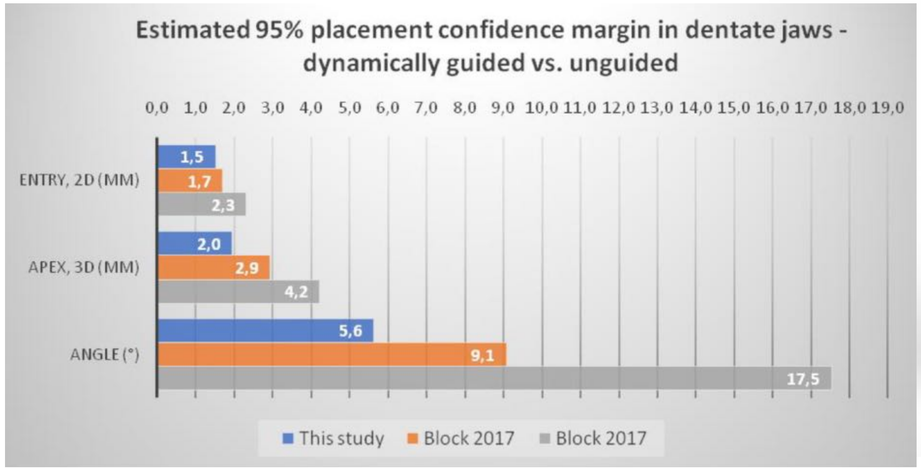
Deviation	Mean	SD
Entry (2D, mm)	0.71	0.40
Apex (3D, mm)	1.00	0.49
Angle (deg)	2.26	1.62

Conclusions

Dynamic computer assisted surgery systems allow more accurate implant placement in comparison with the conventional freehand method, regardless of the surgeon's experience. However, this system seems to offer more advantages to novice professionals, since it allows them to reduce their deviations significantly and achieve similar results to those of experienced clinicians.

Implant Placement Accuracy Using Dynamic Navigation

Block, Emery et al IJOMI 2016

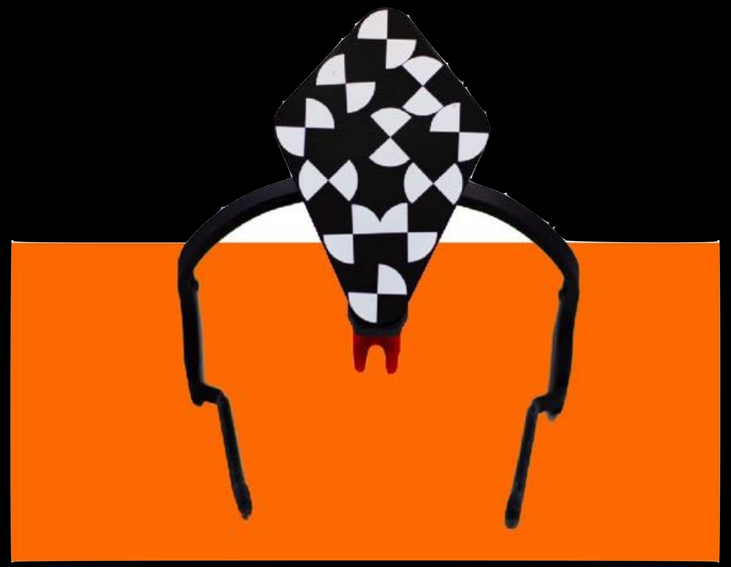


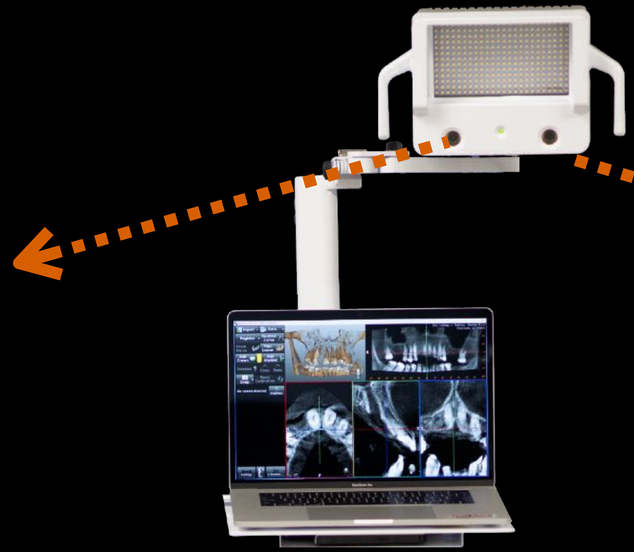
Dynamic Virtual Template

- **Full template-Guidance**

Micron Jaw Tracking Camera

Maxilla





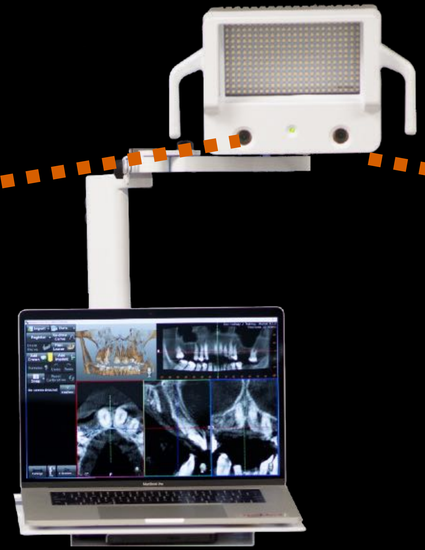
Mandible

Dynamic Virtual Template

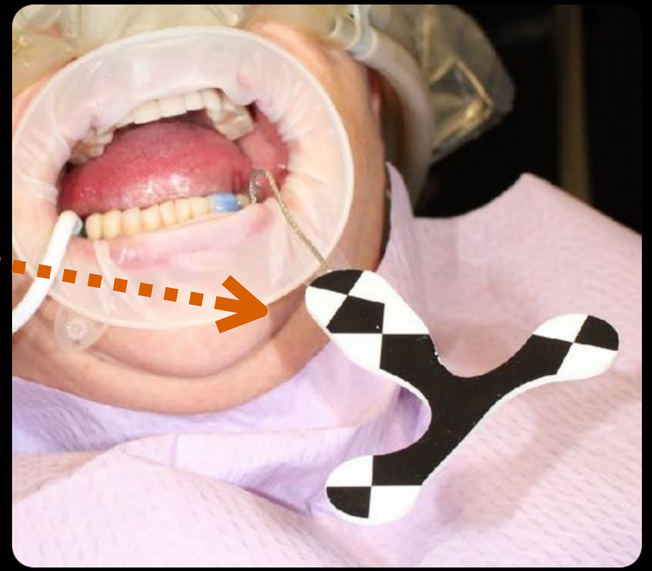
- **Full template-Guidance**

Micron Jaw Tracking Camera

Maxilla



Mandible



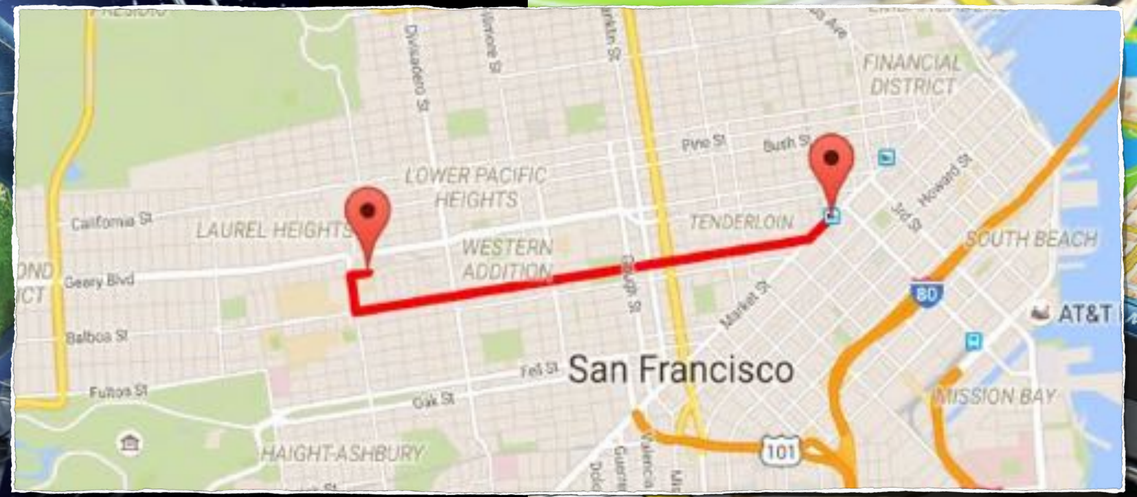
Dynamic Virtual Template

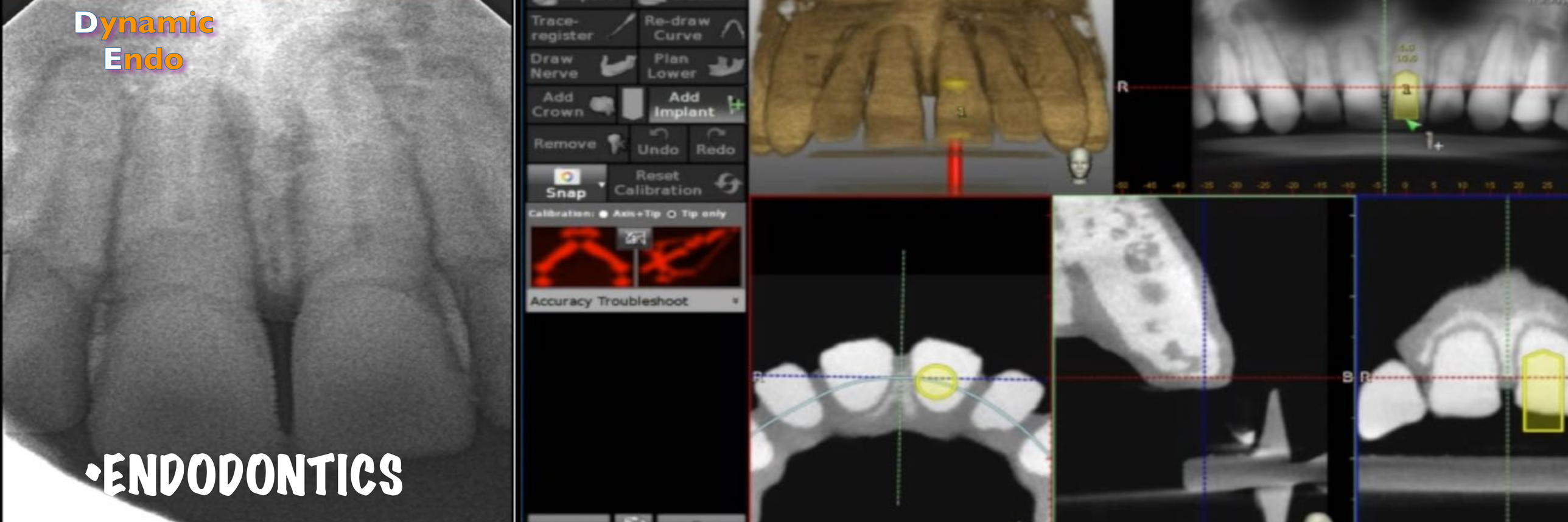
- **Full template-Guidance**

Calibrate any Handpiece Any Drill

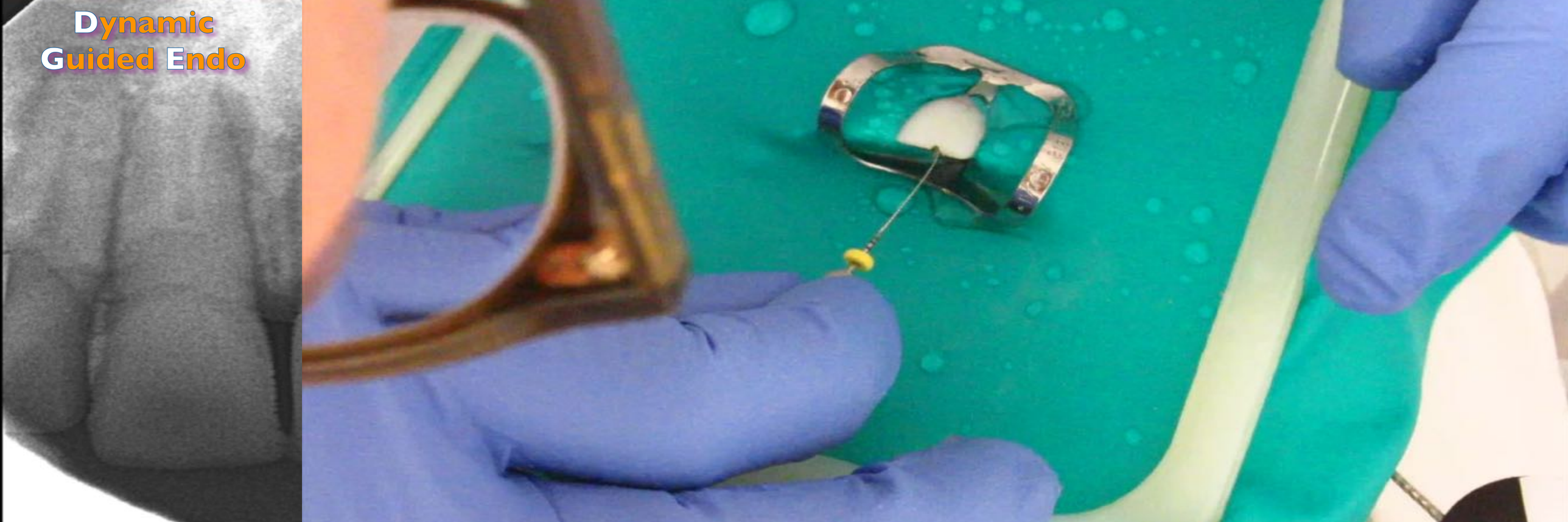
Dynamic Virtual Template

GPS Comparabile Technology




Dynamic
Endo
•ENDODONTICS
Trace-register
Re-draw Curve
Draw Nerve
Plan Lower
Add Crown
Add Implant
Remove
Undo
Redo
Snap
Reset Calibration
Calibration: Axis+Tip Tip only
Accuracy Troubleshoot
R
B


Dynamic
Guided Access
0.4mm
1.1°
11.9mm

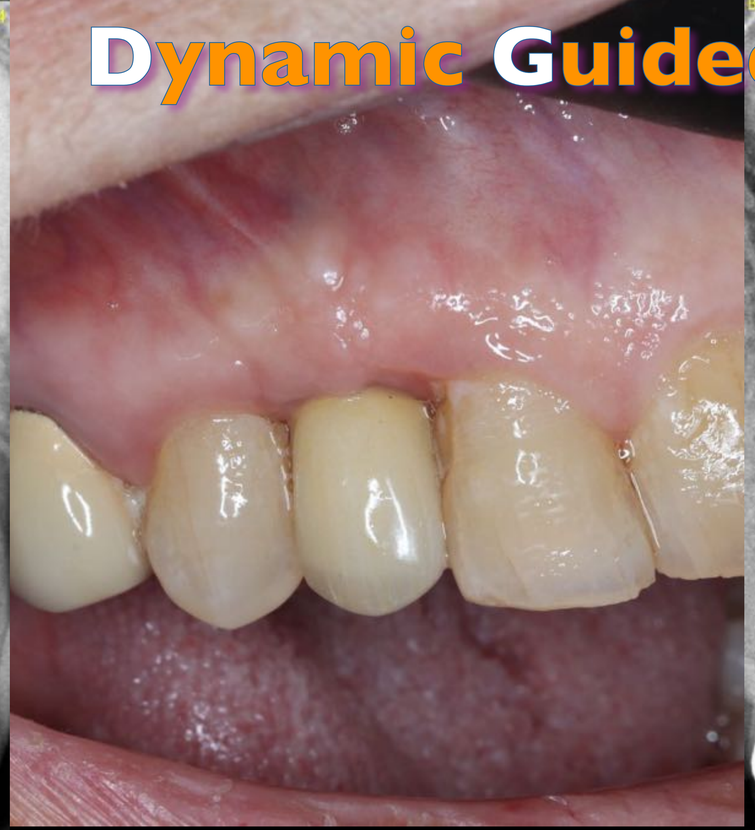

Dynamic
Guided Endo

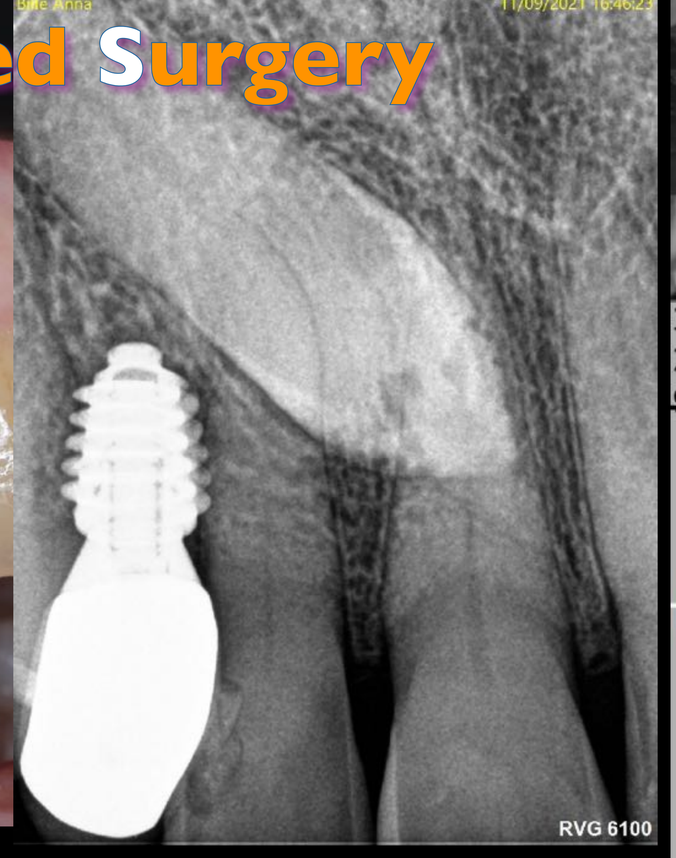

Dynamic
Guided Endo

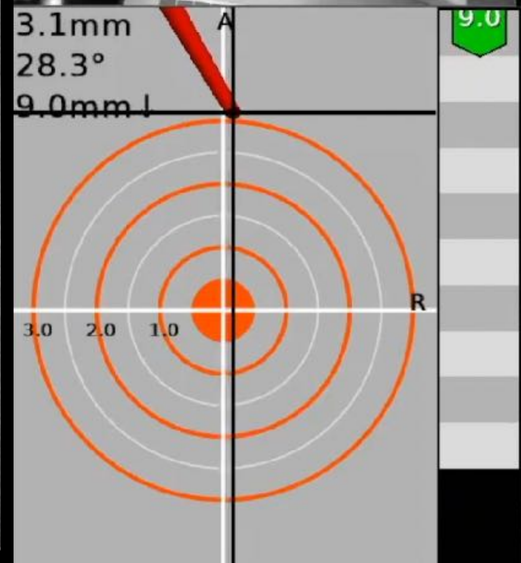
Dynamic
Guided Surgical Endo

Courtesy Dr Paula Villa

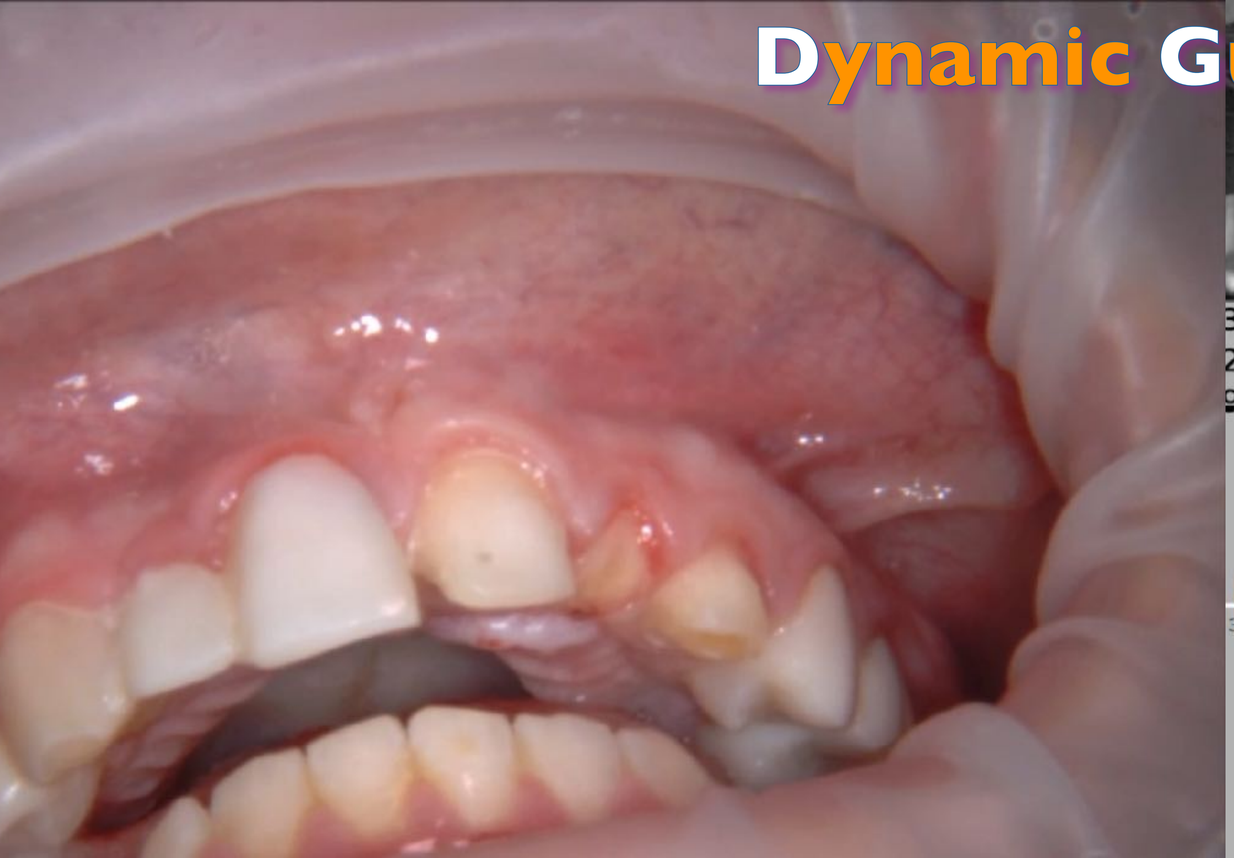
Dynamic Guided Surgery

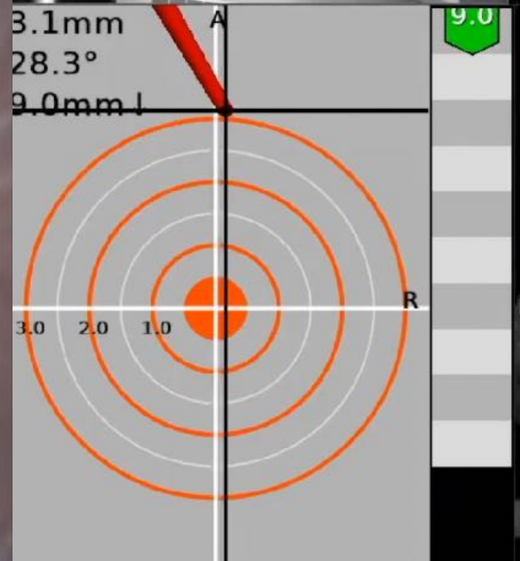


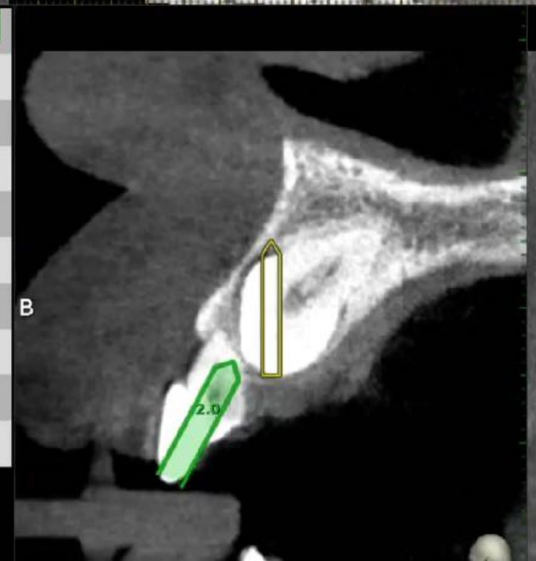


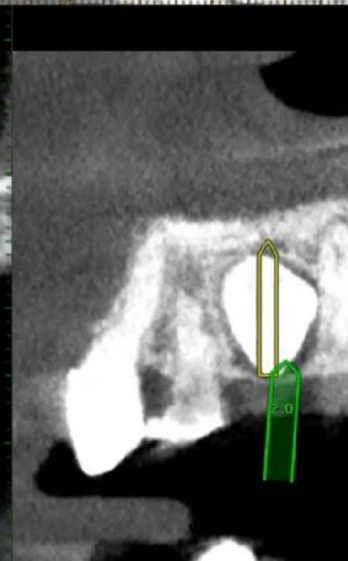


Dynamic Guided Surgery









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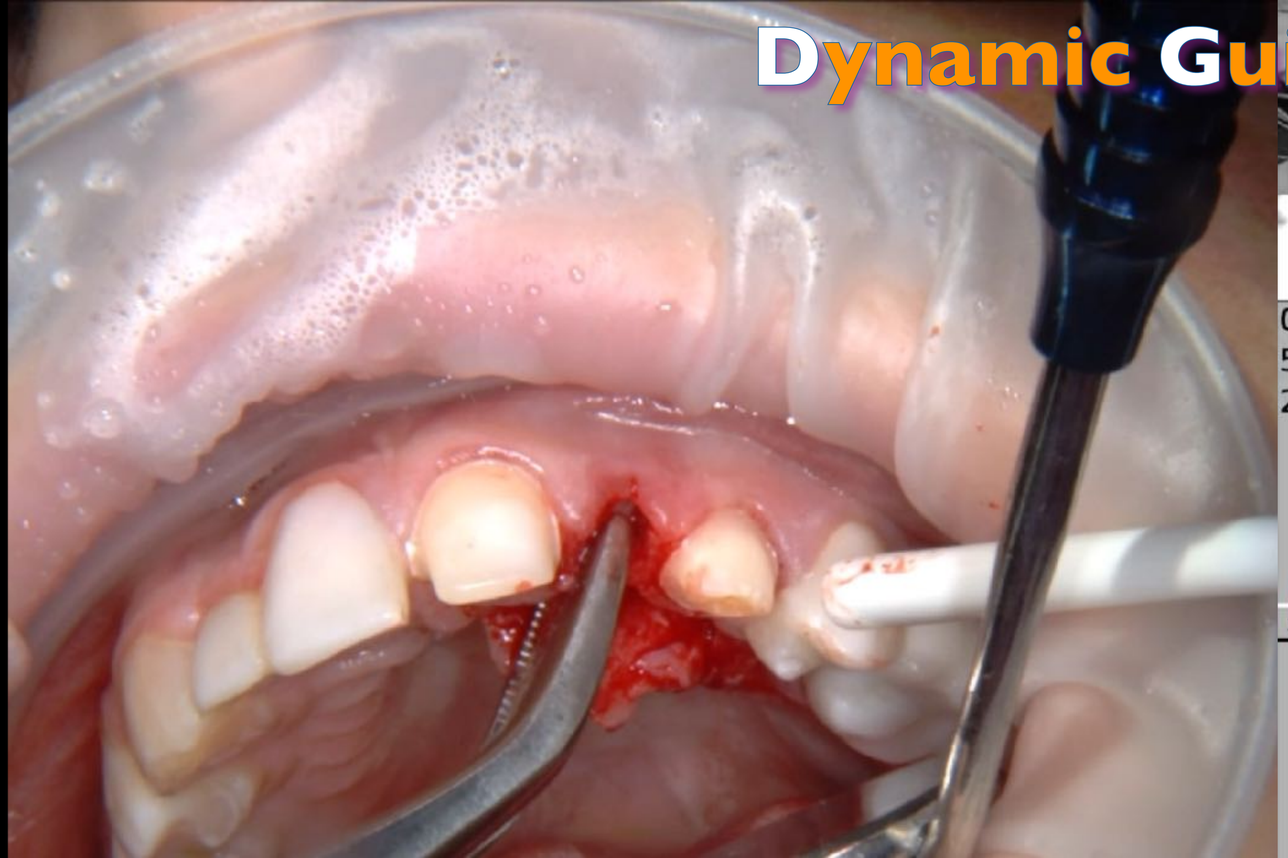

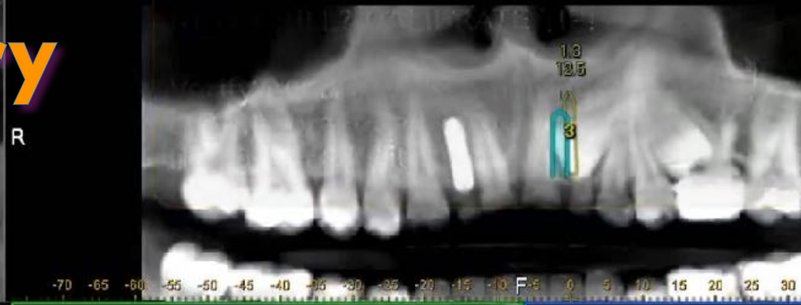

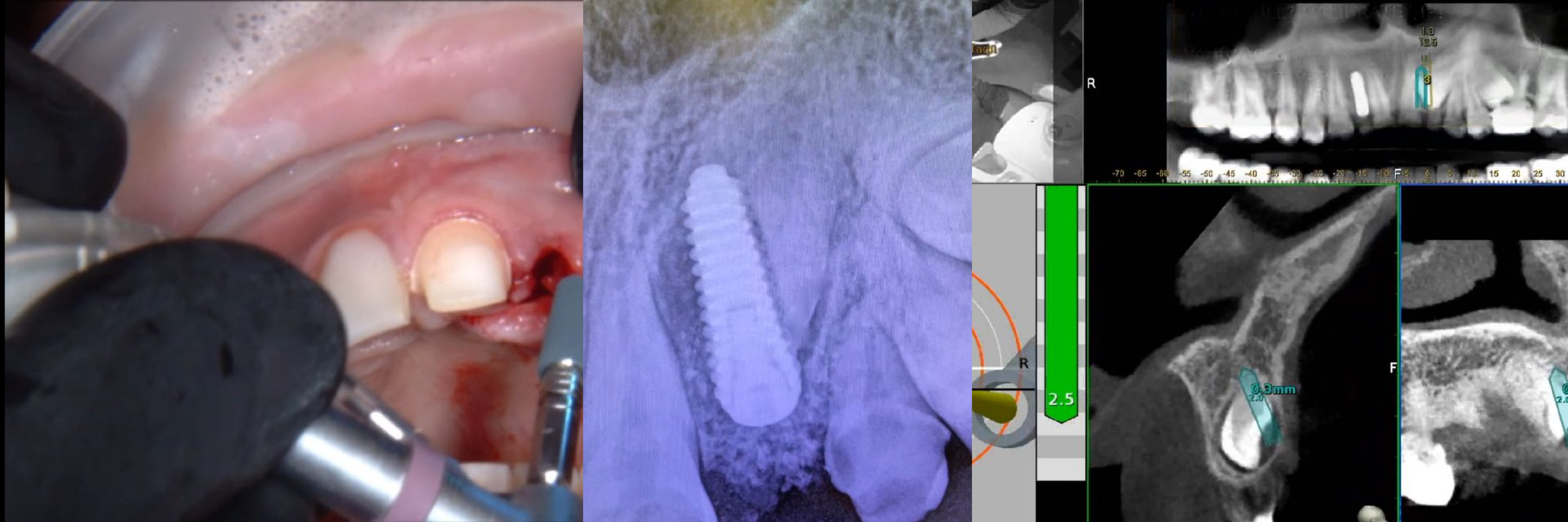
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12.5
3
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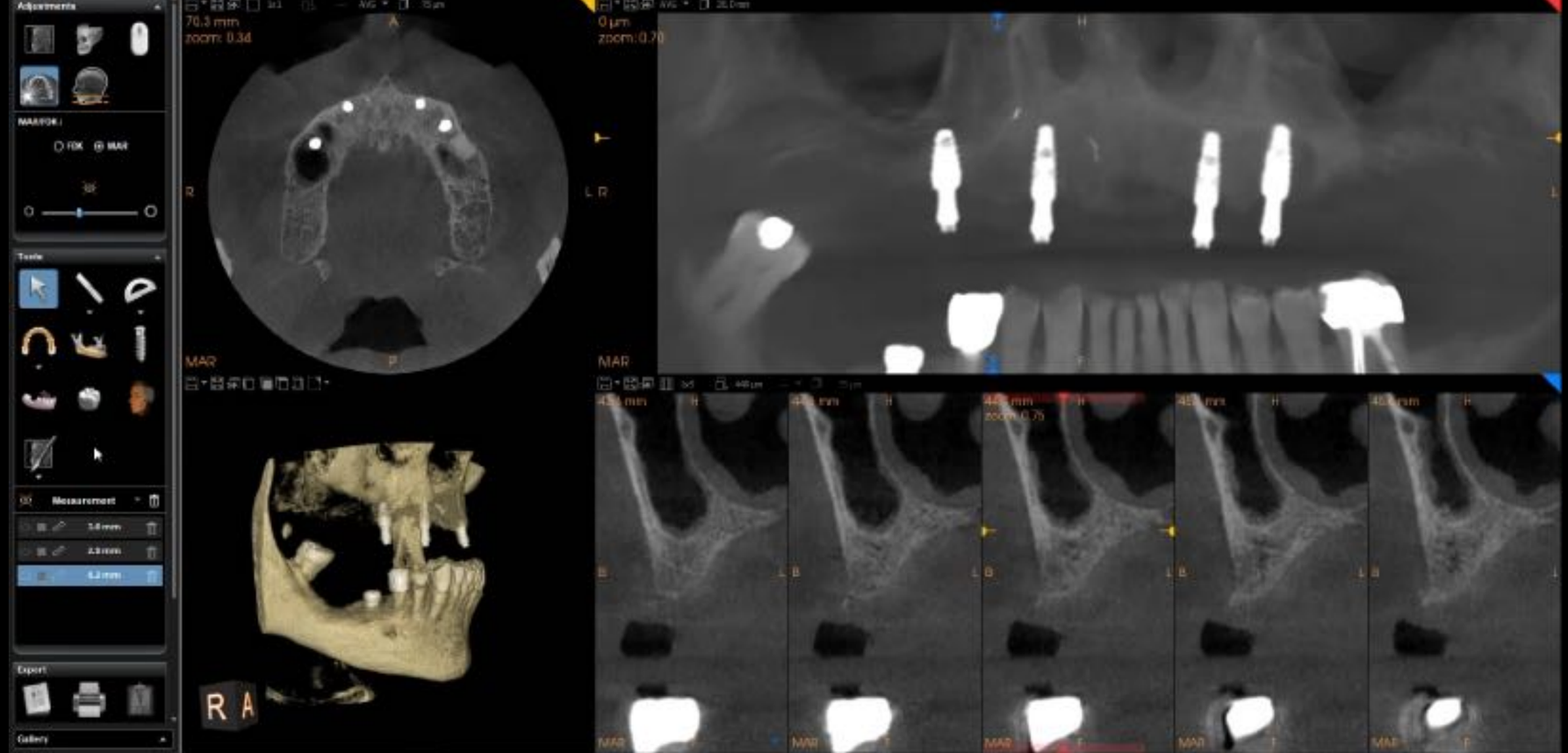
0.3mm
F

CBCT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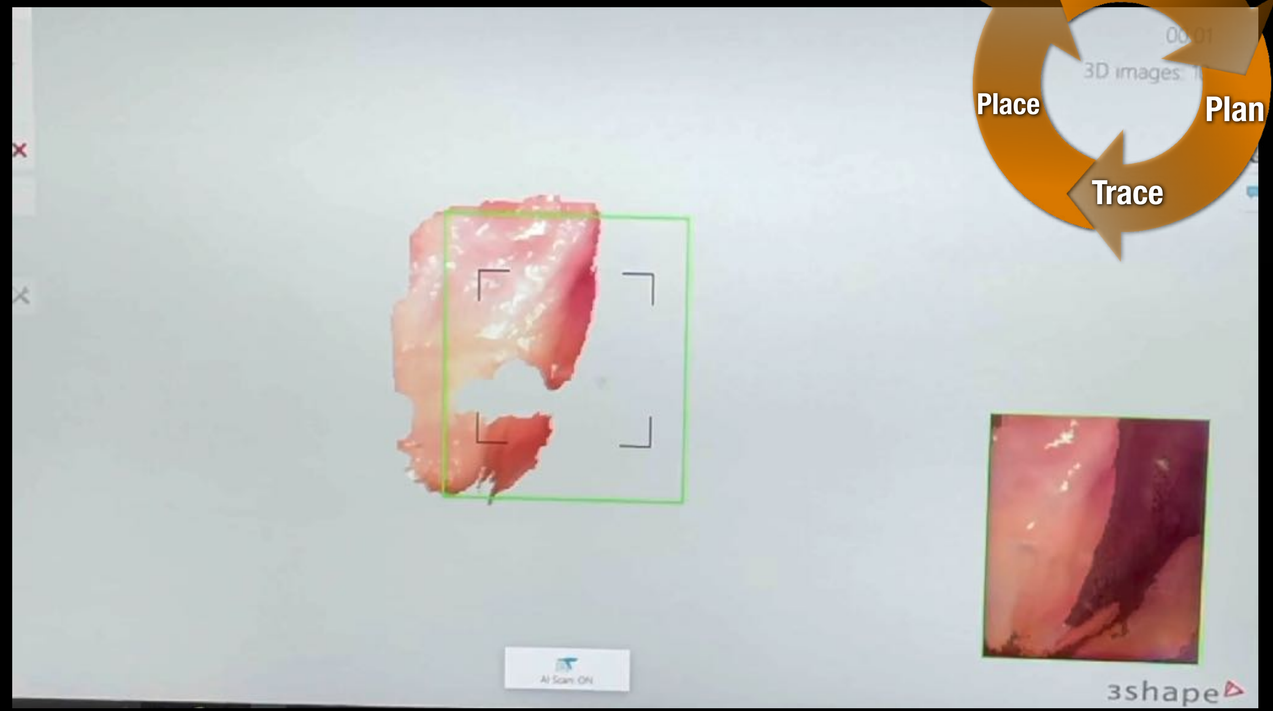
MAR
R A
0 µm
zoom: 0.70
MAR

- Full template-Guidance

SCAN



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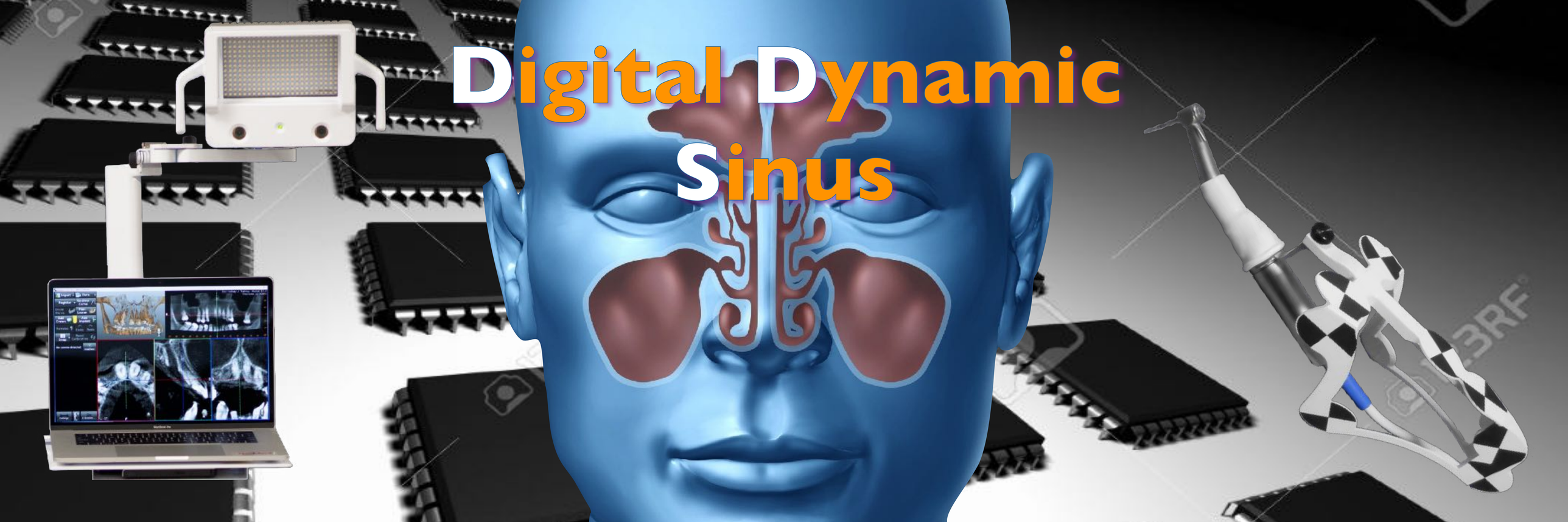
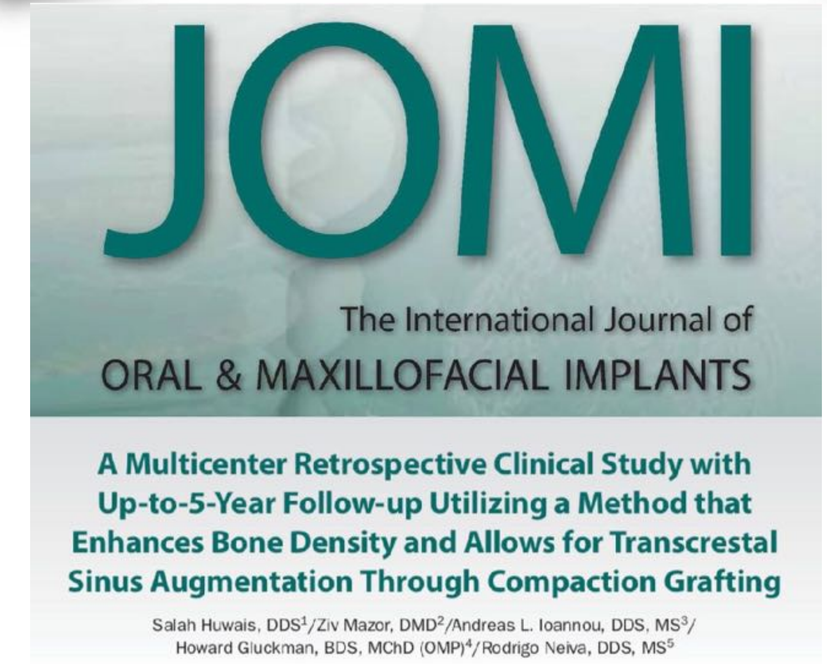
PLAN

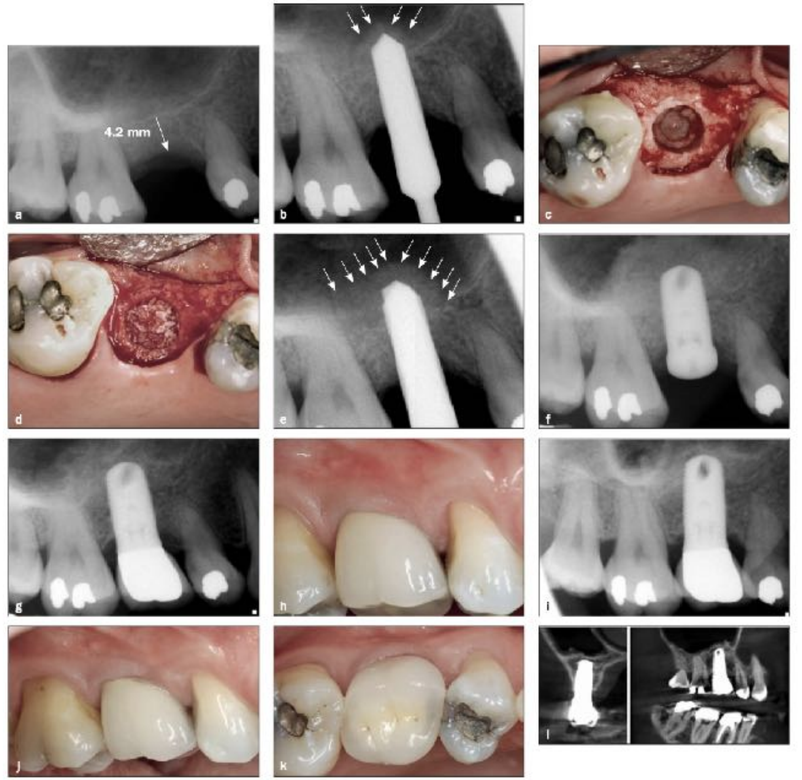
Digital Dynamic Sinus



Clinical Evidence

Trans-crestal Sinus Augmentation





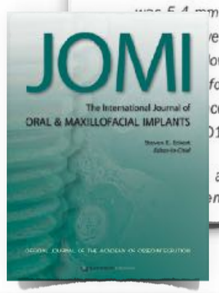
Clinical Evidence

A Multicenter Retrospective Clinical Study with Up-to-5-Year Follow-up Utilizing a Method that Enhances Bone Density and Allows for Transcrestal Sinus Augmentation Through Compaction Grafting

Salah Huwais, DDS[1]/Ziv Mazor, DMD[2]/Andreas L. Ioannou, DDS, MS[3]/
Howard Gluckman, BDS, MChD (OMP)[4]/Rodrigo Neiva, DDS, MS[5]

Purpose: *To evaluate the effectiveness and predictability of a novel biomechanical, minimally invasive bone instrumentation technique that enhances bone density through compaction grafting, called osseous densification, and allows for transcrestal sinus membrane elevation and augmentation with simultaneous implant placement.* ***Materials and Methods:*** *Patients who were consecutively treated with the bone densification and transcrestal sinus augmentation technique and were followed up in three treatment centers between May 2012 and September 2017 were included in this retrospective study. The summary statistics are presented as means for continuous variables and percentages for categorical variables.* ***Results:*** *In total, 222 patients with 261 implants were included in the final clinical analysis. The included follow-up period ranged from 6 to 64 months with a mean of 35 months. The subsinus residual bone height at baseline was 5.4 mm (SD: 1.9). Following the sinus augmentation, a significant vertical increase of 7 mm (SD: 2.49) was achieved. No sinus membrane perforations and no late implant failures were observed from 6 up to 64 months of follow-up, yielding a cumulative implant survival rate of 97%.* ***Conclusion:*** *This osseous densification technique for maxillary implant site preparation with transcrestal sinus augmentation and simultaneous implant placement led to favorable clinical outcomes with up to 64 months of follow-up.* Int J Oral Maxillofac Implants 2018;33:1305–1311. doi: 10.11607/jomi.6770

Keywords: atrophic maxilla, bone substitutes, compaction autografting, densifying burs, maxillary sinus, osseous densification, sinus augmentation, sinus elevation procedure



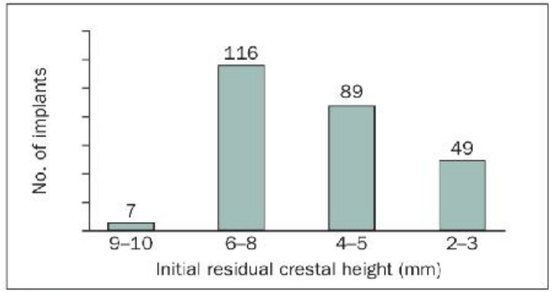
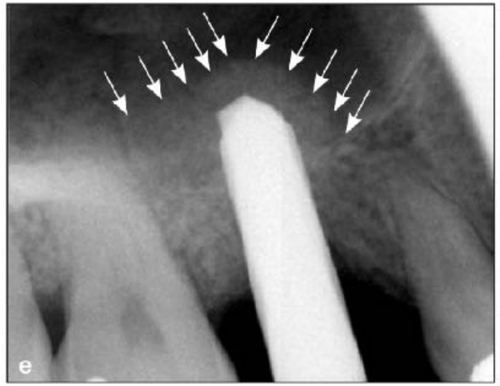


Fig 2 Number of implants placed in 222 patients according to the initial residual crestal height prior to sinus augmentation.



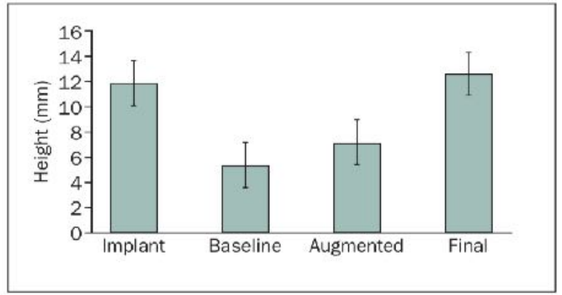


Fig 3 A significant augmentation of 7 mm ($P < .05$) was observed following the osseous densification technique, allowing for the placement of implants at a median height of 11.5 mm.

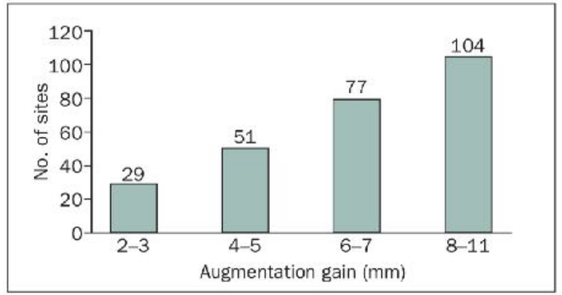


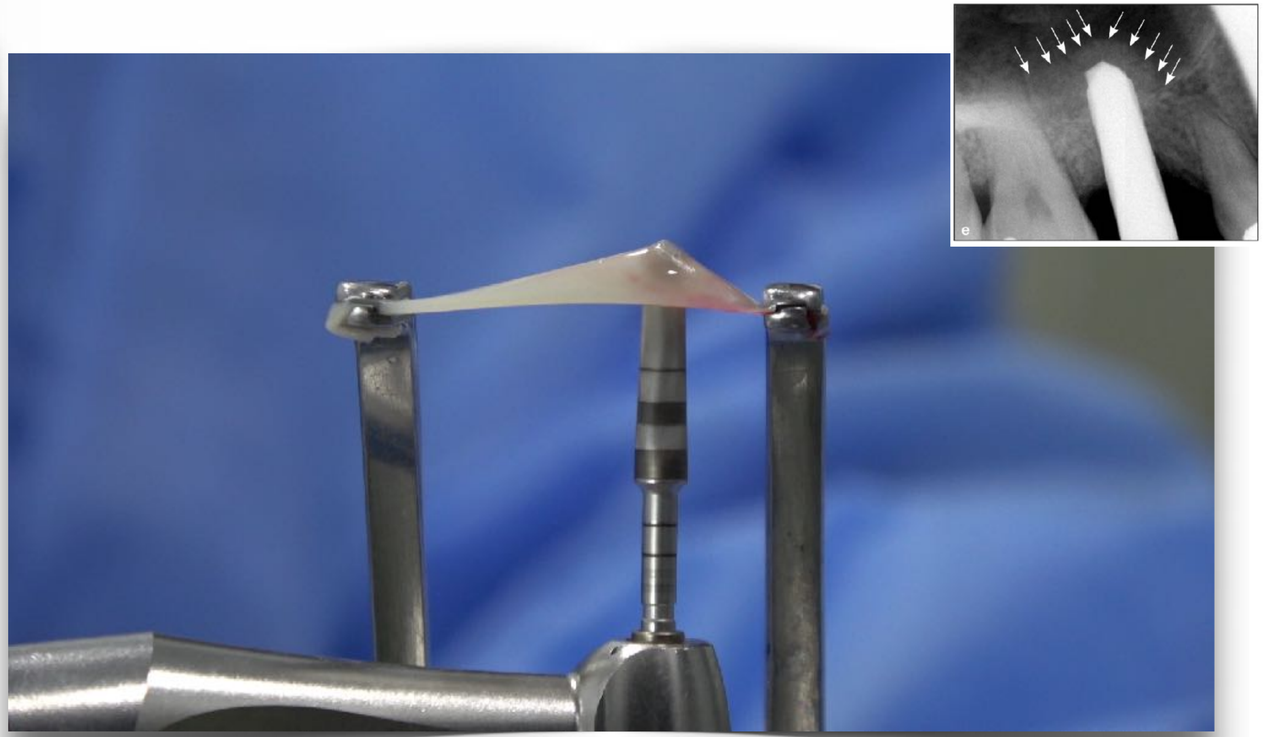
Fig 4 Number of sites according to augmentation gain.

Clinical Evidence

Trans-crestal Sinus Augmentation

PRF Membrane (Fibrin membrane)
with different Densah Burs

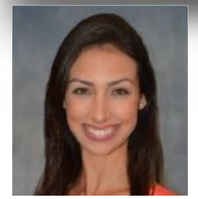
0.3mm Thickness -
1200 RPM CCW



Courtesy Prof. Nelson R. Pinto

Clinical Evidence

Multi-Center Retrospective 5-year follow up of 253 implants Implants with Six Different Thread Design Placed in 184 Patients with Osseodensification



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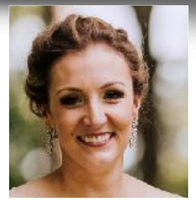
Education Institution
Private Practice, Brooklyn, New York



Dr. Erin (Johnson) Westmeyer, DDS
Clinical Assistant Professor of Implant Dentistry
Division of Prosthodontics
Dental Implant fellowship Program
University of Minnesota
School of Dentistry

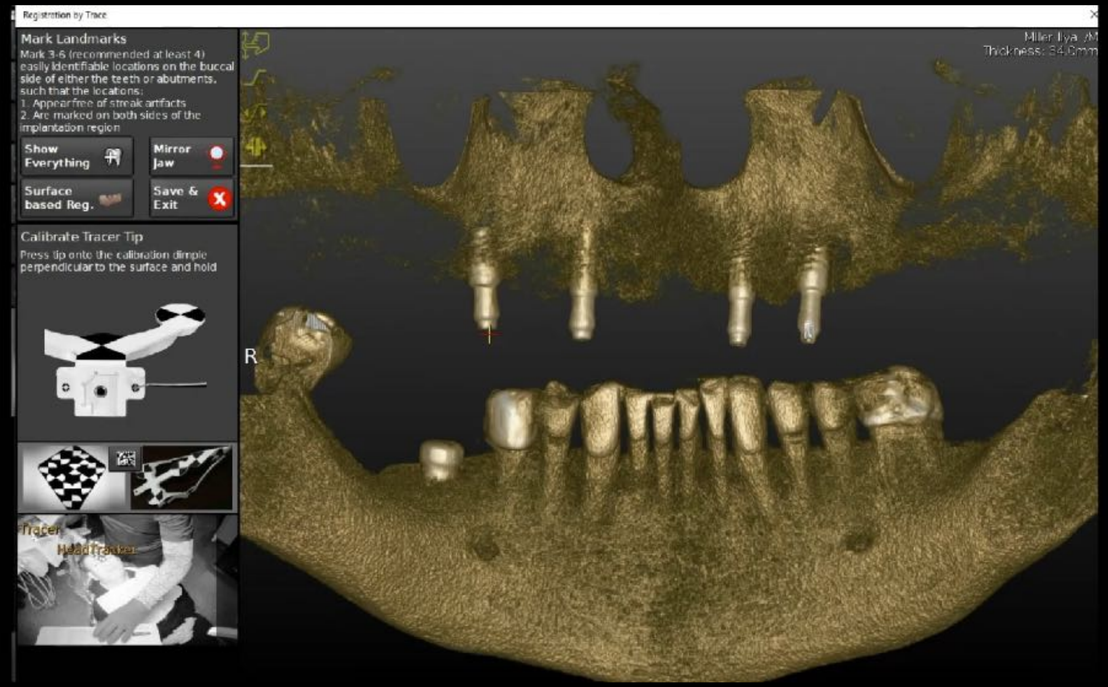
Salah Huwais, DDS
Adjunct Assistant Clinical Profesor
Dental Implant Fellowship Program
University Of Minnesota
School of Dentistry
Private Practice, Jackson, MI

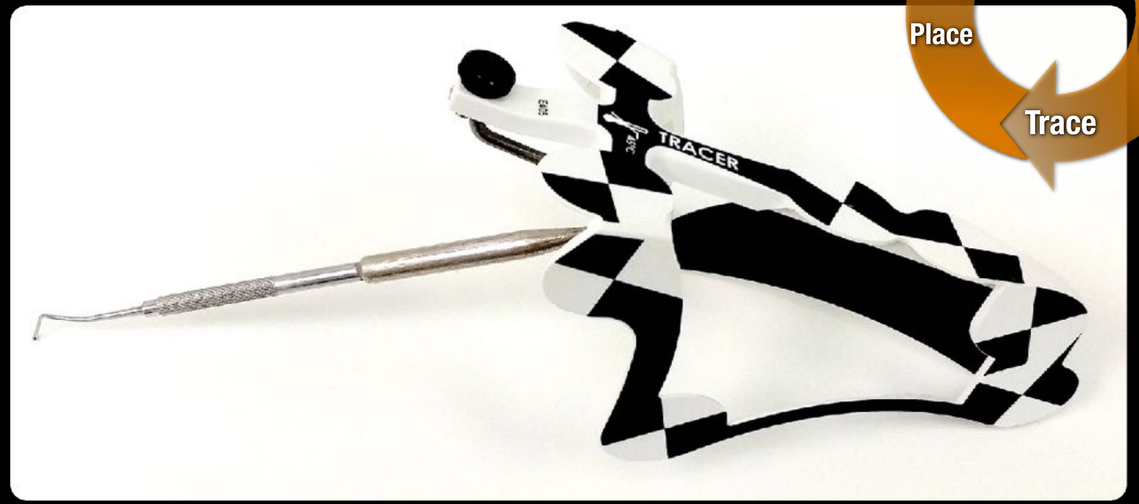
Rodrigo Neiva, DDS, MS
Director of Graduate Program
Department of Periodontology
University Of Florida, School of Dentistry

Tanello, Rosen, Tawil, Johnson, Huwais, Neiva

- **Full template-Guidance**

TAP - Trace





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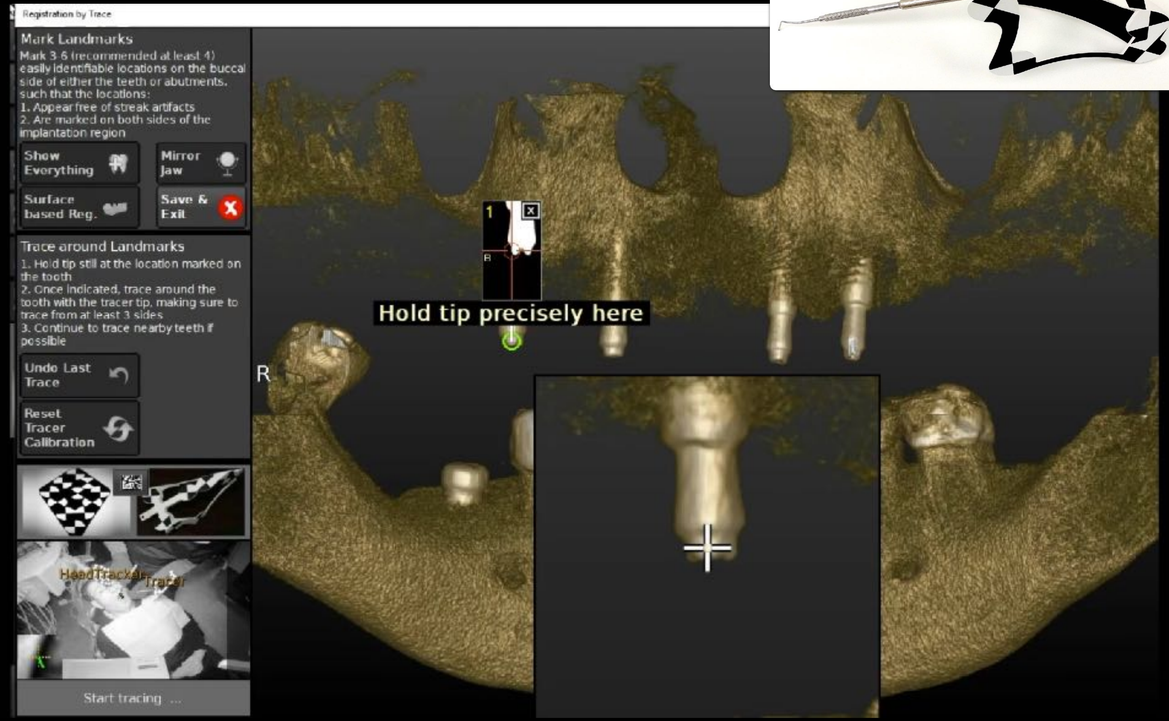
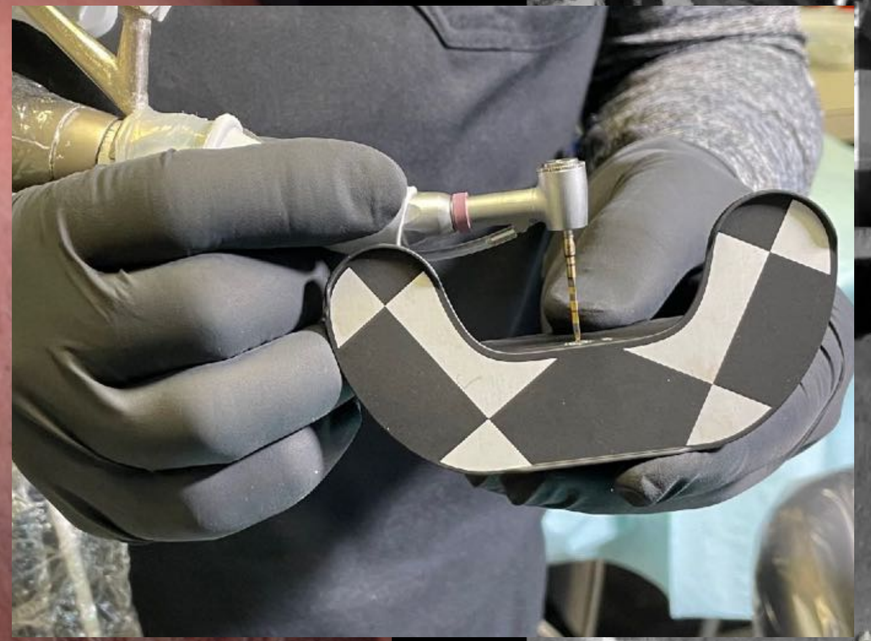
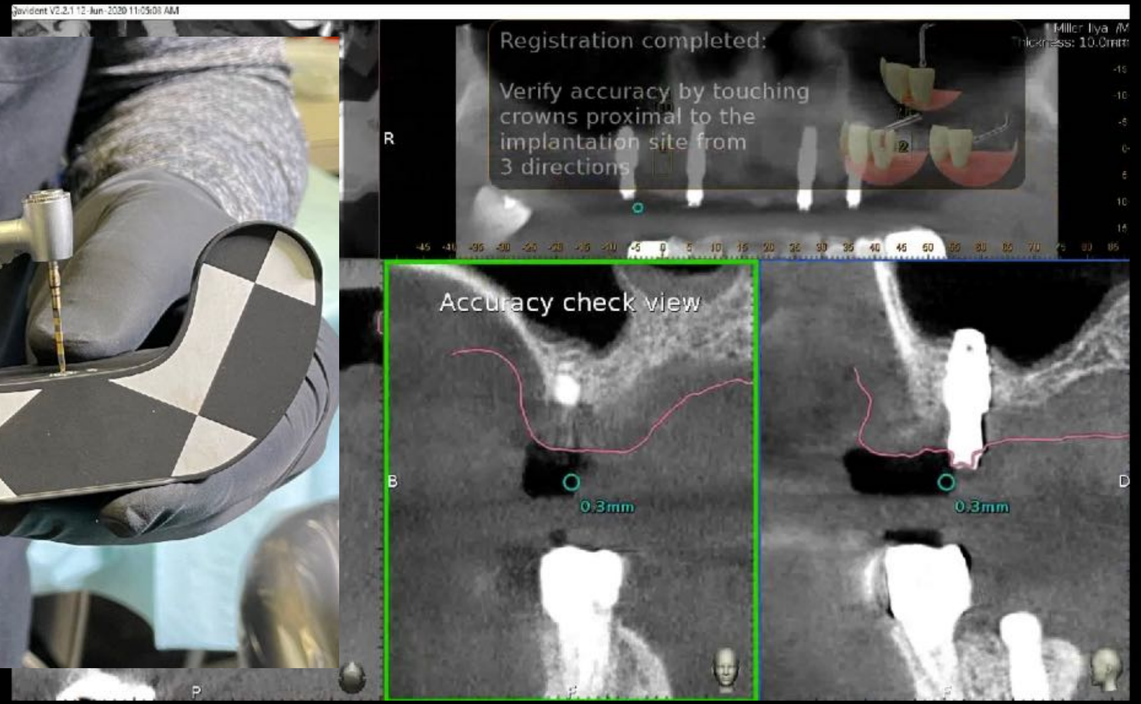


- **Full template-Guidance**

Verify Accuracy

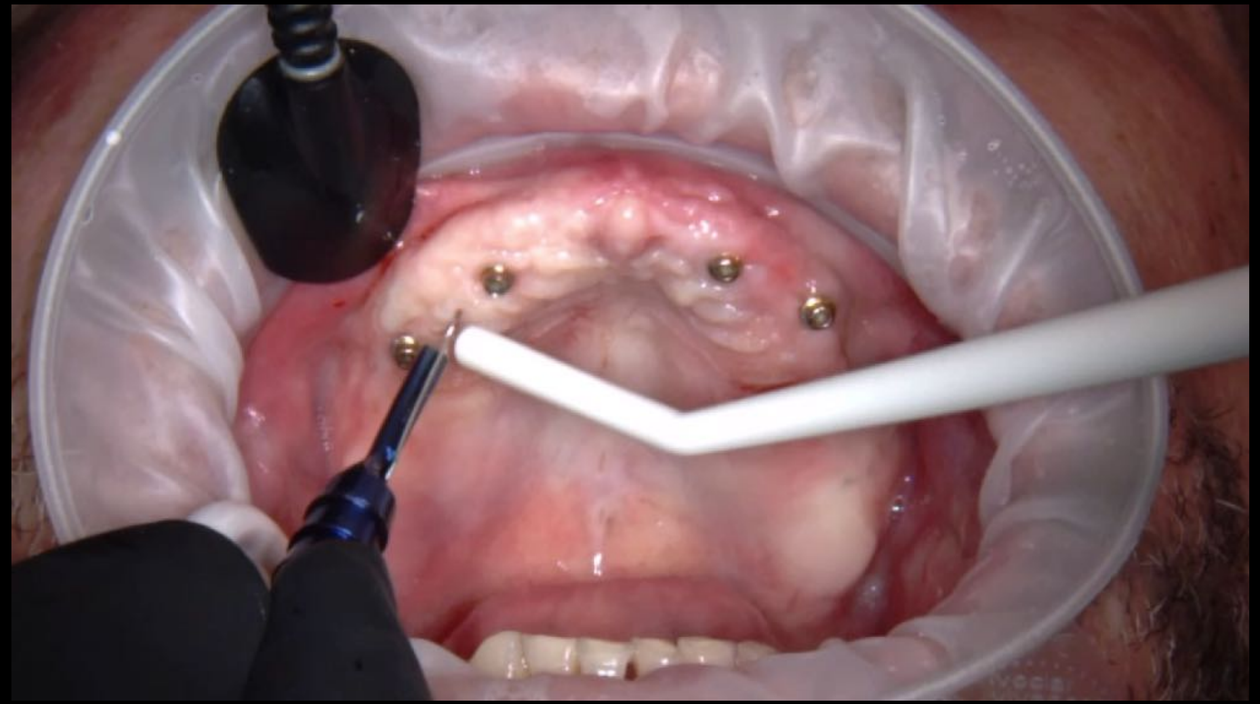




- Full template-Guidance

SURGERY

SOFT TISSUE



PRESERVATION & ENHANCEMENT

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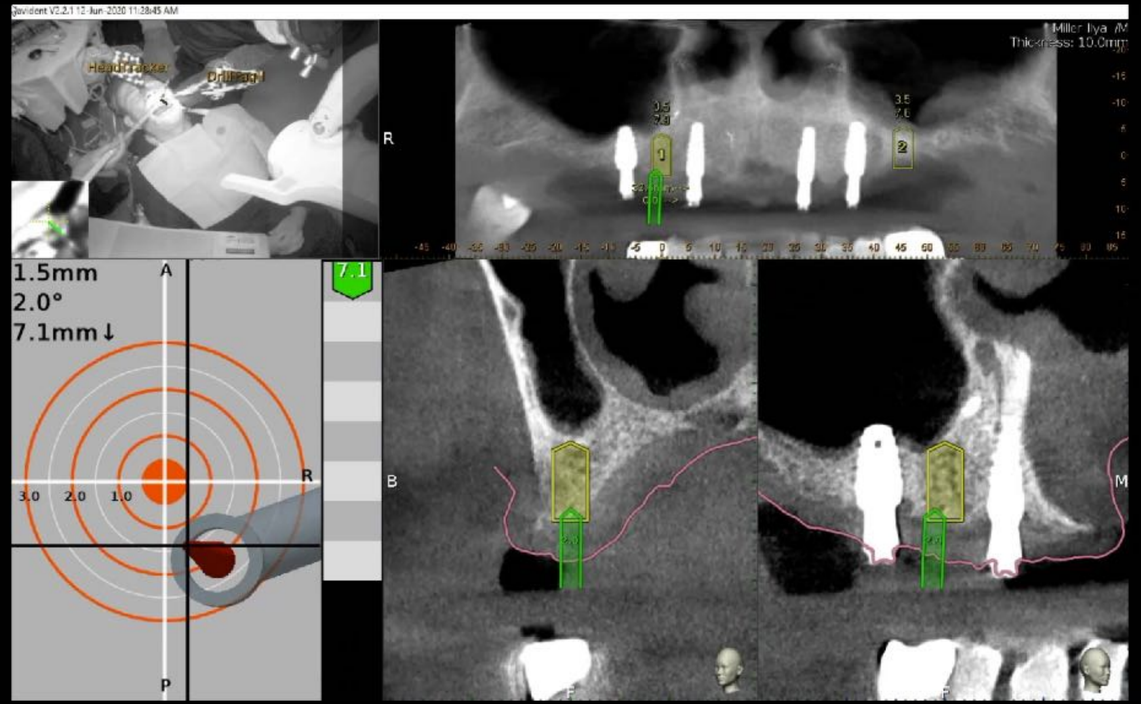
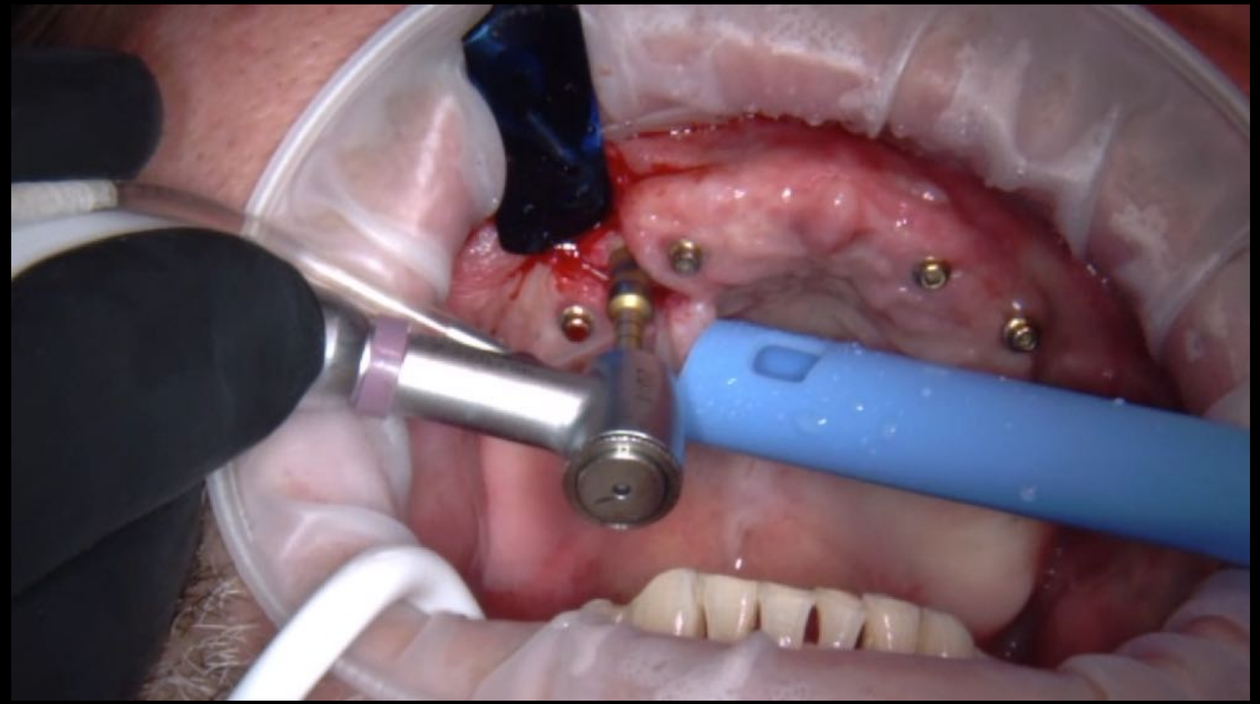
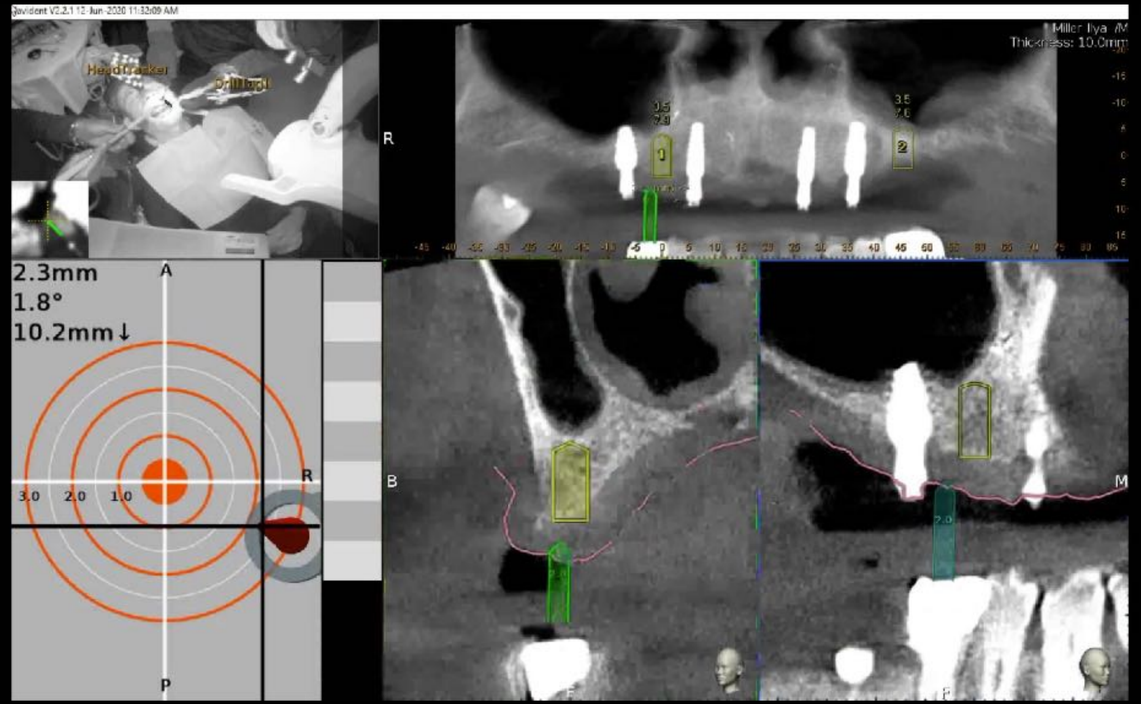
DRILL



- Full template-Guidance

DRILL -Break though sinus floor





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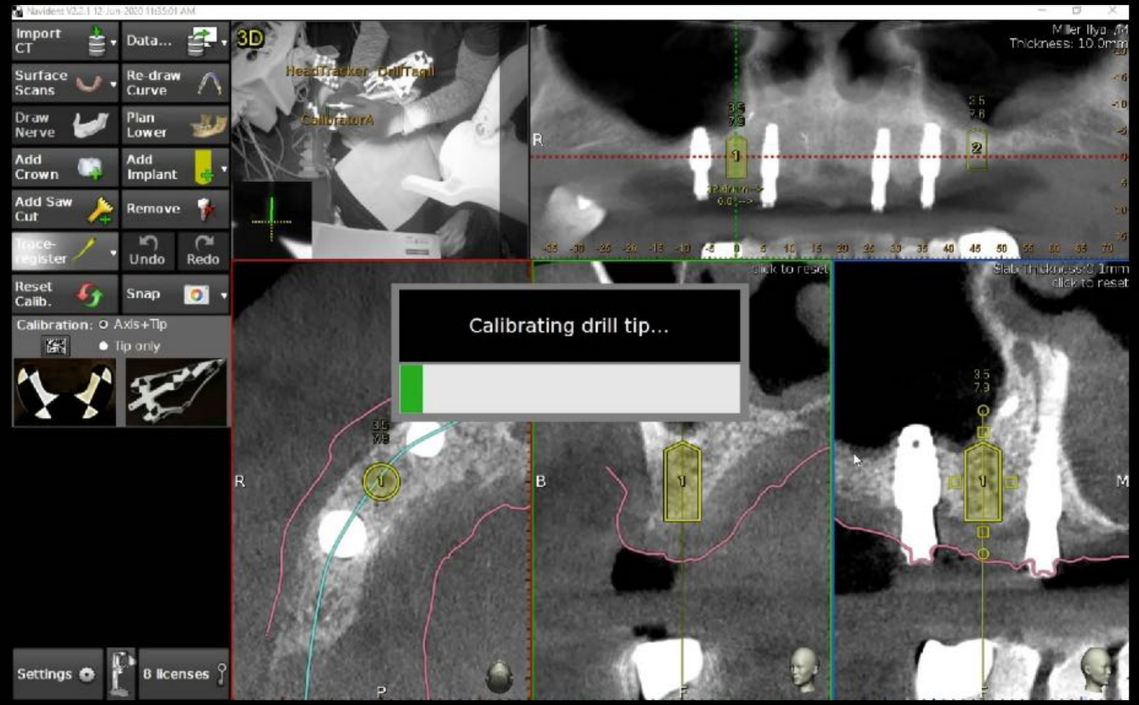

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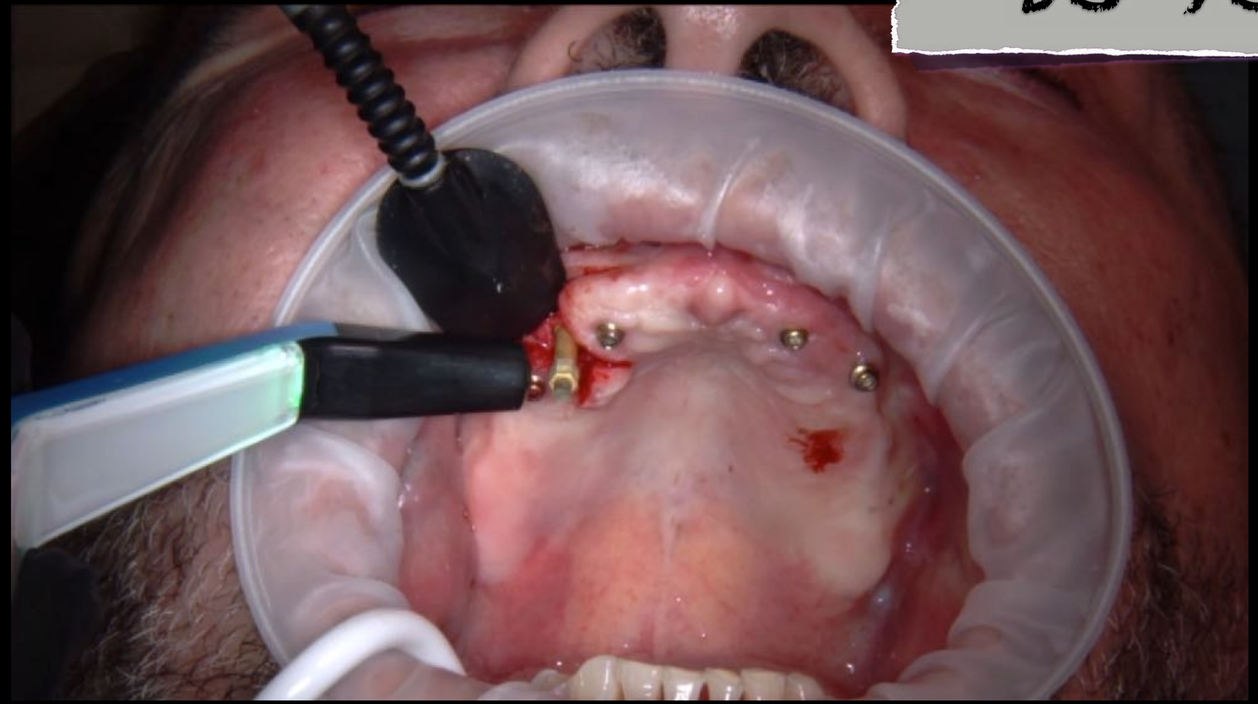
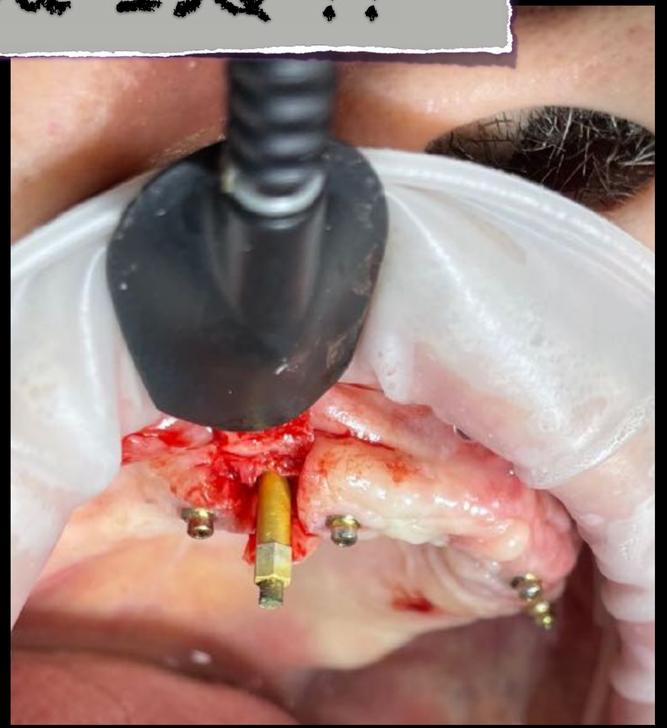
Do You ISQ ??





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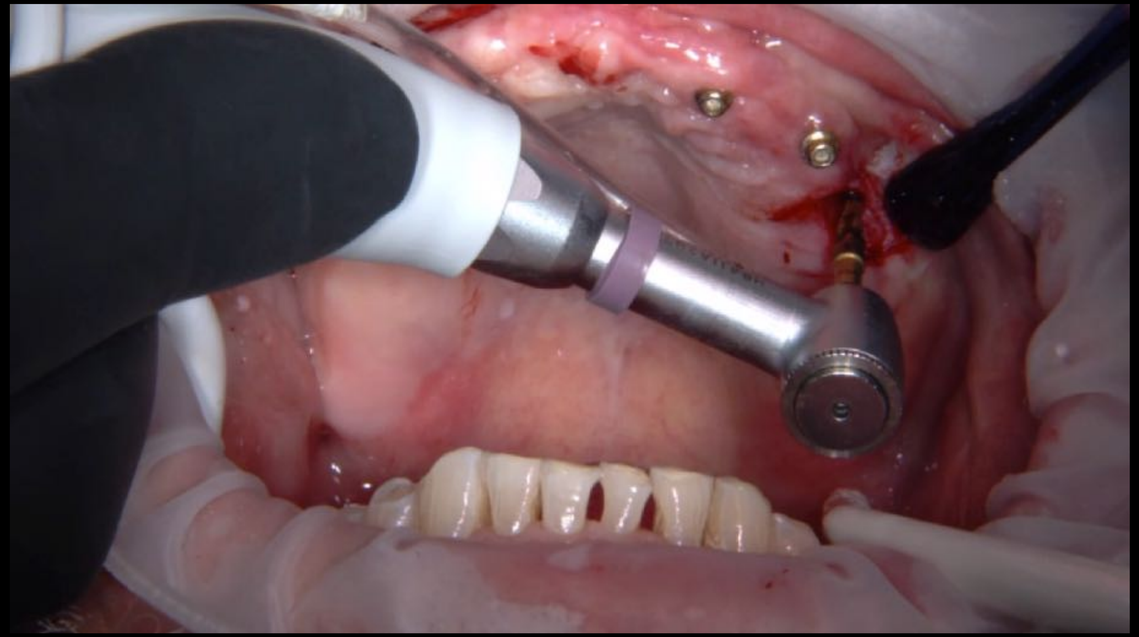

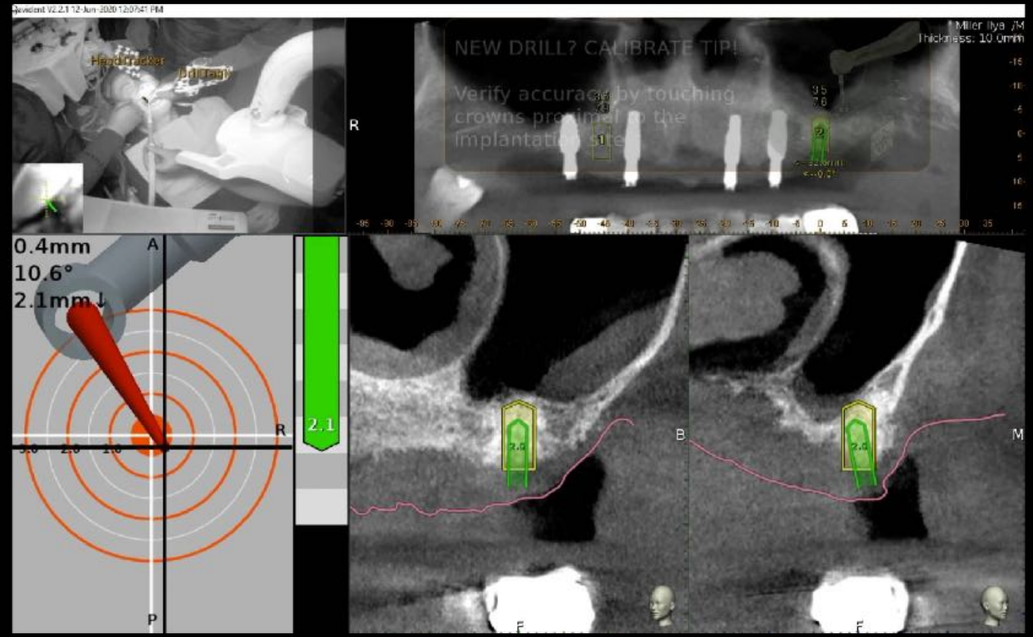

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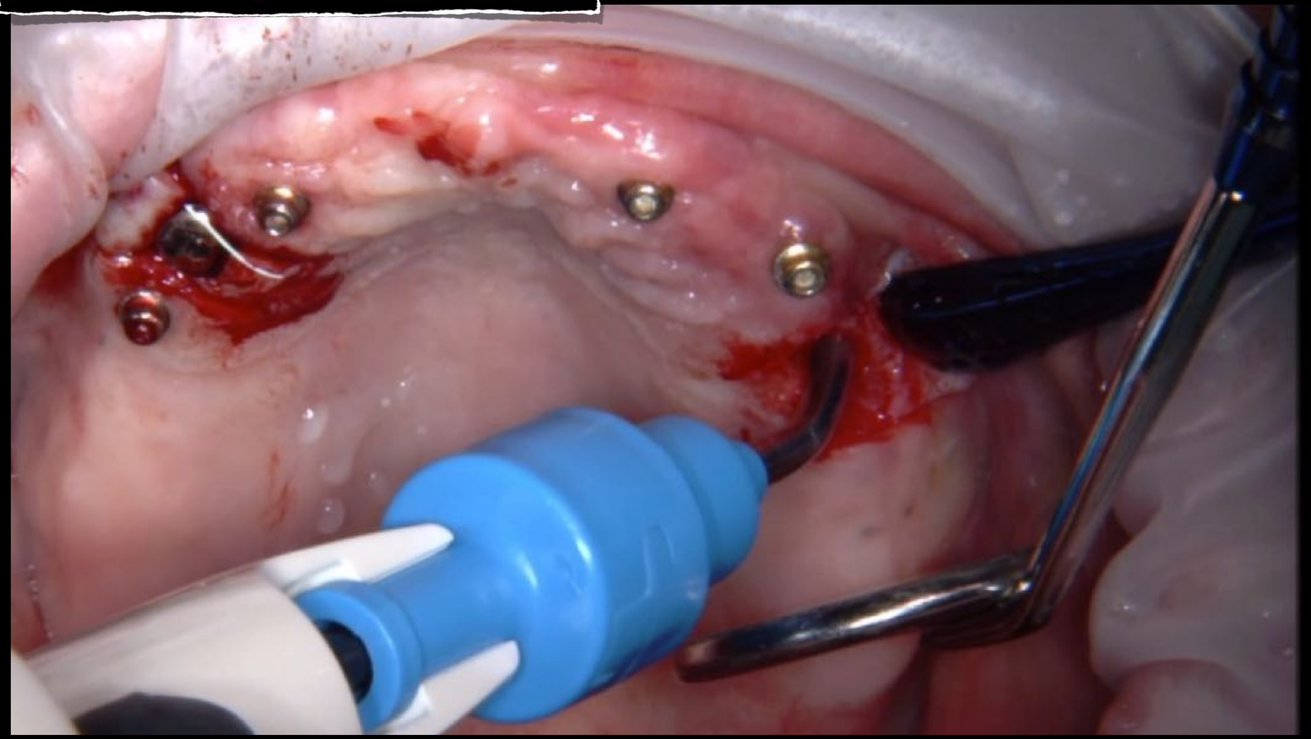

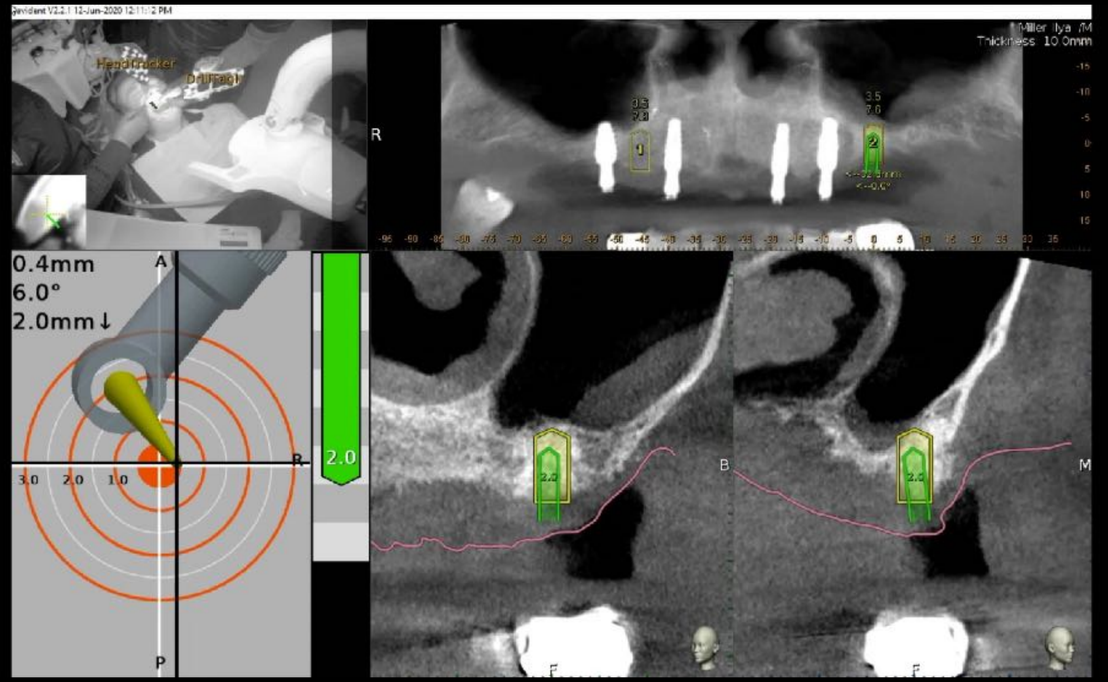

NOVABONE

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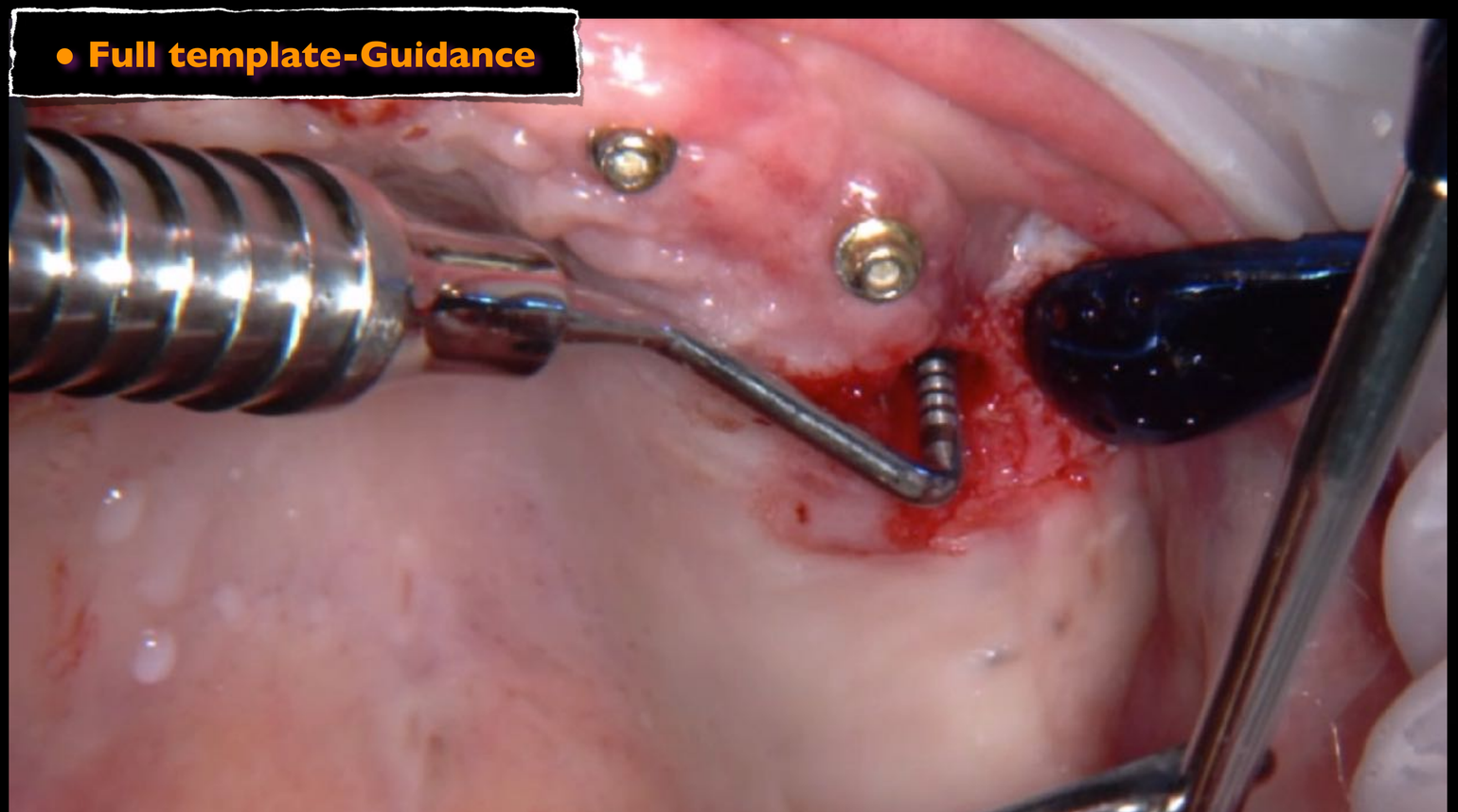

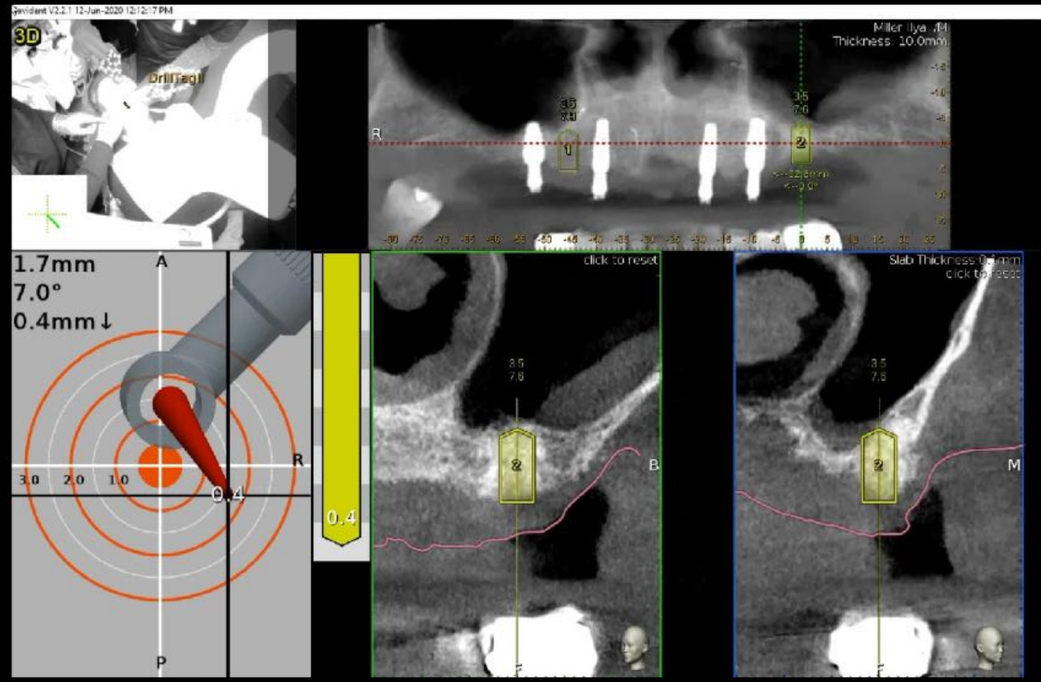

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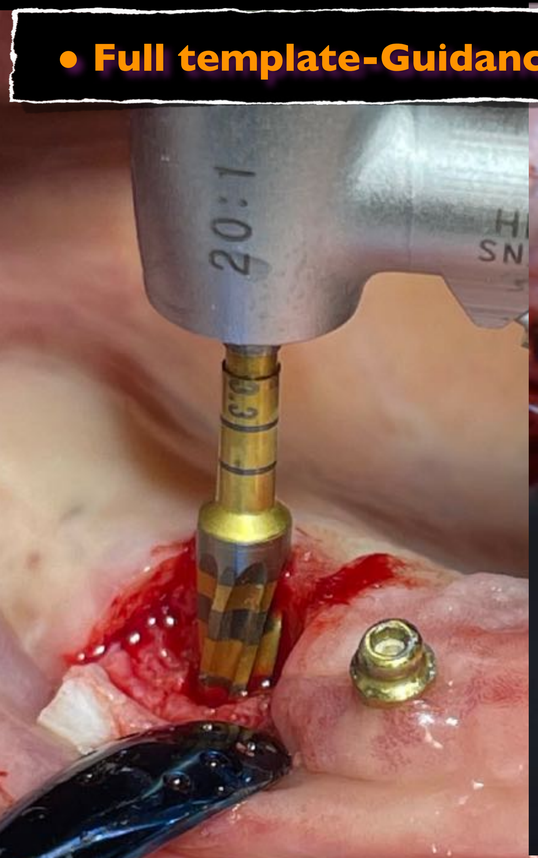

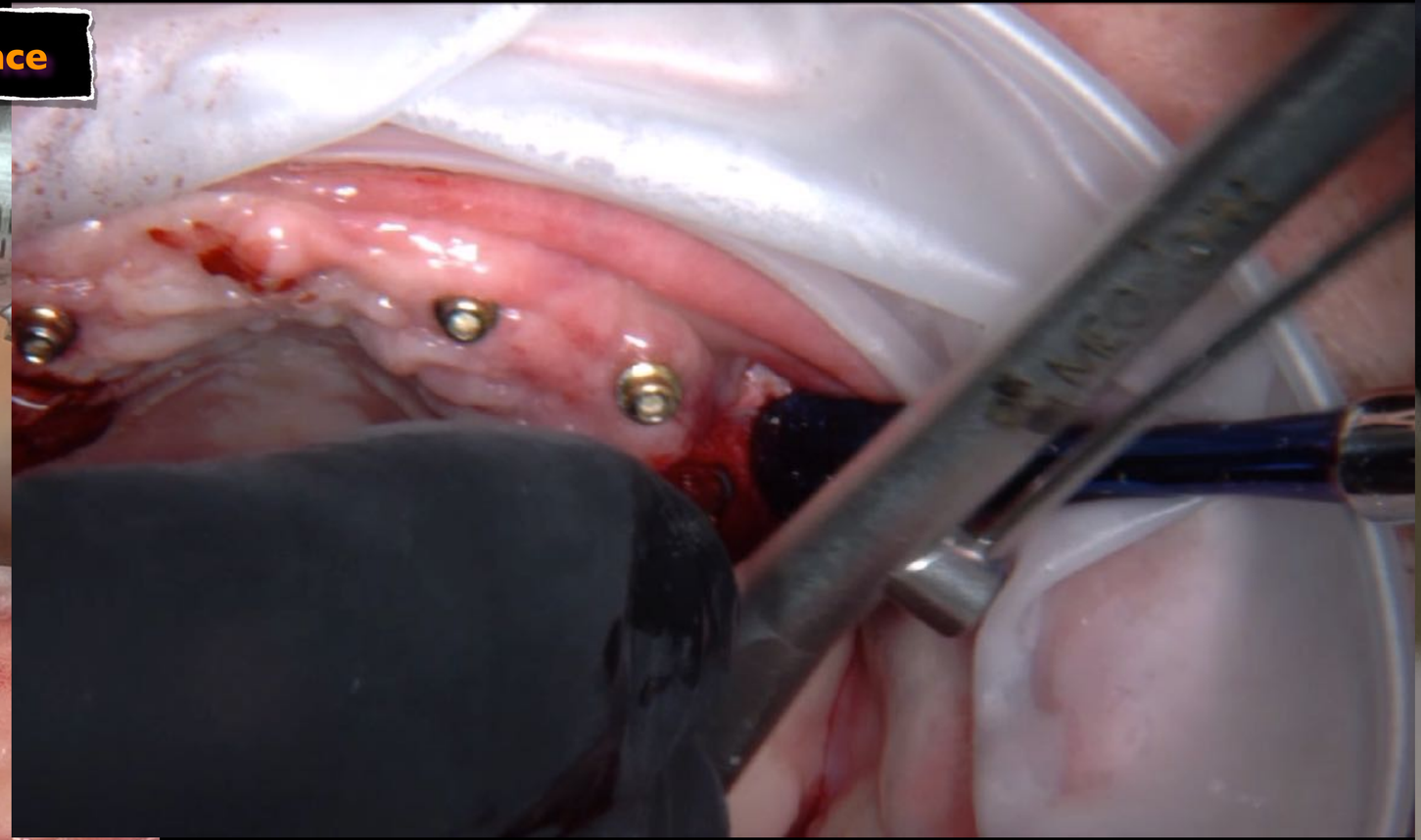

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Denture Conversion

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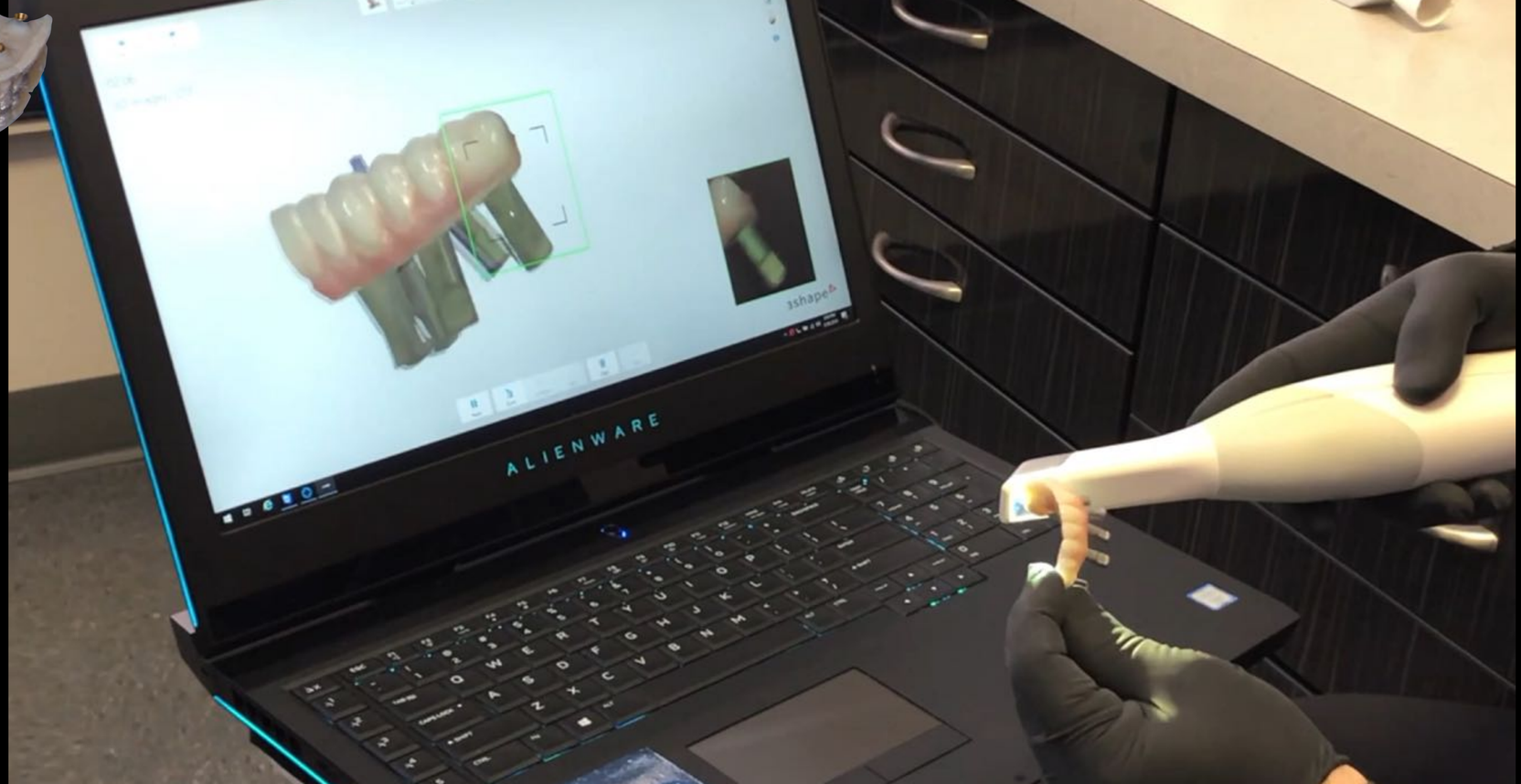

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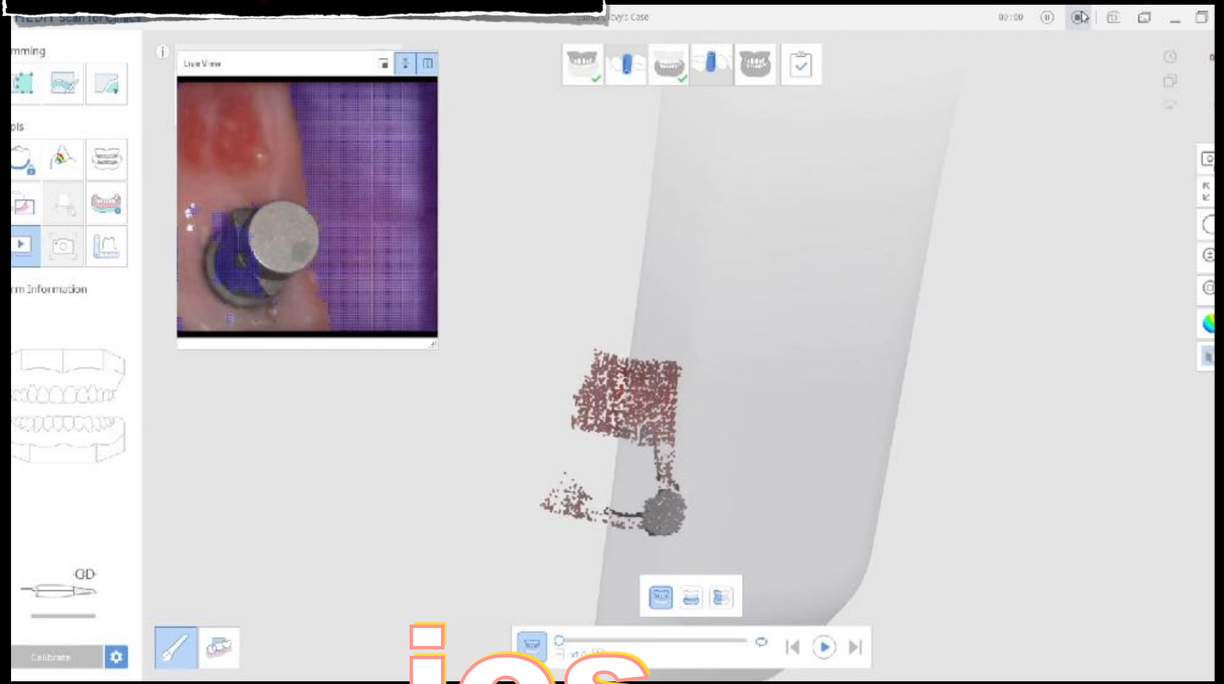

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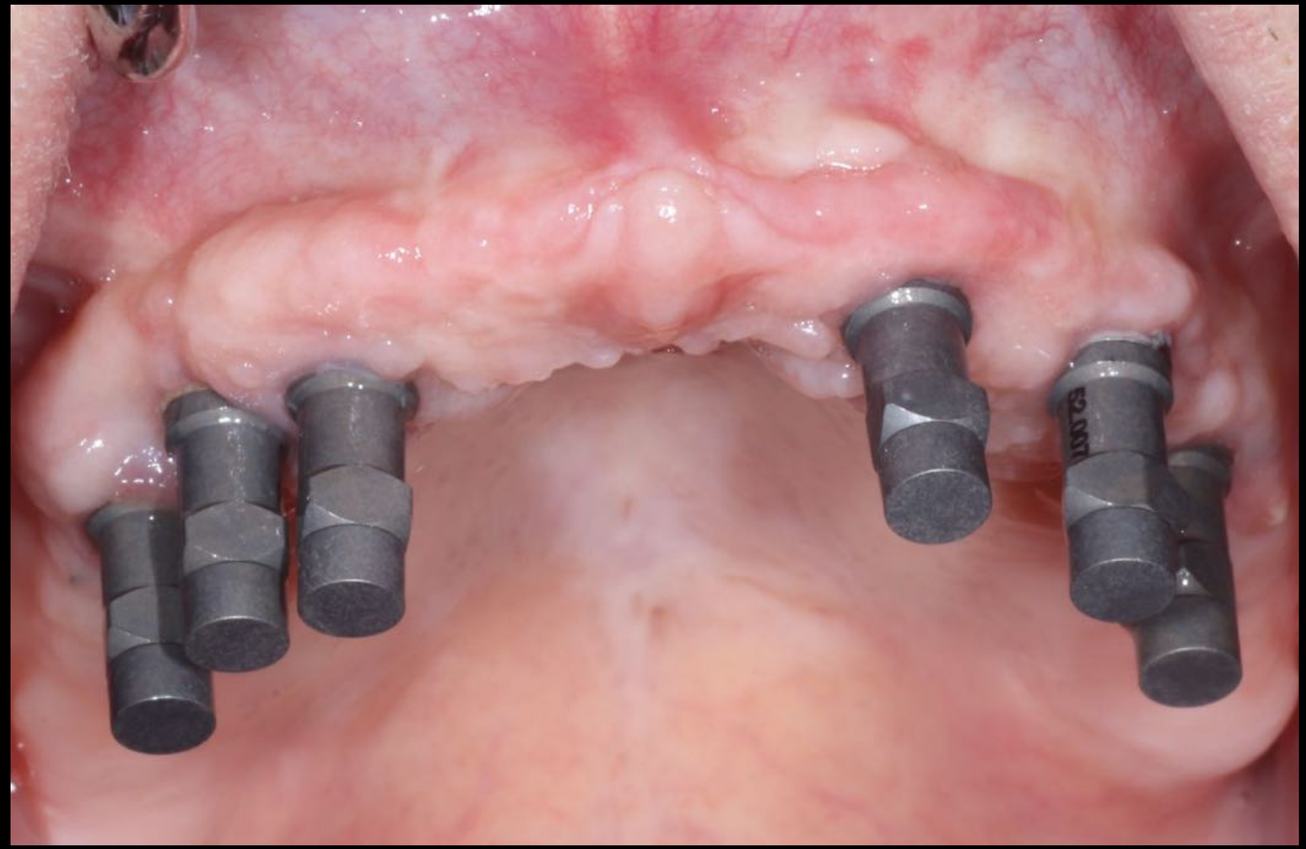

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iCam

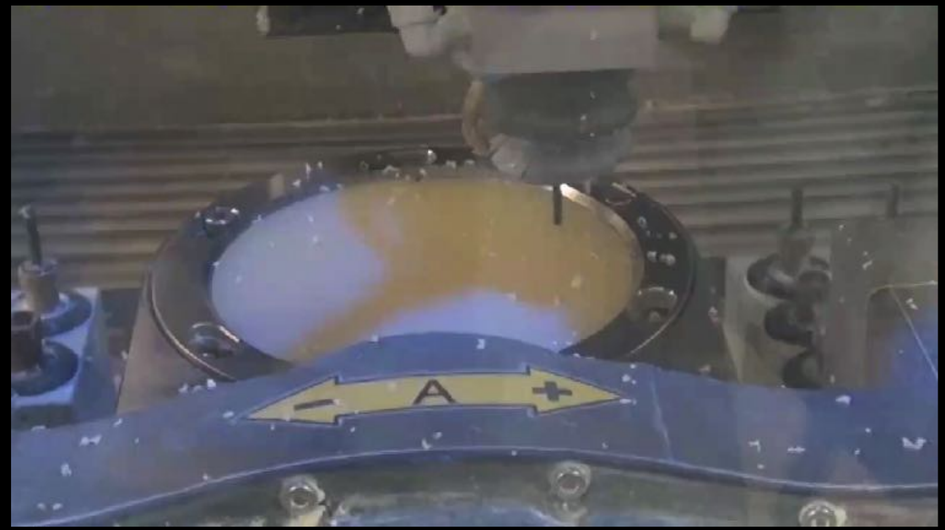
Imetric4D

Photogrammetry

Design

Cad-Cam

vJig



MILL

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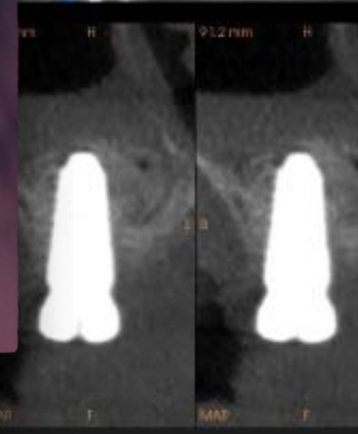

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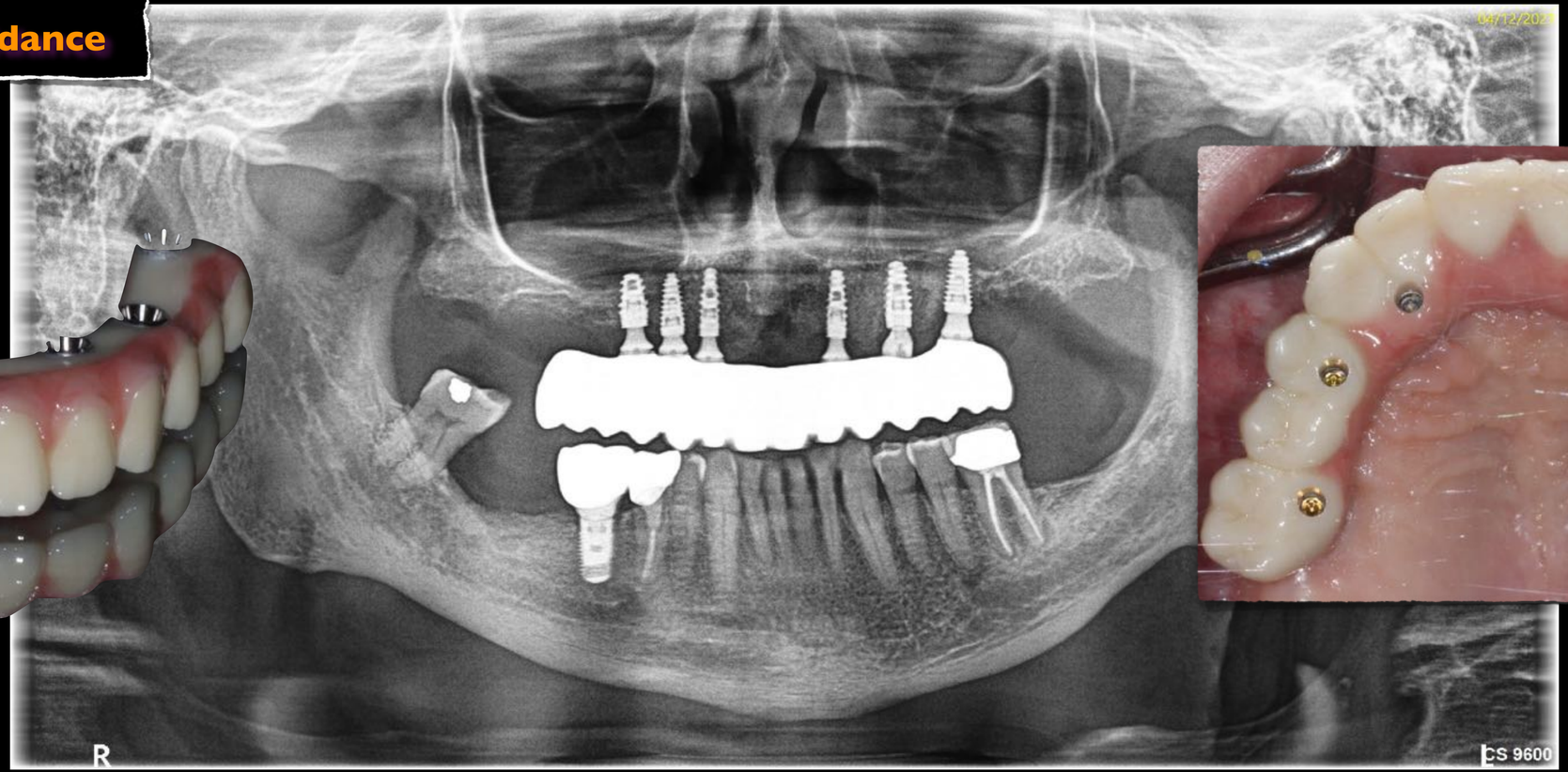
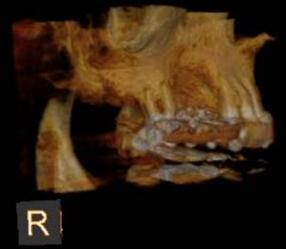
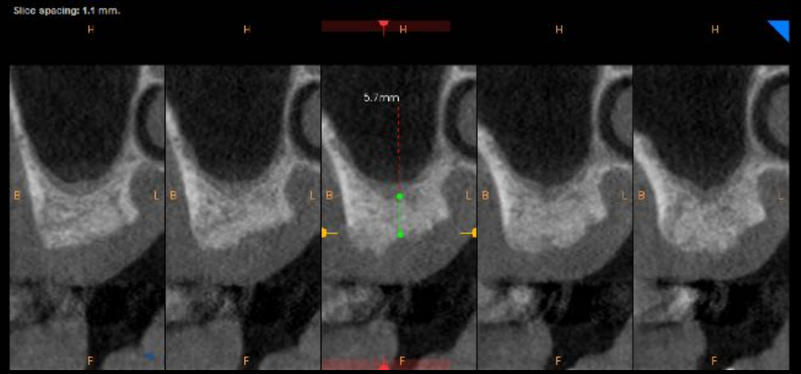
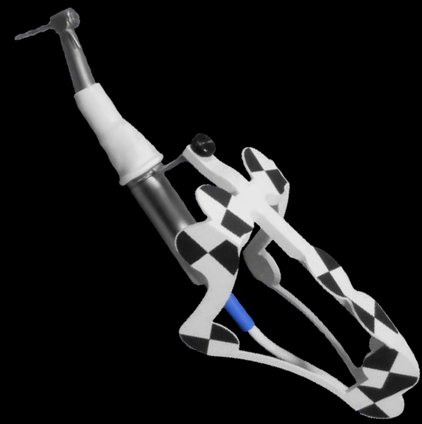


● Full template-Guidance

Digital Dynamic Sinus







Digital Dynamic
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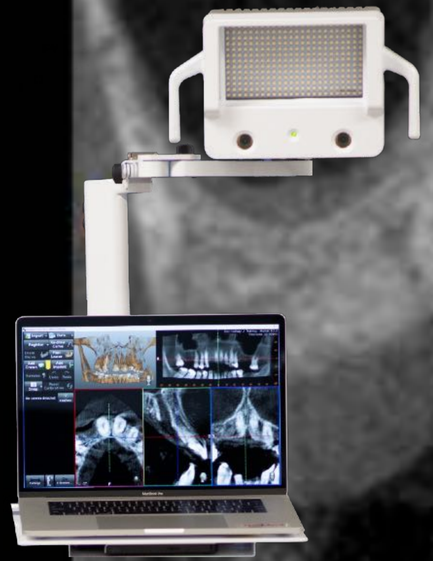
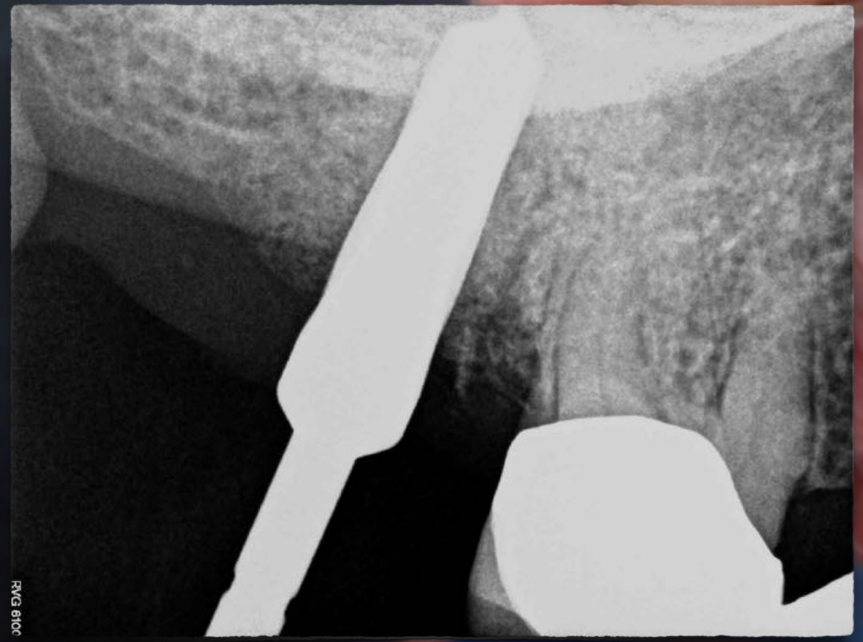
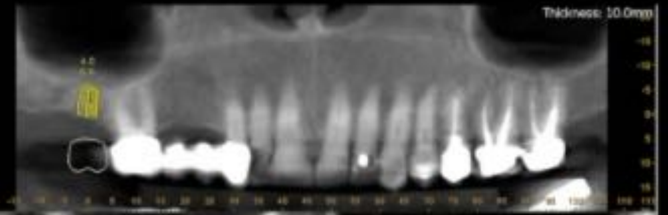
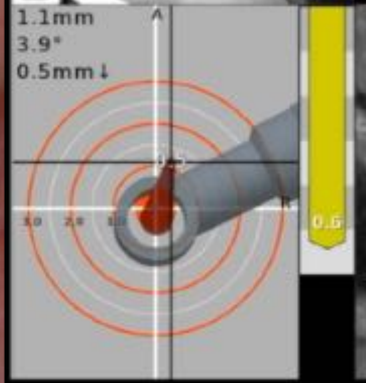


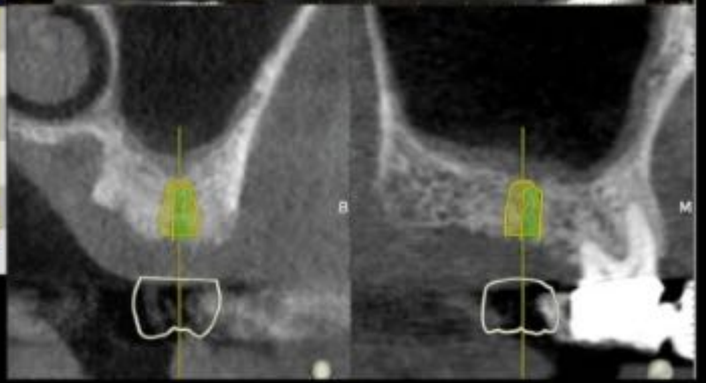
5.7mm

Digital Dynamic Sinus

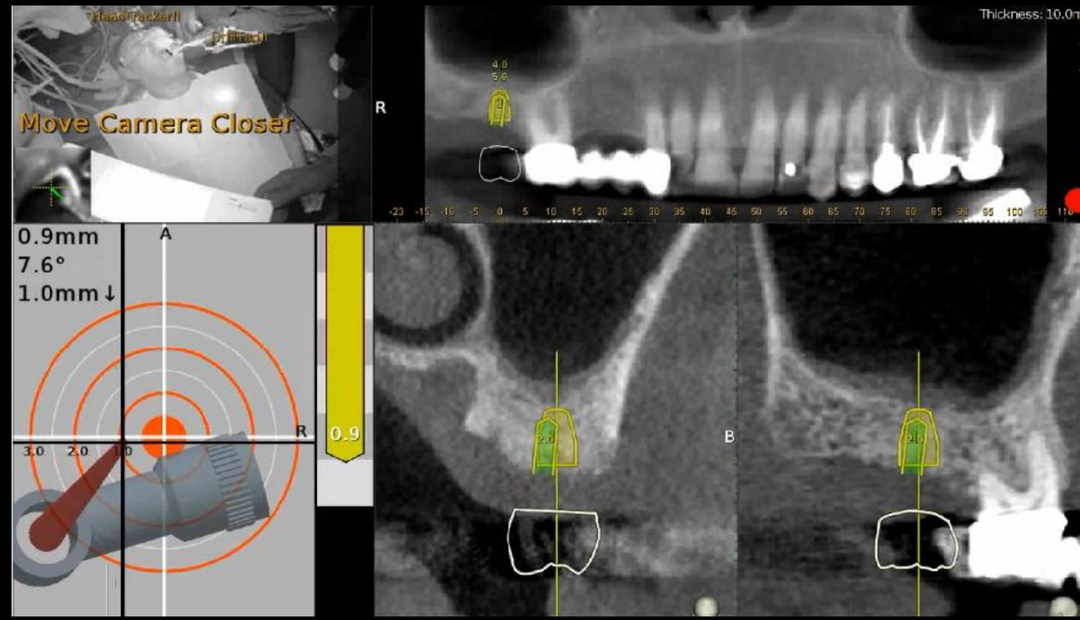






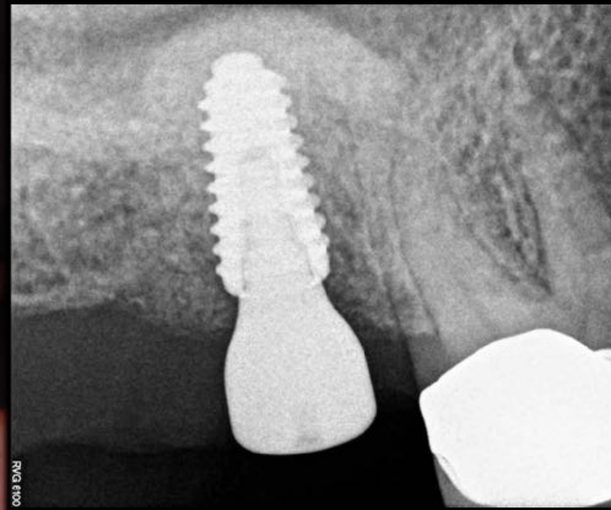



Digital Dynamic
Sinus

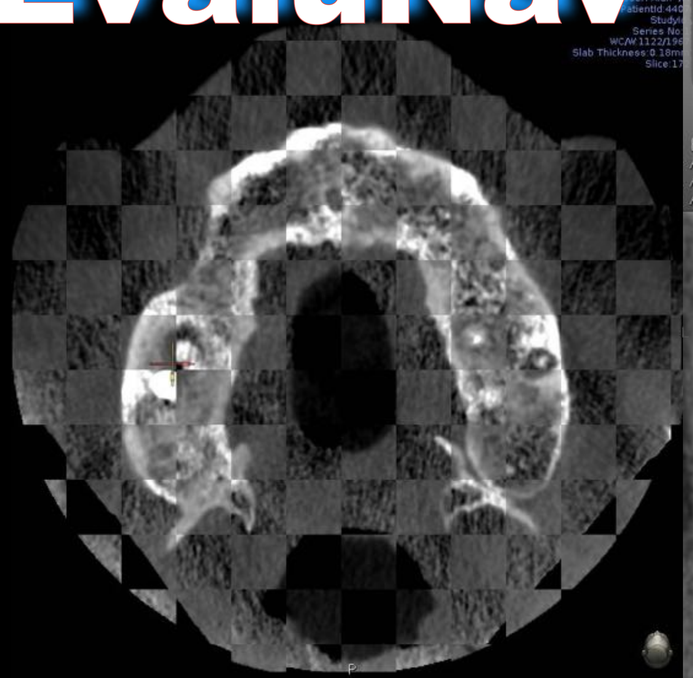

Move Camera Closer
R
Thickness: 10.0m
0.9mm
7.6°
1.0mm↓
A
R
0.9
B

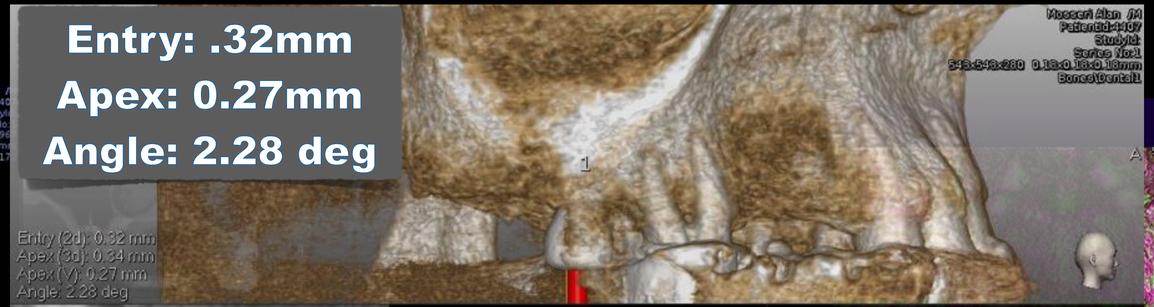
Digital Dynamic
Sinus

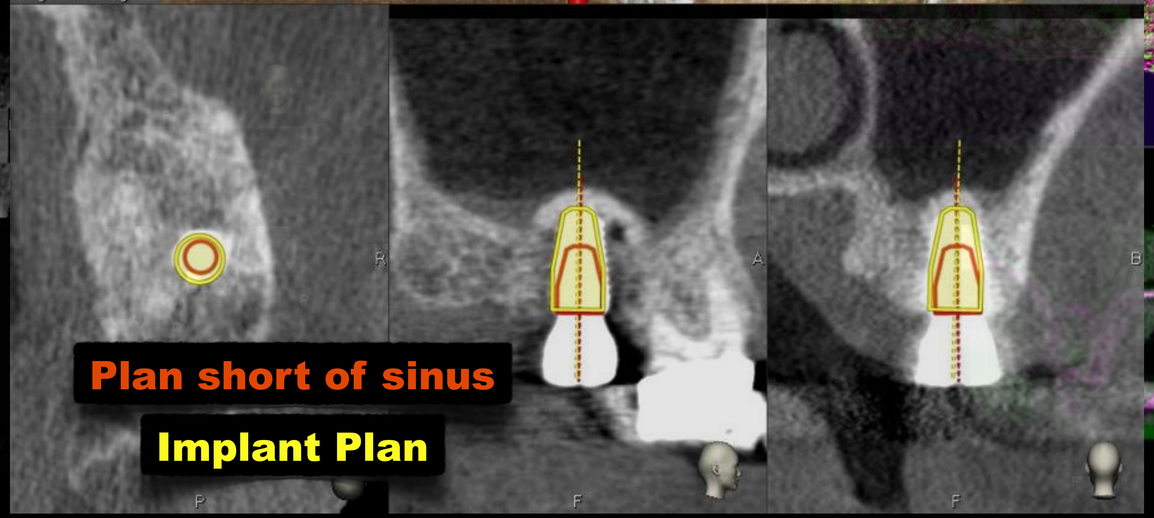
Digital Dynamic Sinus

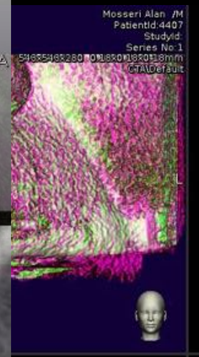


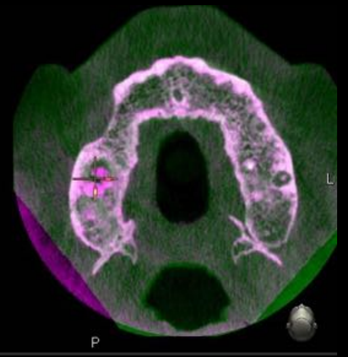
EvaluNav

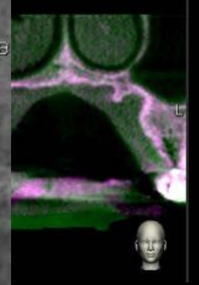


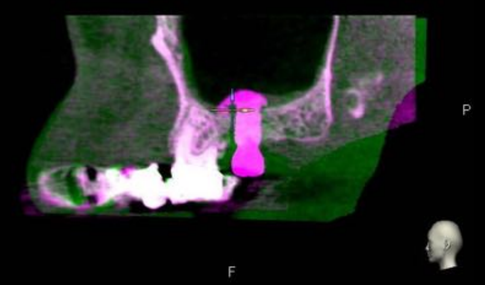

Entry: .32mm
Apex: 0.27mm
Angle: 2.28 deg
Entry (2d): 0.32 mm
Apex (3d): 0.34 mm
Apex (Y): 0.27 mm
Angle: 2.28 deg


Plan short of sinus
Implant Plan









Digital Dynamic Sinus

6 WEEK ISQ — 8 WEEK LOADING


Digital Dynamic Sinus
28 MONTH POST OP

Digital Dynamic Sinus

28 MONTH POST OP

Navigational Guided Crestal Sinus & Densah burs	
	Densah Lift
Numbers of Cases	18
Number of Implants	27
Avg Height Gain	4.3 mm
Failures	0
Complication	Swelling (1), Infection (0)


Partial Extraction
Therapy

- No functional benefit as the area can only be utilized as a pontic
- Preservation of the periodontium
- Hard and soft tissue 3 dimensional stability

Salama et al. Int J Periodontics Restorative Dent. 2007 Dec;27(6):521-7


Root Membrane
The Root Membrane Technique: A Retrospective Clinical Study With Up to 10 Years of Follow-up
Longitudinal Soft Tissue Changes During Periodontal Ligament–Mediated Immediate Implant Placement with the Root-Membrane Technique
IMPLANTS
The Root Membrane Concept:
In the Zone With the "Triangle of Bone"

HUMAN HISTOLOGY

Human Histologic Evidence of New Bone Formation and Osseointegration Between Root Dentin (Unplanned Socket-Shield) and Dental Implant: Case Report

Charles Schwimer, DMD, BS[1]/Gregory A. Pette, DMD, MS[2]/Howard Gluckman, BDS, MChD (OMP)[3]/Maurice Salama, DMD[4]/Jonathan Du Toit, BChD, MSc(Dent)[5]

The socket-shield technique described 7 years ago has since grown in its reporting in the literature as a valid method of ridge preservation at immediate implant placement. To date, large clinical cohorts with up-to-4-year follow-up have been reported. Additionally, evidence of tissue histology at the dental implant and socket-shield has been demonstrated in the animal model. However, human histologic evidence has not yet been available, and the clinician's uncertainty regarding the tissues that may form between the socket-shield and dental implant may remain unanswered until now. This case report presents the first human histologic evidence that bone may entirely fill the space between root dentin and an osseointegrated implant surface. Int J Oral Maxillofac Implants 2018;33:e19–e23. doi: 10.11607/jomi.6215

Keywords: *dental implant, implantology, partial extraction therapies, ridge preservation, socket-shield*

Literature reporting on the retention of the tooth root or part of the tooth root to maintain alveolar ridge volume and offset postextraction collapse has been growing in recent years.[1] The socket-shield technique has been proposed as such a method, sectioning the facial root portion for it to remain submerged in situ with its physiologic attachment to bundle bone intact.[1] The hypothesis asserts that this root portion, when retained, circumvents the destruction of Sharpey's fibers inserted into bundle bone and "shields" the facial alveolar ridge from collapsing adjacent to the implant.[2,3] The literature to support this theory is growing.[1–14] As yet, the technique requires additional data to advocate in everyday practice, especially data ranking higher in the hierarchy of scientific evidence.

Hürzeler and coworkers[2] as well as Bäumer and coworkers[3] have provided valuable histologic evidence of the healed socket-shield and implant sectioned from the alveolar ridge. Yet, these have been presented in the canine model. The clinician may still be uncertain as to what tissue grows between the socket-shield and dental implant in a human. Is it periodontal ligament, new cementum, or partial or full periodontal regeneration? Will the identification of this tissue architecture affect the decision-making when selecting the socket-shield technique to offset resorptive complications at immediate implant placement? The objective of this case report was to present the first human histologic evidence that demonstrates the healing possibility of new bone and osseointegration between root dentin and dental implant.

[1]Private Practice, Pittsburgh, Pennsylvania, USA
[2]Private Practice, Naples, Florida, USA.
[3]Private Practice, Dental Aesthetic Academy, Specialist in Periodontics and Implant Medicine, The Implant Clinic, Cape Town, South Africa.
[4]Associate Professor of Periodontics, University of Pennsylvania, Philadelphia, Pennsylvania; Medical College of Georgia; Private Practice, Atlanta, Georgia, USA.
[5]Department of Periodontics and Oral Medicine, University of Pretoria, Faculty of Health Sciences, School of Dentistry, Pretoria, South Africa.
Correspondence: Charles Schwimer, 6201 Steubenville Pike, Pittsburgh, PA 15136, USA. Email: F4Cchuck@aol.com
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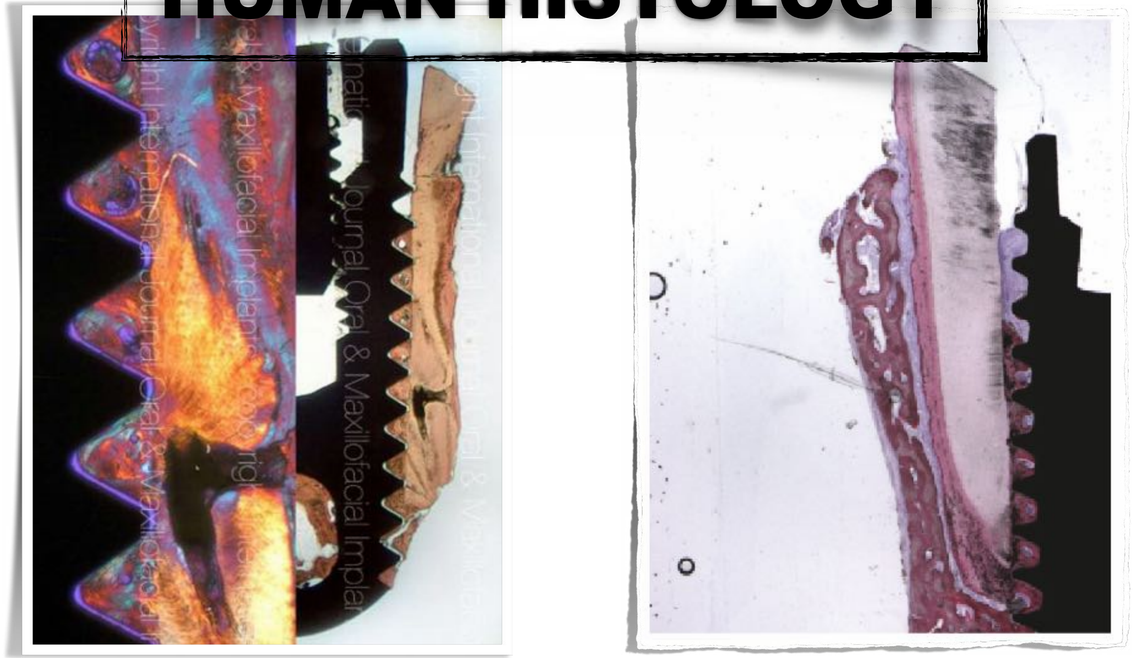
CASE REPORT

A woman aged 45 years presented to the offices of her periodontist for a routine check-up, and provided a history that included among others discomfort and vague sensation associated with her implant crown at the left maxillary first premolar site. The patient's medical history was noncontributory. The dental history entailed loss of the premolar tooth 2 years prior and an immediate implant being placed. A period of submerged healing followed, with subsequent implant exposure and definitive restoration with a cement-retained crown. Intraoral examination noted no overt inflammation, peri-implant mucositis, or tissue



Hindawi
BioMed Research International
Volume 2017, Article ID 7269467, 8 pages
https://doi.org/10.1155/2017/7269467

Research Article

The Root Membrane Technique: Human Histologic Evidence after Five Years of Function

Miltiadis E. Mitsias,[1,2] Konstantinos D. Siormpas,[3] Georgios A. Kotsakis,[4] Scott D. Ganz,[5,6,7] Carlo Mangano,[8] and Giovanna Iezzi[9]

[1]*Department of Periodontology and Implant Dentistry, College of Dentistry, New York University, New York, NY 10010, USA*
[2]*Private Practice, Athens, Greece*
[3]*Private Practice, Larissa, Greece*
[4]*Division of Periodontology, School of Dentistry, University of Minnesota, Minneapolis, MN 55455, USA*
[5]*Rutgers School of Dental Medicine, Newark, NJ 07103, USA*
[6]*Hackensack University Medical Center, Hackensack, NJ 07601, USA*
[7]*Private Practice, Fort Lee, NJ 07024, USA*
[8]*Department of Dental Sciences, Vita and Salute University S. Raffaele, 20132 Milan, Italy*
[9]*Department of Oral and Biotechnological Science, University G. D'Annunzio, 66013 Chieti, Italy*

Correspondence should be addressed to Miltiadis E. Mitsias; mmitsias@msn.com

Received 6 August 2017; Accepted 16 November 2017; Published 22 November 2017

Academic Editor: Hassan Maghaireh

Background. The "root membrane" (RM) is a technique that has become popular among implantologists for placement of immediate implants in the anterior maxilla. *Purpose.* To present histologic evidence of an immediate implant placed in the human anterior maxilla, according to the RM technique, and retrieved after five years. *Methods.* A fixture, along with the surrounding tissues, was retrieved from the anterior maxilla of a 68-year-old patient, who had been treated five years earlier with immediate implant placement and RM technique. The specimen was processed for histologic/histomorphometric evaluation. *Results.* The buccal bone plate was maintained without any resorption; a healthy periodontal ligament was evidenced. The implant showed osseointegration, with a high percentage of bone-to-implant contact (BIC = 76.2%). With regard to the space between the RM and the implant, the apical and medial thirds were filled with compact, mature bone; the coronal third was colonized by noninfiltrated connective tissue. *Conclusions.* The RM technique appears to be effective in preventing bone resorption of the buccal bone plate of the human anterior maxilla, five years after the placement of an immediate implant.

1. Introduction

To date, the rehabilitation of the anterior maxilla with postextractive single implants represents a successful treatment procedure characterized by high survival rates, as evidenced by several short- [1, 2] and long-term [3, 4] clinical studies.

However, this surgical procedure remains complex for the surgeon because it can be difficult to obtain a prosthetic restoration that mimics the emergency profile and the appearance of the natural, contralateral tooth, in perfect symmetry with it [2–4].

In order to achieve a complete in the aesthetic areas of the anterio guishable from the natural contralat to preserve and maintain the archite tissues [5, 6].

Unfortunately, as has been kno extraction triggers a physiological resorption process: in fact, tooth l periodontal ligament and the vascul it [7–9]. Since these vessels help to plate, especially in the anterior maxi


HOWIE GLUCKMAN
JONATHAN DU TOIT
MAURICE SALAMA
SNJEZANA POHL
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DARCIO FONSECA
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ARMANDO PONZI
EHAB MOUSSA
ALI TUNKIWALA
ATTILA BODROGI

Navigation System in Socket Shield

October 2019

CASE LETTER

A Novel Application of Dynamic Navigation System in Socket Shield Technique

Joey T. Chen, DDS

Introduction

Achieving osseointegration after dental implant placement has been proven to be a predictable process, and implant restorations can maintain adequate functions for many years.[1,2] Obtaining optimal long-term esthetic results in implant therapy, however, remains a challenging task. One of the main reasons for this difficulty is alveolar bone resorption after tooth extraction, which leads to significant reduction in the horizontal and vertical dimensions of the hard and soft tissues.[3,4]

The socket shield technique has been developed to overcome the tissue resorption process.[5] By retaining the buccal and/or the proximal portions of the root to be extracted, the periodontal ligament and surrounding bone can be maintained. This leads to the preservation of soft tissue contour, hence a natural-appearing, esthetic result can be achieved.

The socket shield technique, however, is technique-sensitive. Preparing the socket shield to the correct shape, thickness, and length without damaging the surrounding tissue can be challenging because the socket has limited visibility and access, and the root anatomy varies. It is difficult to visualize the root during preparation and know exactly how much structure to reduce or remove.

The image-guided dynamic navigation system was developed to have real-time visualization of anatomical structures such as bone and teeth, as well as drill tips during implant surgical procedures. This type of system has advantages in placing implants in a pre-planned, prosthetically driven position, avoiding crucial anatomical structures such as the inferior alveolar nerve and maxillary sinus. Since the system provides real-time feedback, any malpositioning or false alignment of the drills can be immediately corrected.

The present report describes a novel method in applying the image-guided dynamic navigation system in the socket shield preparation and immediate implant placement.

Clinical Case Report

Part I—The dynamic navigation workflow

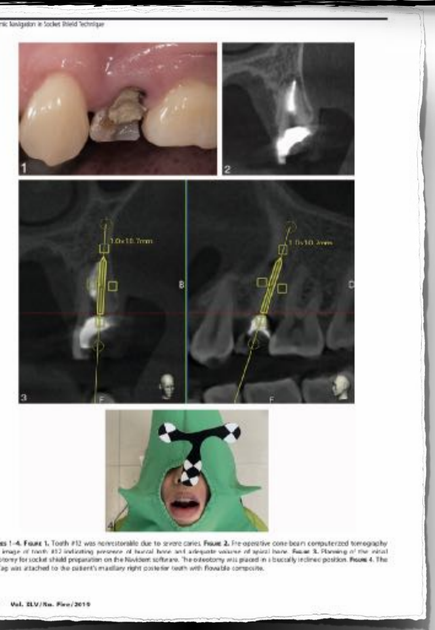
A 28-year-old female with noncontributory medical history presented with a non-restorable maxillary left first premolar due to severe caries. Clinical photographs and a cone-beam computerized tomography (CBCT) scan were taken (Veraviewepocs 3D R100, J Morita Mfg Corp, Kyoto, Japan) (Figures 1 and 2), and a preliminary impression was made with polyvinyl siloxane material. A diagnostic wax-up of tooth #13 was made on the preliminary study cast from the impression. The study cast was then scanned and transferred into standard tessellation language (STL) files. Both the CBCT data set (CBCT scan) and the STL files were imported into the Navident software (Navident R1.6.1, ClaroNav Inc, Toronto, Canada) for case analysis and treatment planning. The two files were merged and mapped together in the software to obtain an accurate image of the bone, teeth, roots, and soft tissue.

On the Navident software, a 1.mm-diameter osteotomy was planned from the buccal border of the root canal chamber to the root apex with a slight tilt towards the buccal side (Figure 3). The osteotomy was planned buccal to the root apex and parallel the palatal root area. This osteotomy would enhance the apico-coronal direction of the mesiodistal cut and ensure the complete removal of the root apex and any periapical pathology.

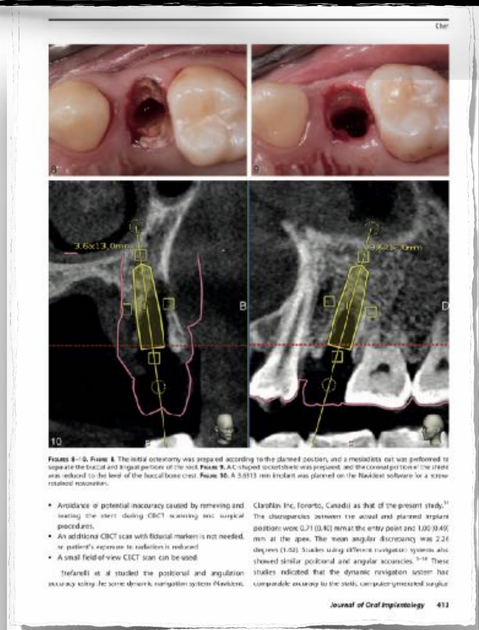
To accurately guide the drilling process, the navigation system must map the drill tip to a CT scan image of the jaw. This was done in three steps: registration, calibration, and tracking.

Registration was the process of mapping the CBCT image to the patient's physical jaw structures. First, on the preliminary study cast, the wax-up armature of the jaw tracker, which was a jig used for real-time tracking of the patient's jaw, was bent and fitted onto the occlusal surfaces of the maxillary right premolar and molars. Then the Jaw Tracker was attached to the maxillary right premolar and molars with flowable composite resin (Figure 4). The systems tracking camera (Micron Tracker, ClaroNav Inc) traced the Jaw Tracker in the physical 3D space, thereby allowing for a continuous tracking of the patient's maxillary anatomical structures.

Next is the tooth registration procedure. The Tracer Tool with a TraserTag attached was calibrated on the Calibrator (Figure 5a and b). The tracking camera locates both the Calibrator and the TracerTag, at which the Tracer Tool was placed in the divots of the Calibrator. The computer calibrates the Tracer Tool's tip in relation to the TracerTag. Then the Tracer Tool was used to trace the surfaces of four pre-selected teeth around the maxillary arch. As the Tracer Tool's ball tip slid over the tooth surfaces, the system continuously sampled its position in space creating a virtual "cloud of points" in a 3D mesh, in relation to the Jaw Tracker attached to the patient's jaw (Figure 6). The virtual 3D mesh was then registered by the software to the outer surfaces of the traced teeth in the CT



FIGURES 1–4. FIGURE 1. Tooth #12 was nonrestorable due to severe caries. FIGURE 2. Pre-operative cone beam computerized tomography slice image of tooth #12 indicating presence of buccal bone and adequate volume of apical bone. FIGURE 3. Planning of the virtual osteotomy for socket shield preparation on the Navident software. The osteotomy was placed in a buccally inclined position. FIGURE 4. The JawTag was attached to the patient's maxillary right posterior teeth with flowable composite.



FIGURES 8–10. FIGURE 8. The initial osteotomy was prepared according to the planned position, and a mesiodistal cut was performed to separate the buccal and lingual portions of the root. FIGURE 9. A C-shaped socket shield was prepared, and the coronal portion of the shield was reduced to the level of the buccal bone crest. FIGURE 10. A 3.6X13 mm implant was planned on the Navident software for a screw-retained restoration.

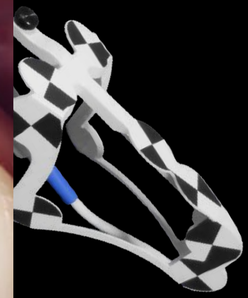
- Avoidance of potential inaccuracy caused by removing and reseating the stent during CBCT scanning and surgical procedures.
- An additional CBCT scan with fiducial markers is not needed, so patient's exposure to radiation is reduced.
- A small field-of-view CBCT scan can be used.

Stefanelli et al studied the positional and angulation accuracy using the same dynamic navigation system (Navident, ClaroNav Inc, Toronto, Canada) as that of the present study.[10] The discrepancies between the actual and planned implant positions were 0.71 (0.42) mm at the entry point and 1.00 (0.49) mm at the apex. The mean angular discrepancy was 2.24 degrees (1.52). Studies using different navigation systems also showed similar positional and angular accuracies.[9,10] These studies indicated that the dynamic navigation system had comparable accuracy to the static computer-generated surgical

Joey Chen, DDS

Dynamic Virtual Template

- **Full template-Guidance**



Root Membrane Kit

Dynamic Virtual Template

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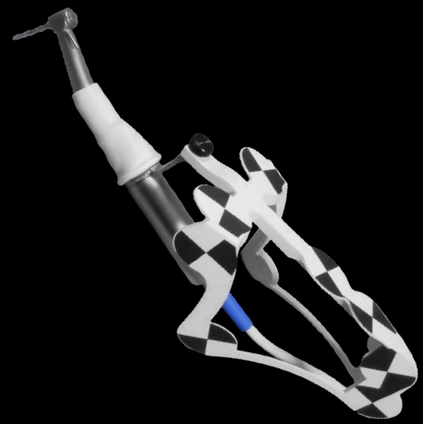
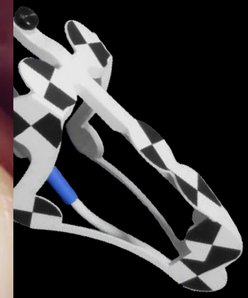


Dynamic Virtual Template

- **Full template-Guidance**

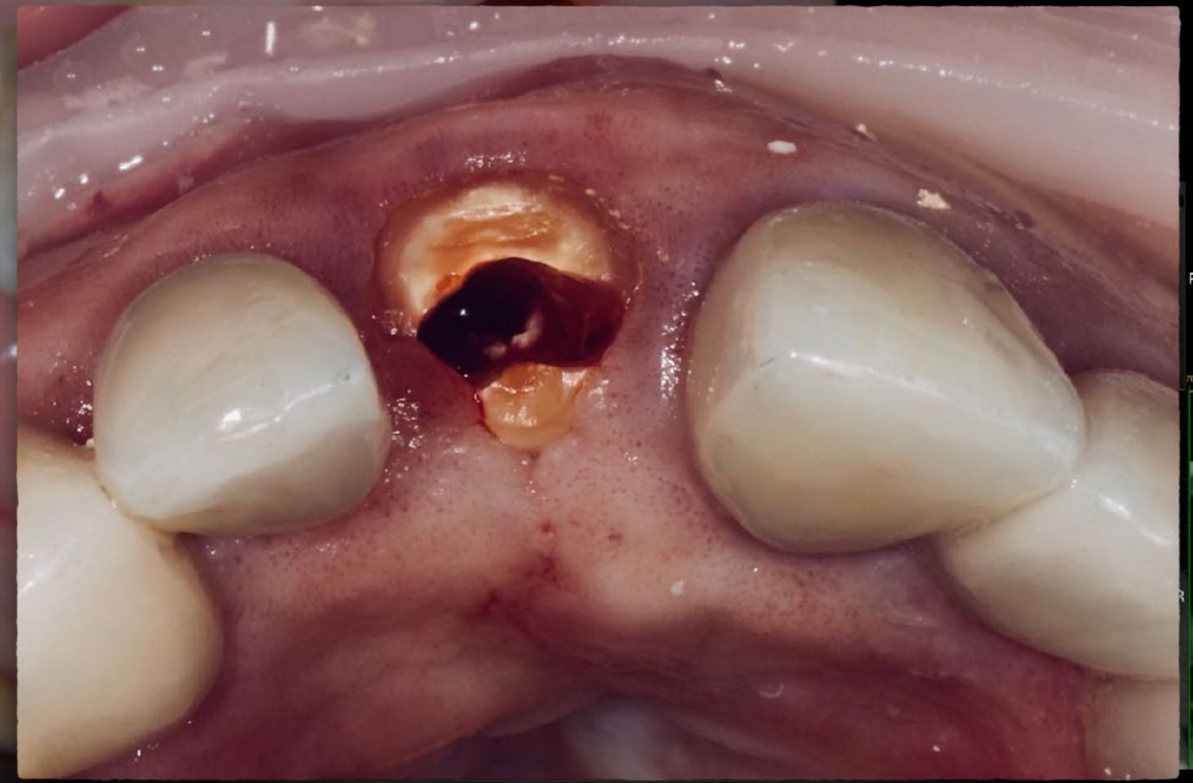


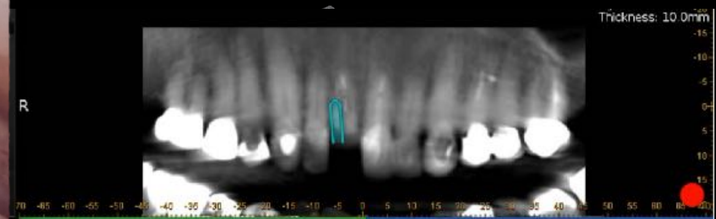
Digital Dynamic Shield

rtial Extraction Therapy

Digital Dynamic Shield

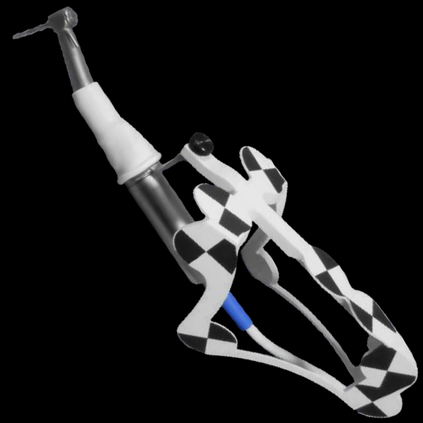
Partial Extraction Therapy





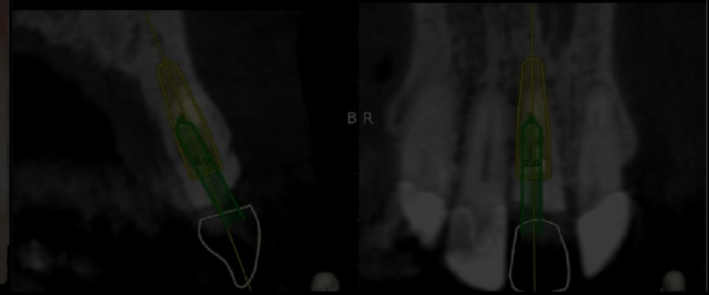
Digital Dynamic Shield

Partial Extraction Therapy

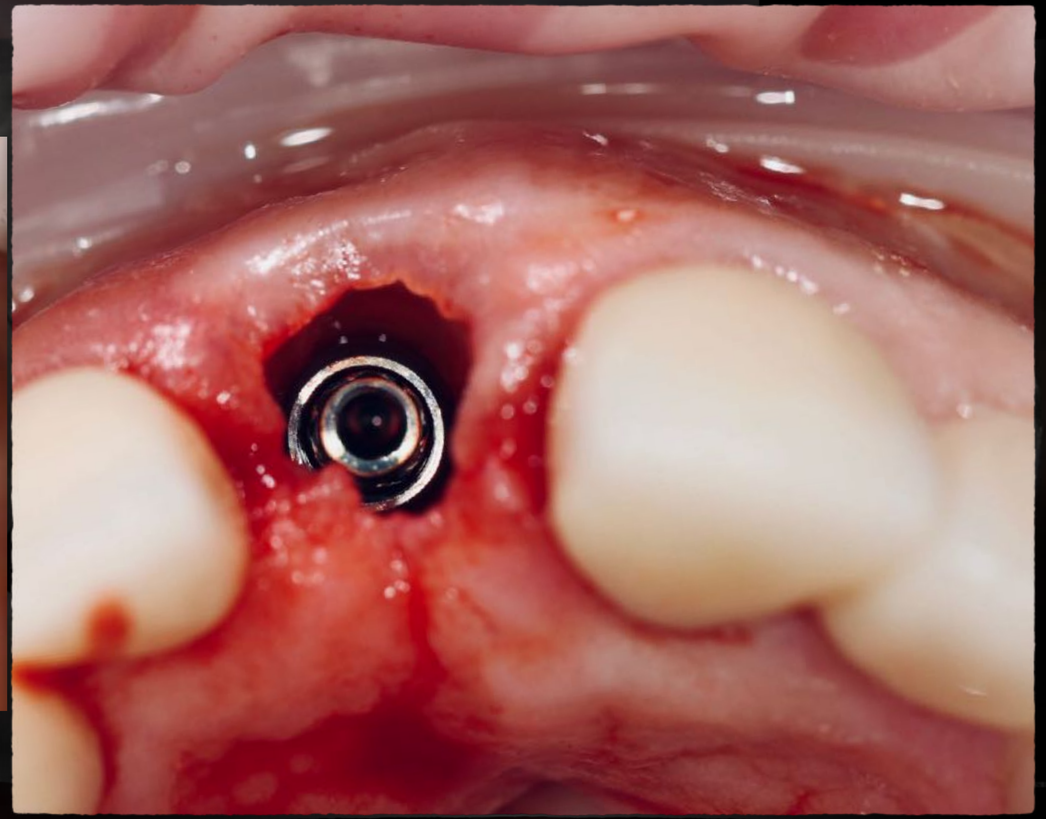


Digital Dynamic Shield

Partial Extraction Therapy



Digital Dynamic Shield



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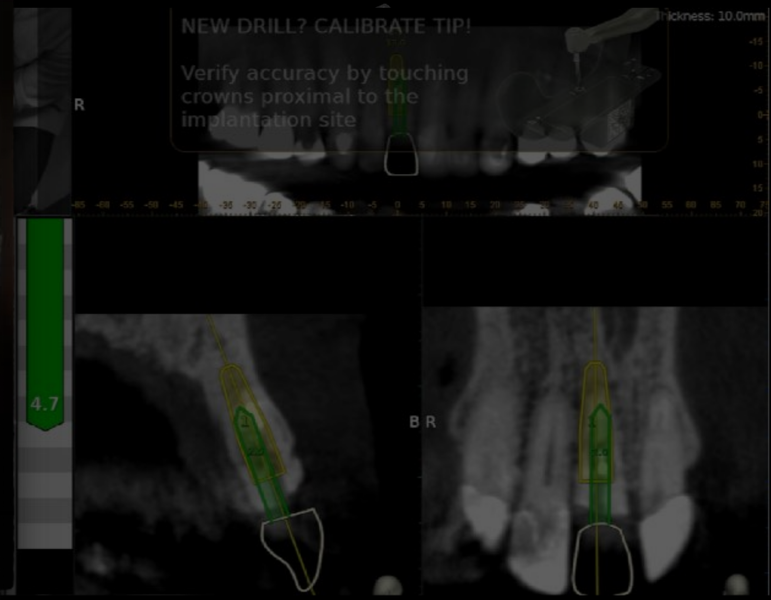
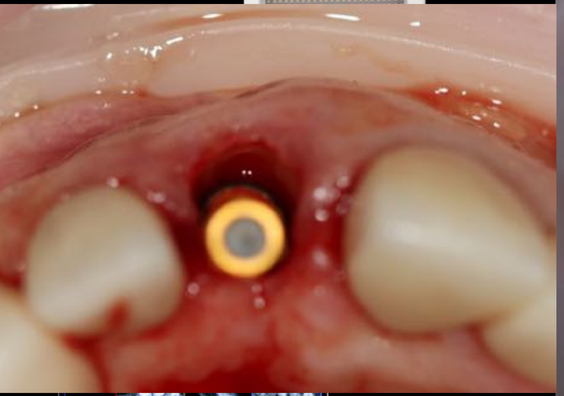
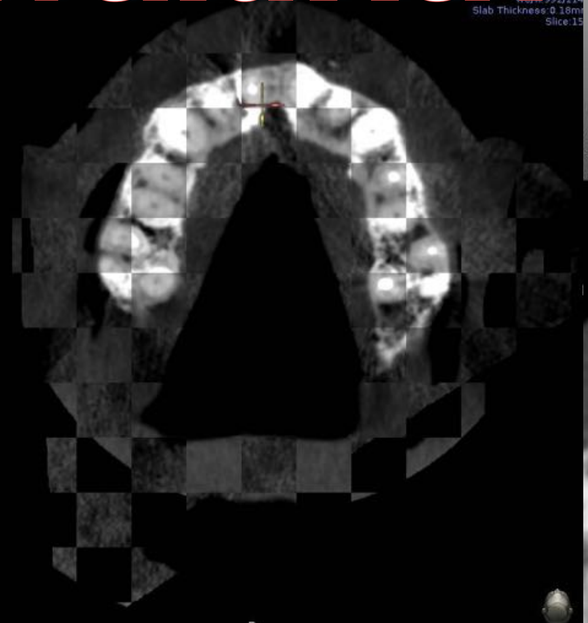


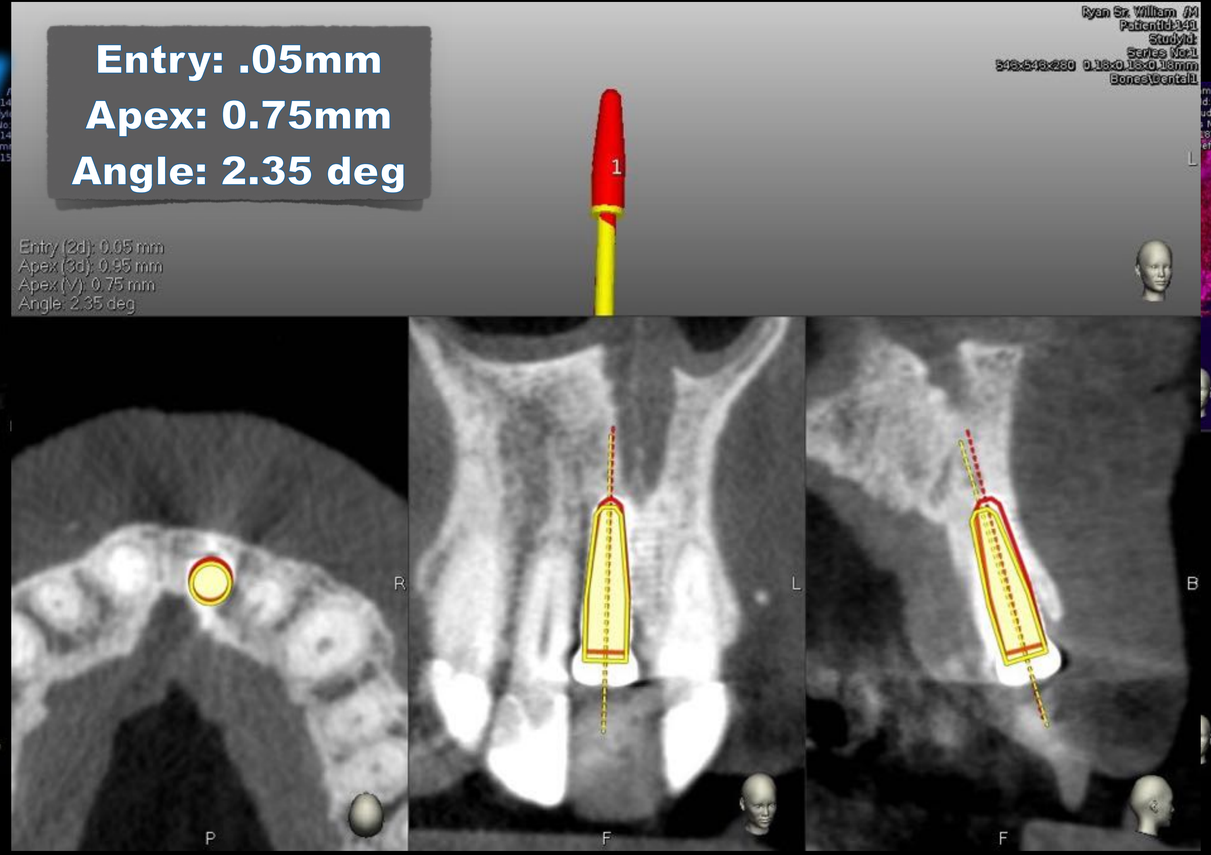
Digital Dynamic Shield



Partial Extraction Therapy

EvaluNav




Entry: .05mm
Apex: 0.75mm
Angle: 2.35 deg
Entry (2d): 0.05 mm
Apex (3d): 0.95 mm
Apex (V): 0.75 mm
Angle: 2.35 deg
1
L
R
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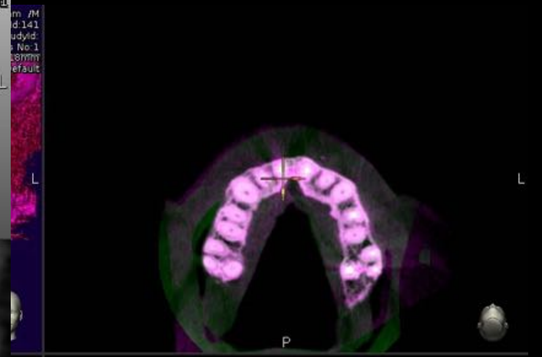
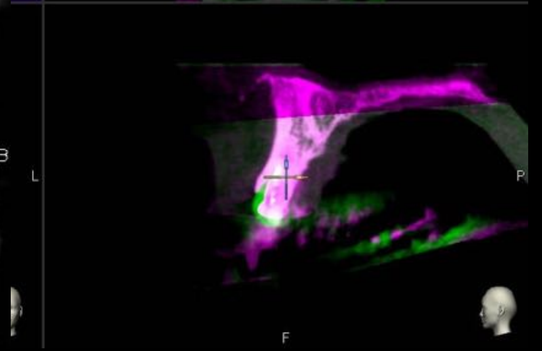
F
B





Digital Dynamic Shield

Partial Extraction Therapy

Digital Dynamic Shield

Partial Extraction Therapy

Digital Dynamic Shield

Partial Extraction Therapy

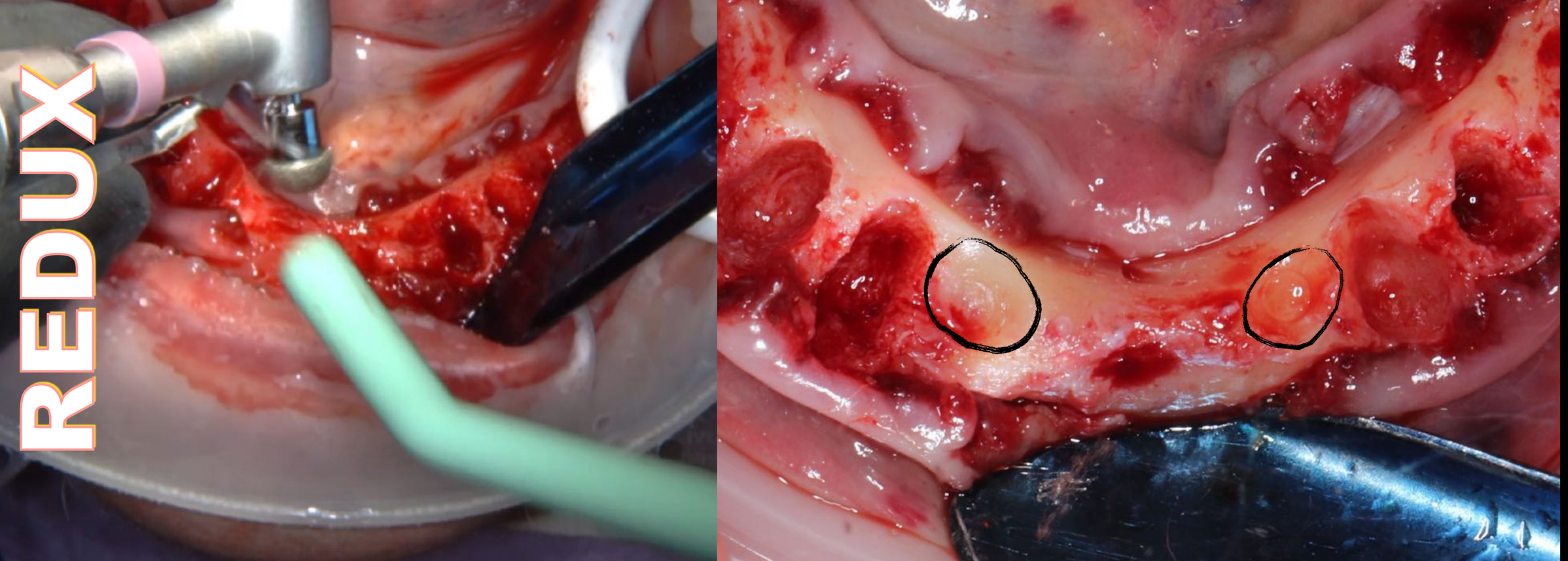
Digital Dynamic Shield

Partial Extraction Therapy

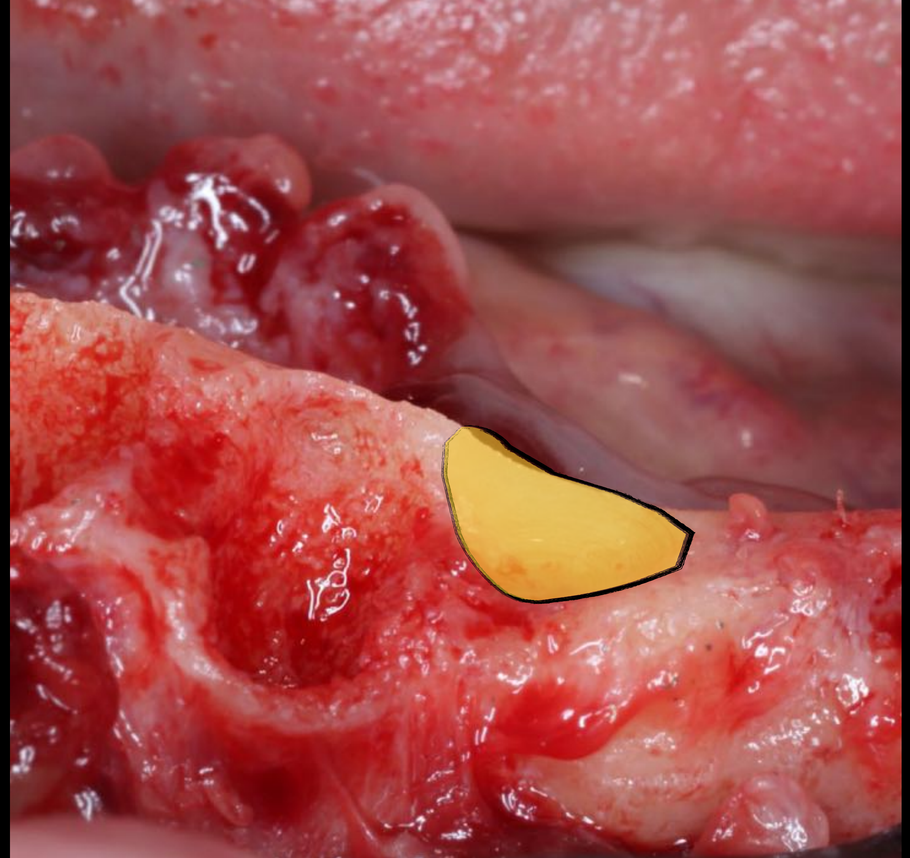
Navigational Guided Partial Extraction Therapy	
	PET
Numbers of Cases	24
Number of Implants	32
Failures	1
Complication	Swelling (1), Infection (0)

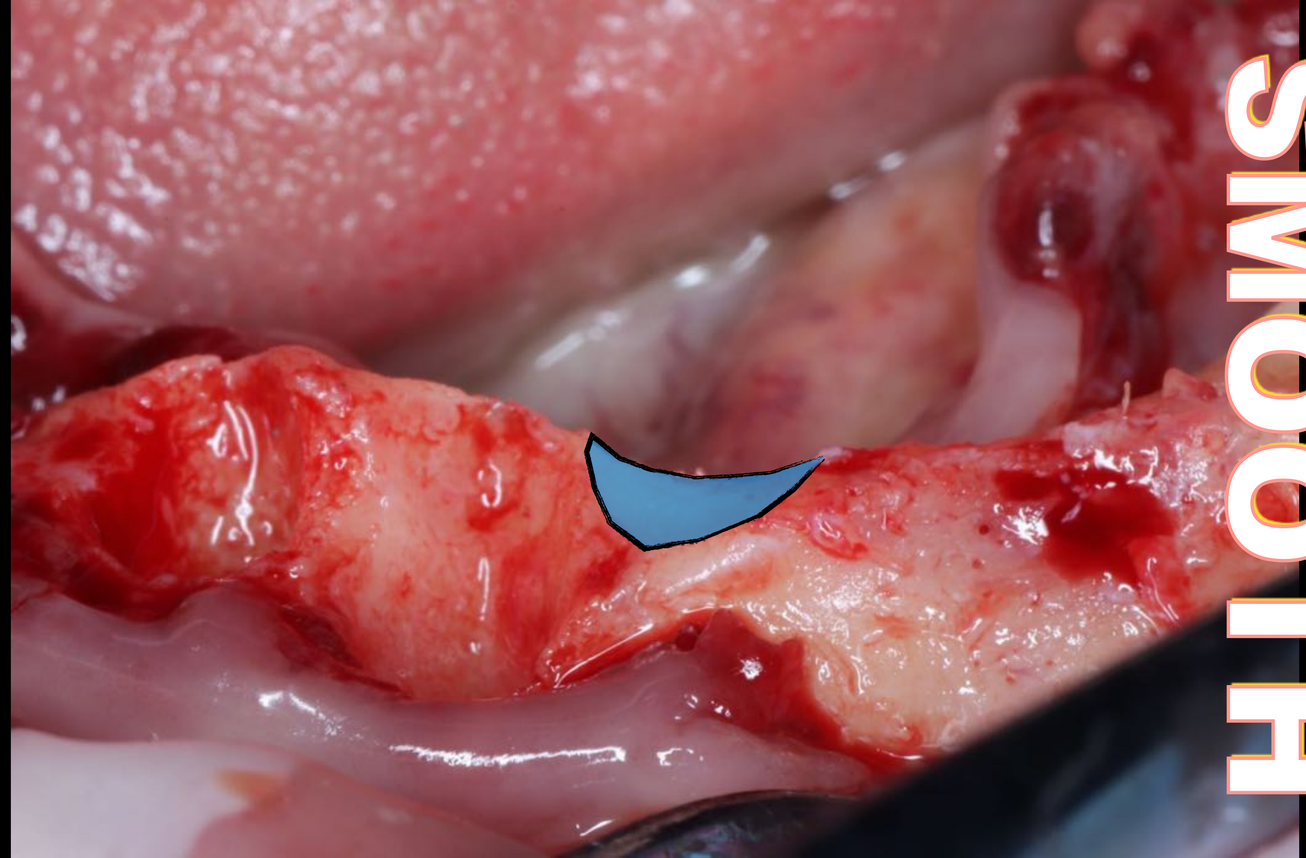
Virtual Guidance

Virtual Guidance


REDUX
SMOOTH

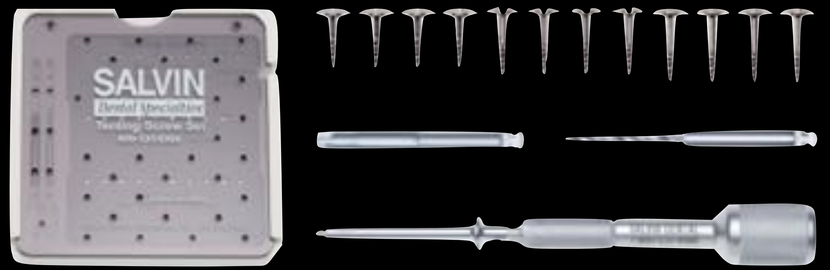
REDUX





SMOOTH

Identifying

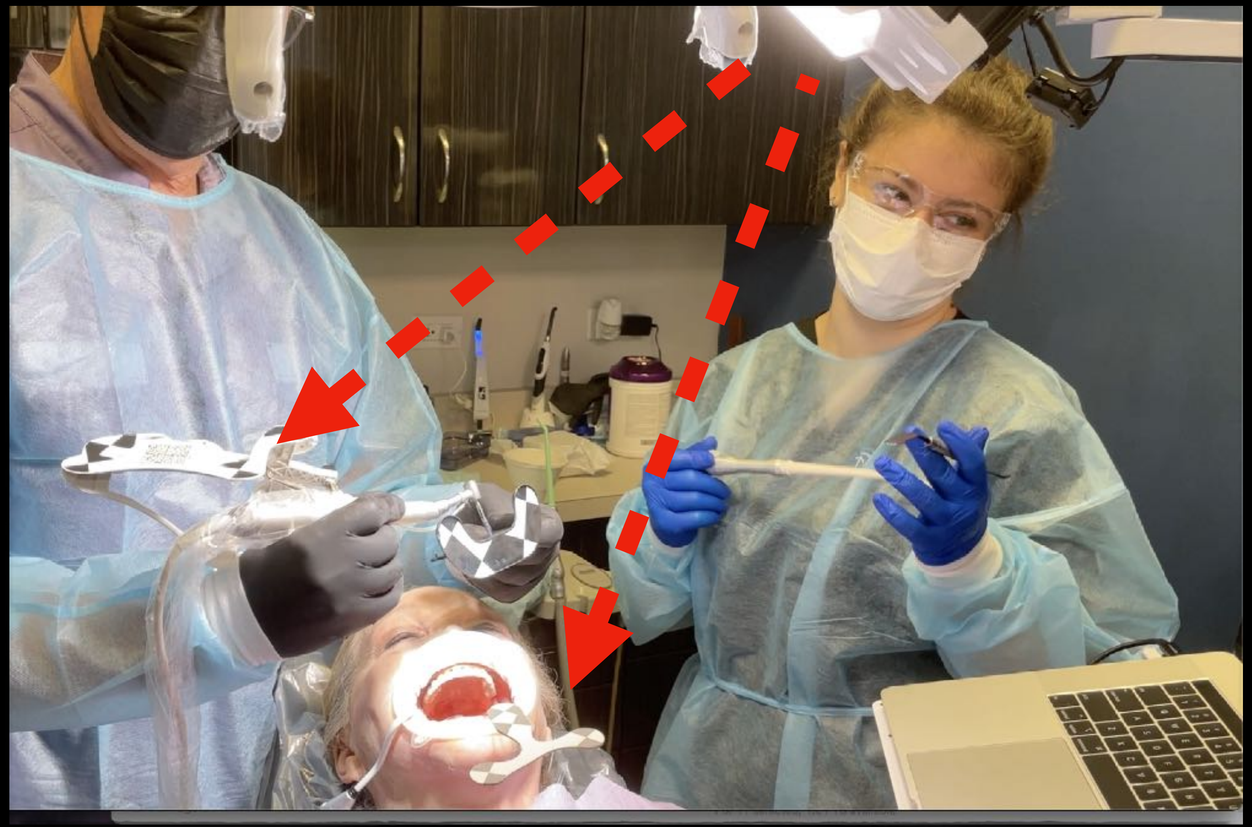


Screws

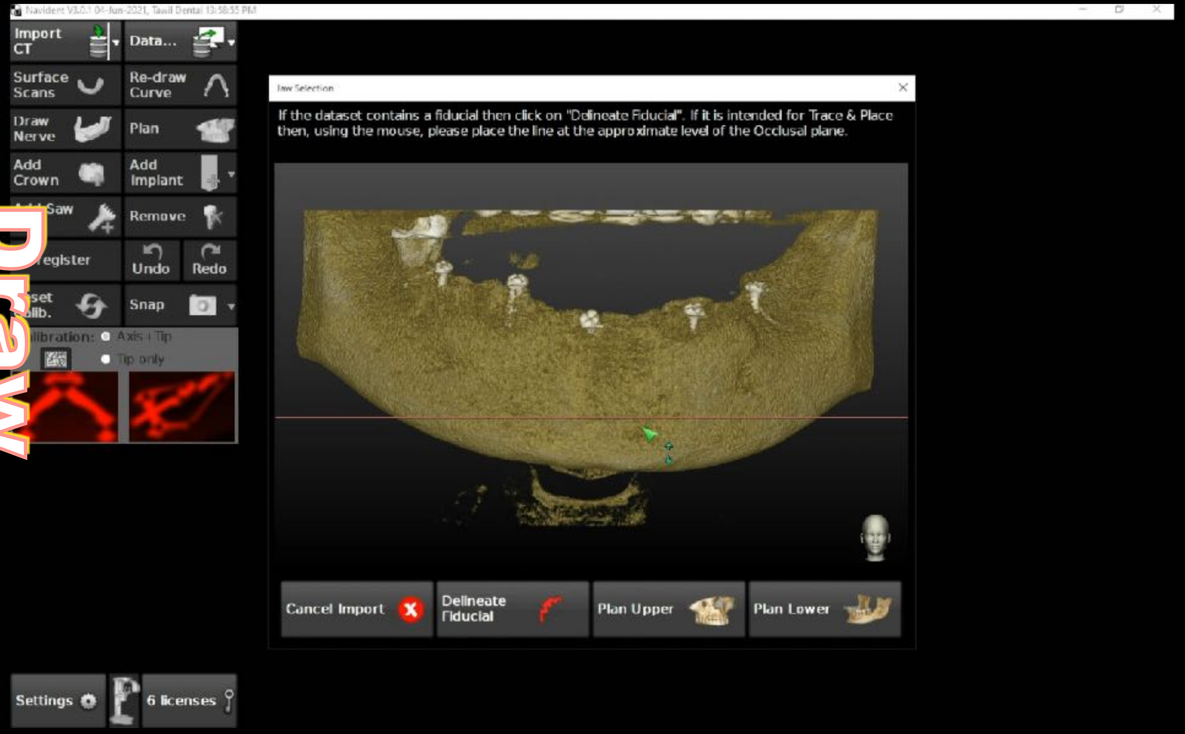
Screws

Jaw Tracking

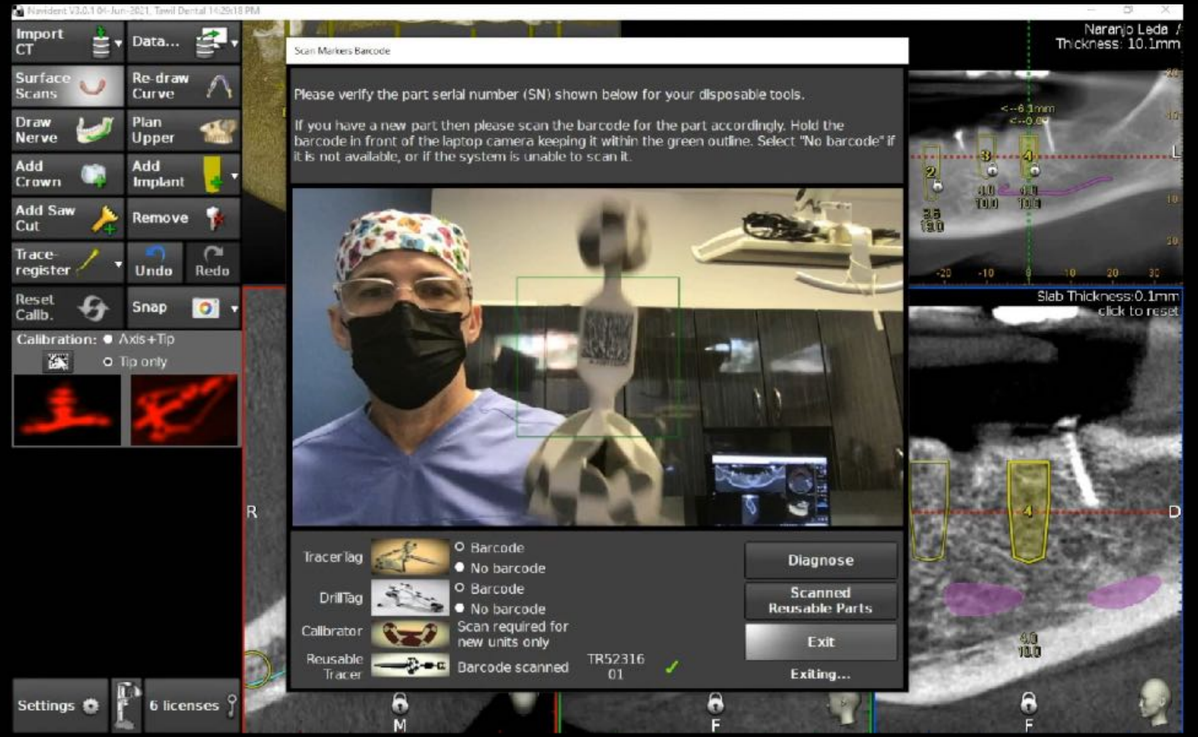
Jaw



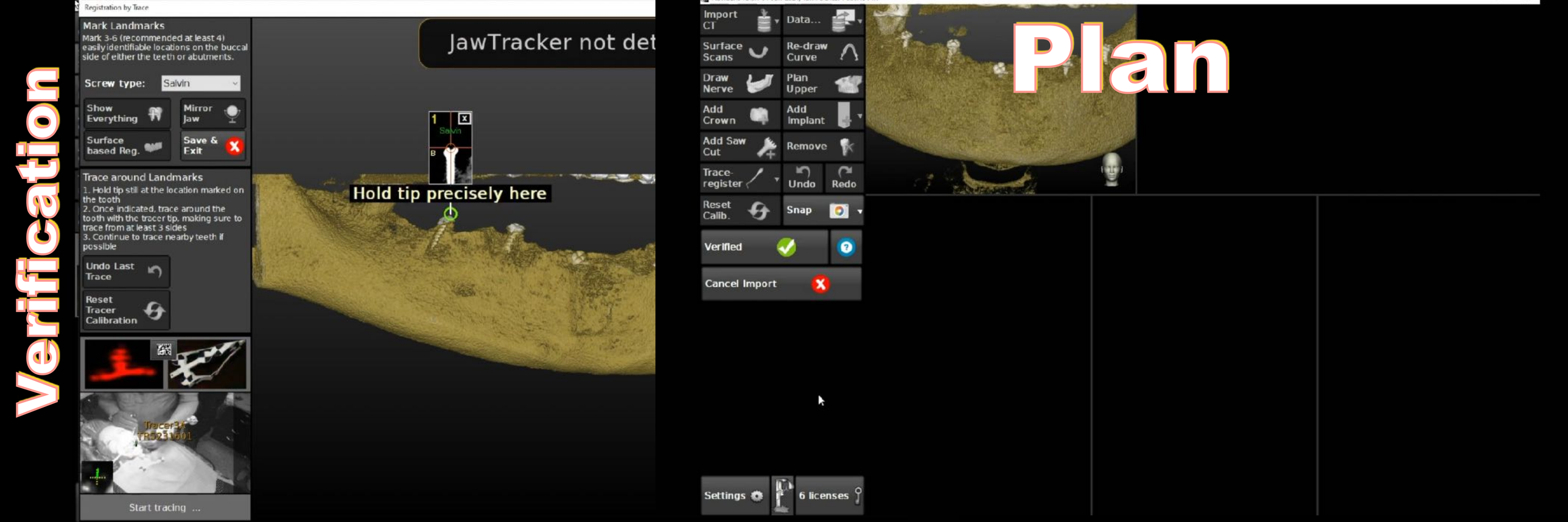
Tracking

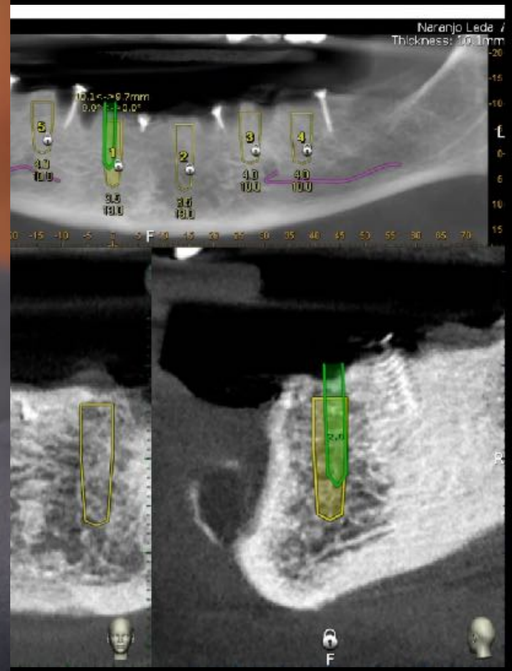


Draw

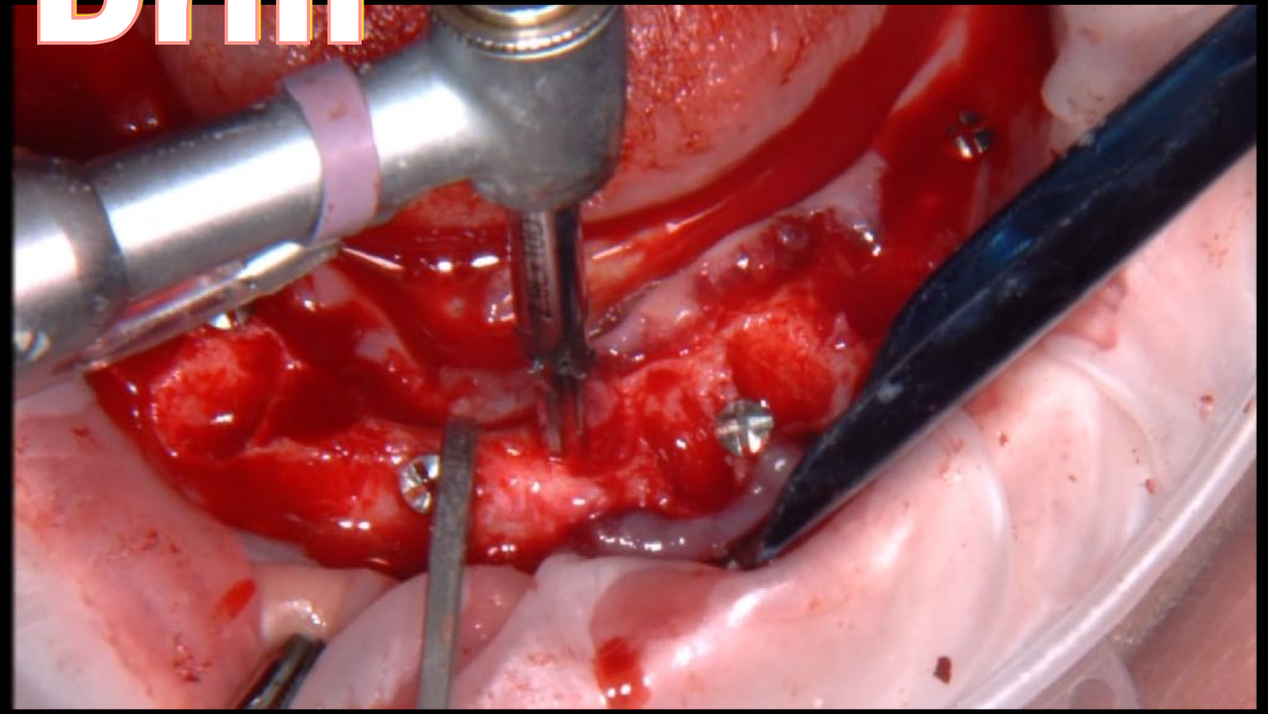


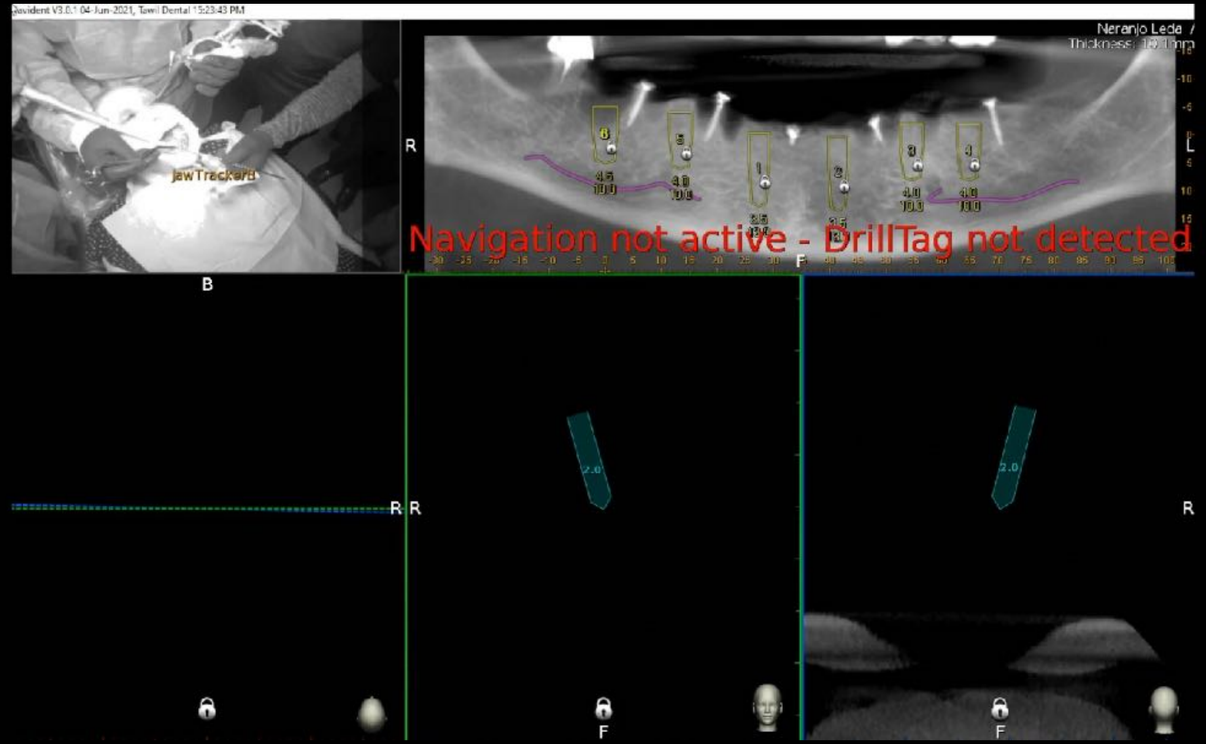
Trace Points


Verification
Registration by Trace
Mark Landmarks
Mark 3-6 (recommended at least 4) easily identifiable locations on the buccal side of either the teeth or abutments.
Screw type:
Salvin
Show Everything
Mirror Jaw
Surface based Reg.
Save & Exit
Trace around Landmarks
1. Hold tip still at the location marked on the tooth
2. Once indicated, trace around the tooth with the tracer tip, making sure to trace from at least 3 sides
3. Continue to trace nearby teeth if possible
Undo Last Trace
Reset Tracer Calibration
Start tracing ...
JawTracker not det
Hold tip precisely here
Import CT
Data...
Surface Scans
Re-draw Curve
Draw Nerve
Plan Upper
Add Crown
Add Implant
Add Saw Cut
Remove
Trace-register
Undo
Redo
Reset Calib.
Snap
Verified
Cancel Import
Settings
6 licenses
Plan

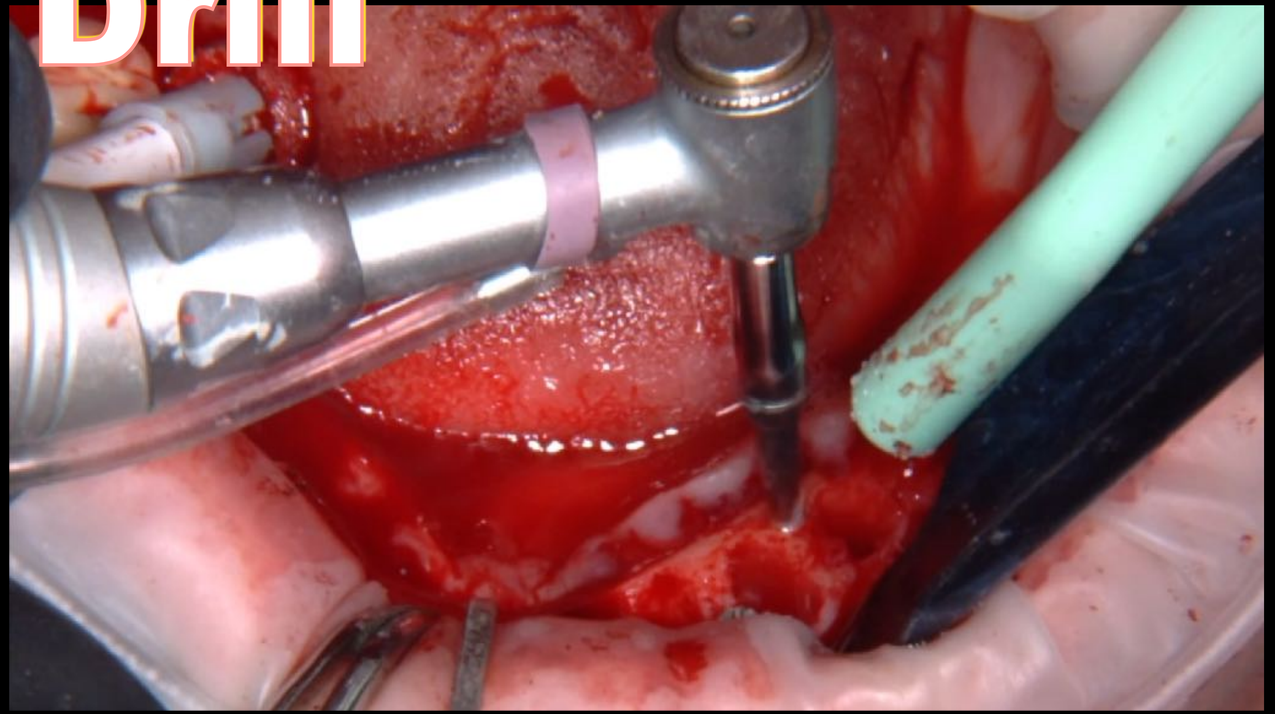

Nerenjo Leda
Thickness: 10.1mm

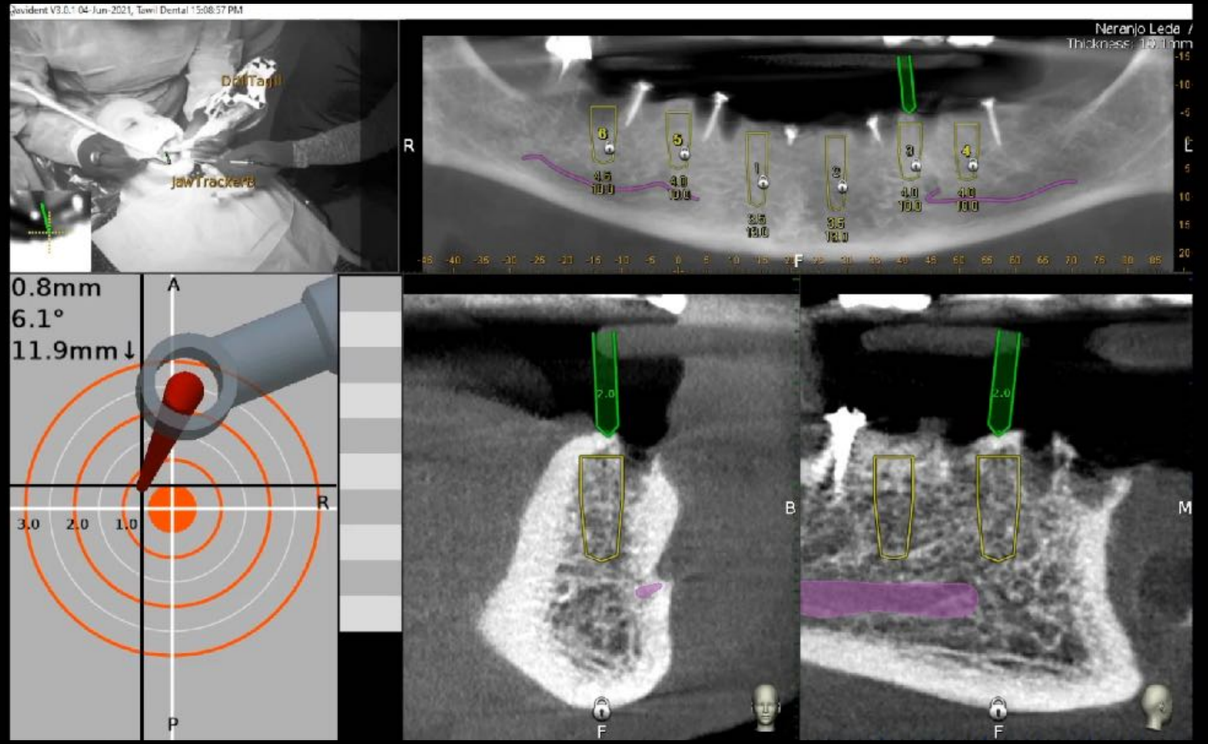
Drill





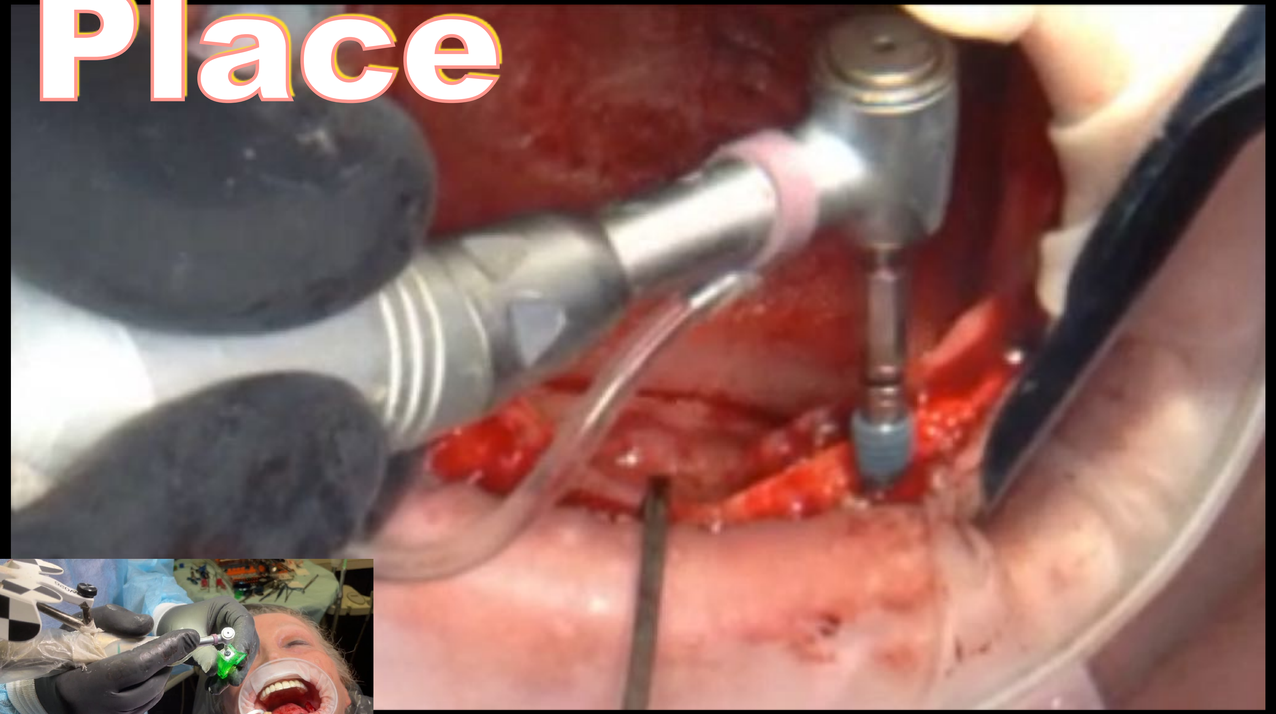
Drill

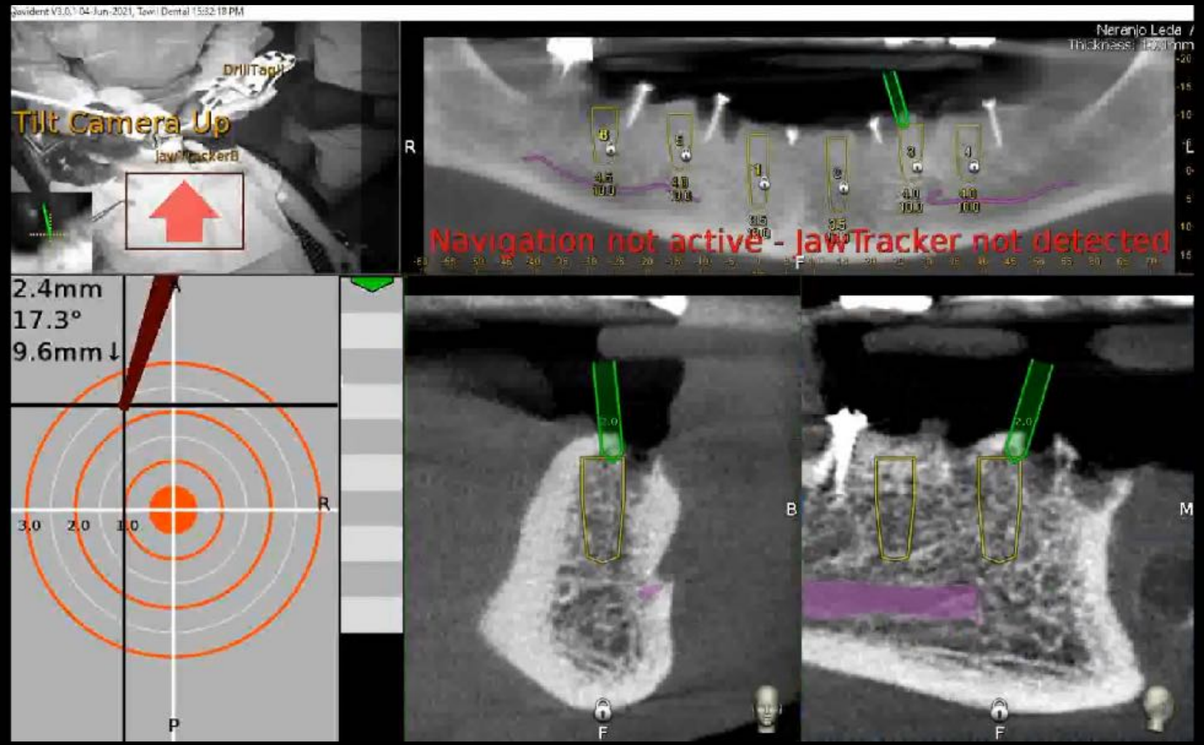




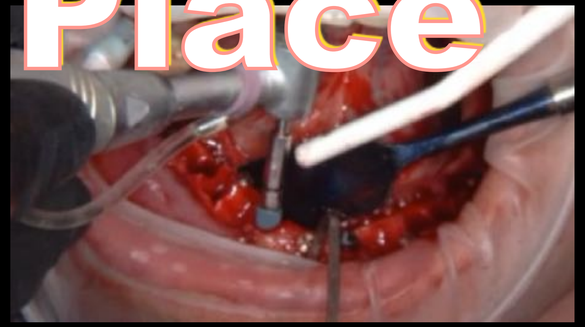
Place

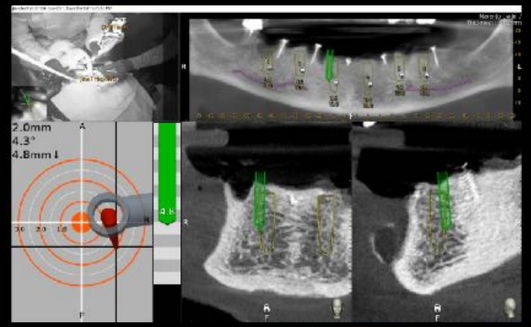
Place

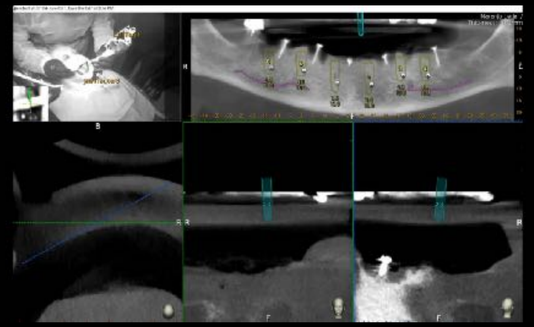


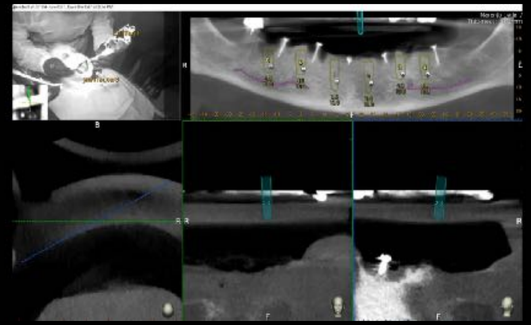

Tilt Camera Up
Navigation not active - JawTracker not detected
2.4mm
17.3°
9.6mm↓

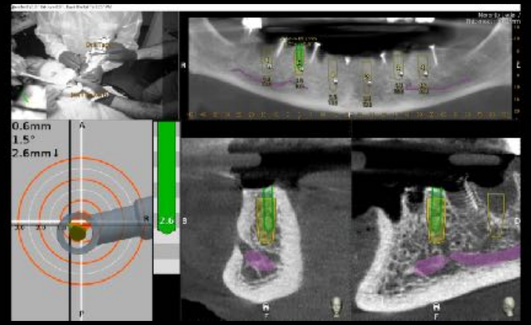
Place

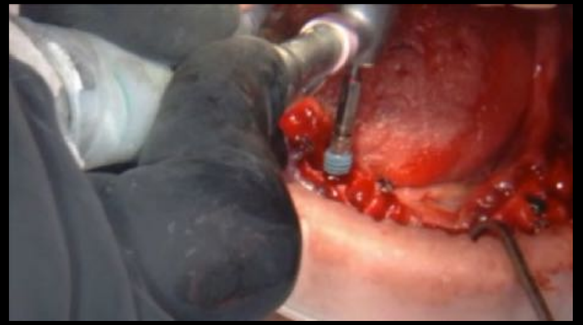


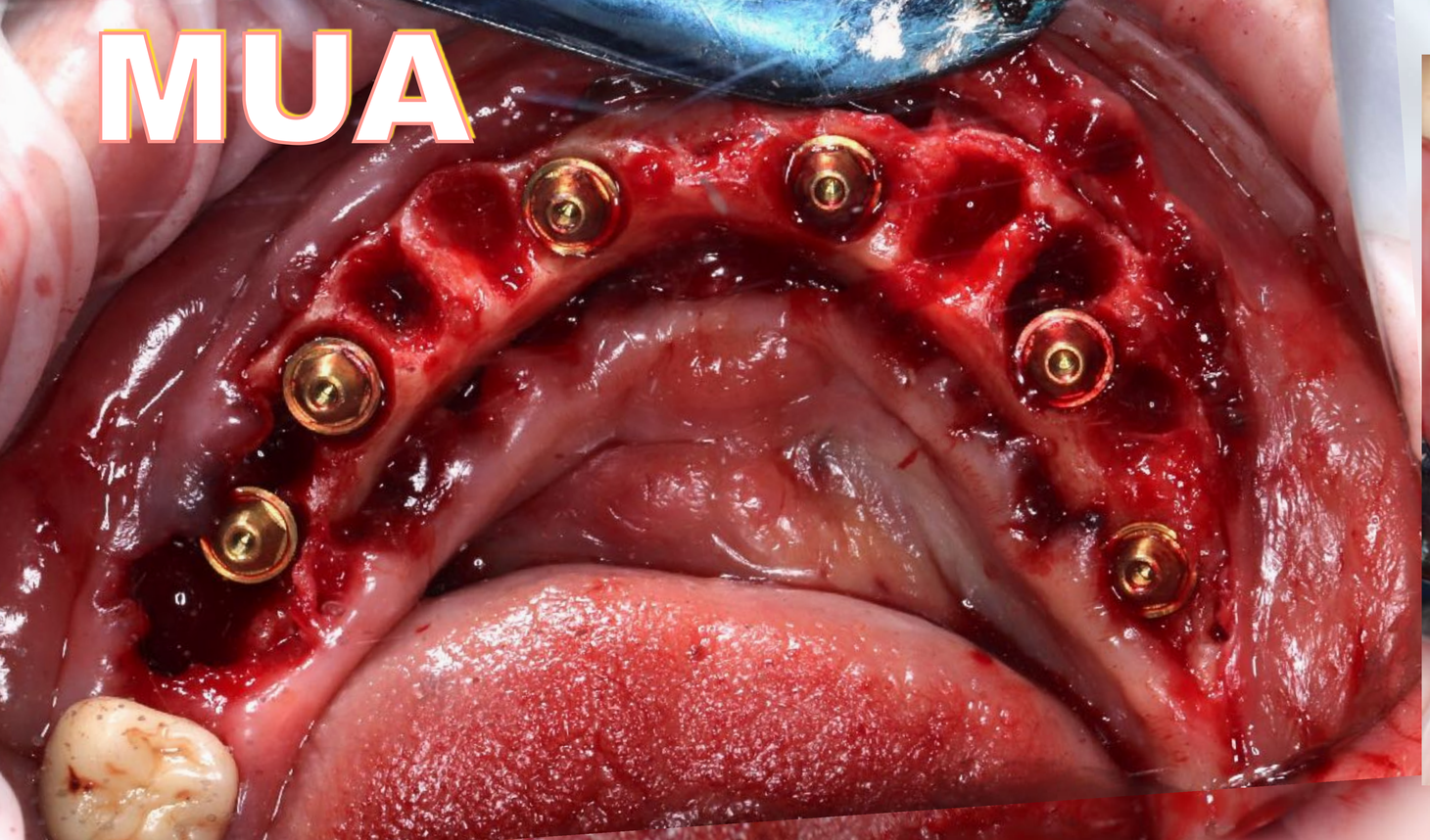








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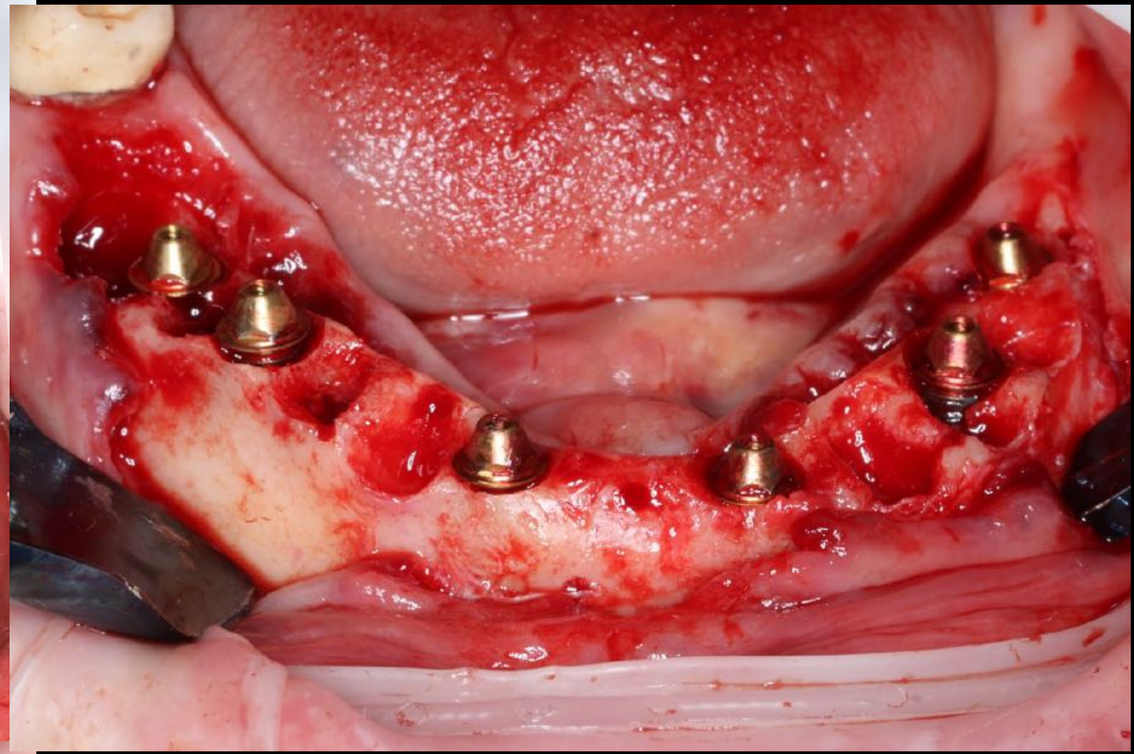
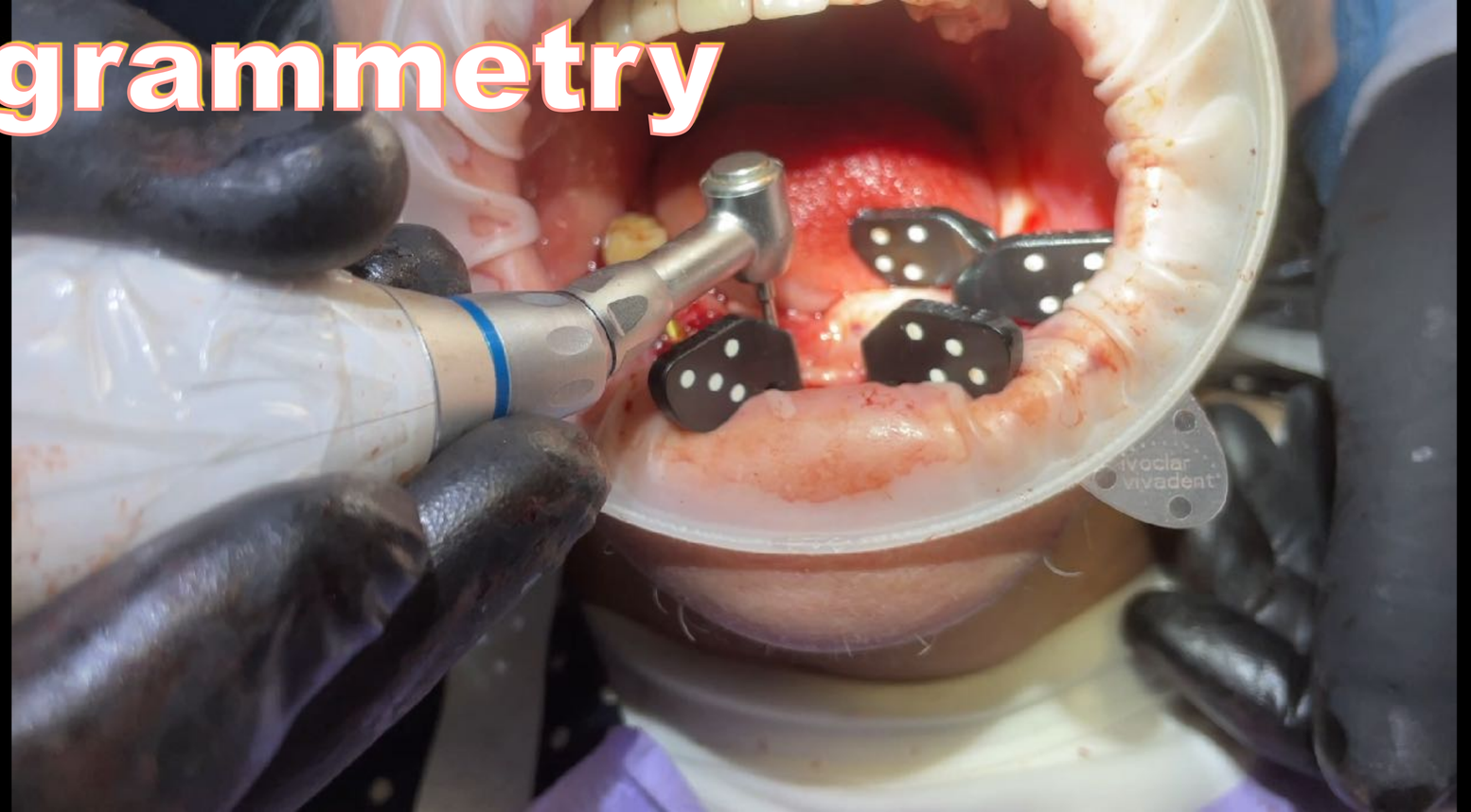
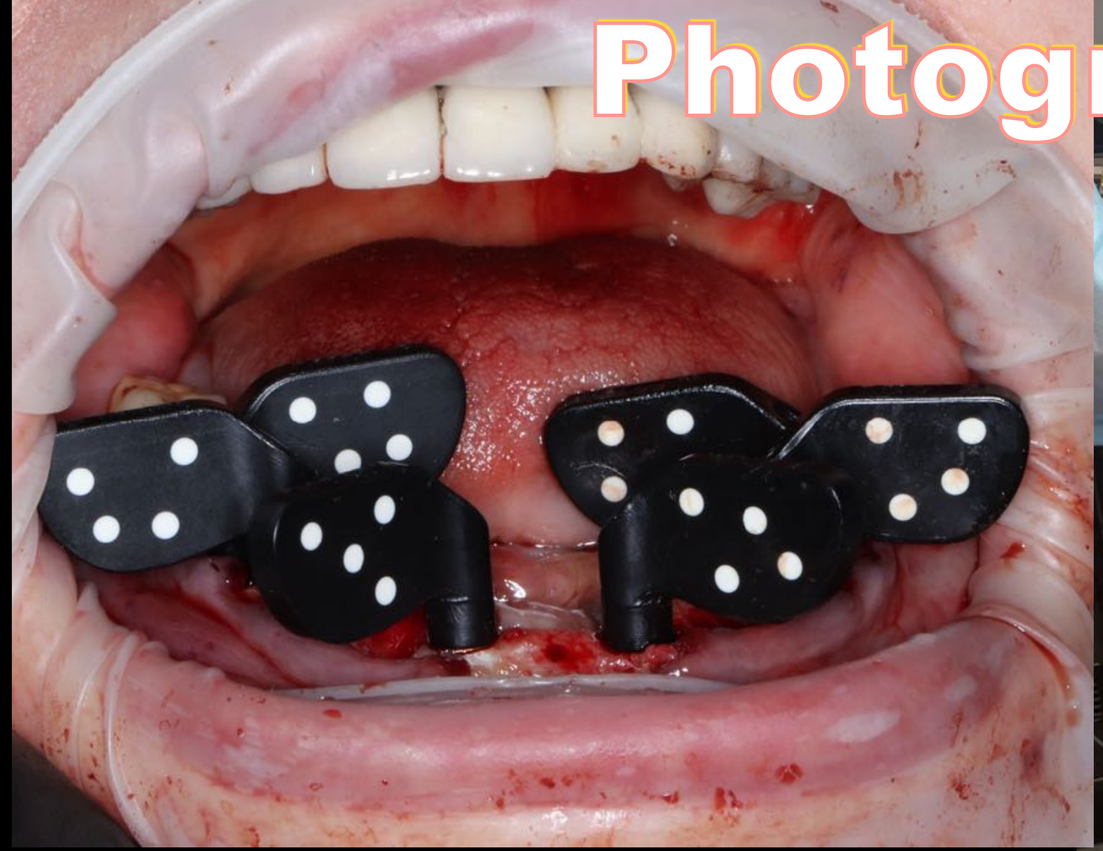


Photogrammetry



PIC dental
PRECISE IMPLANTS CAPTURE

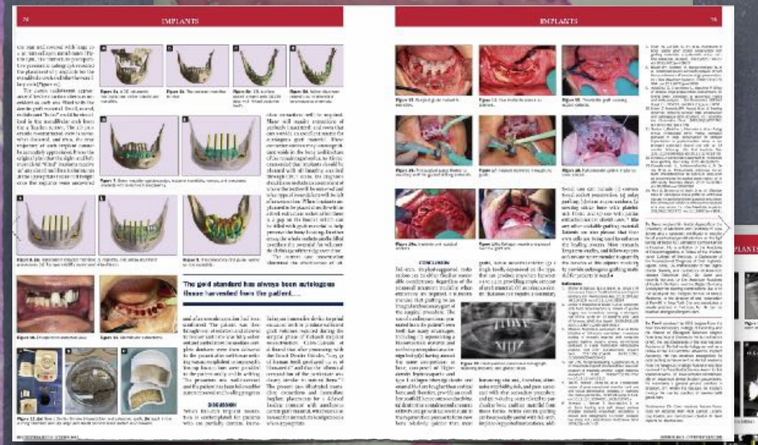
Photogrammetry



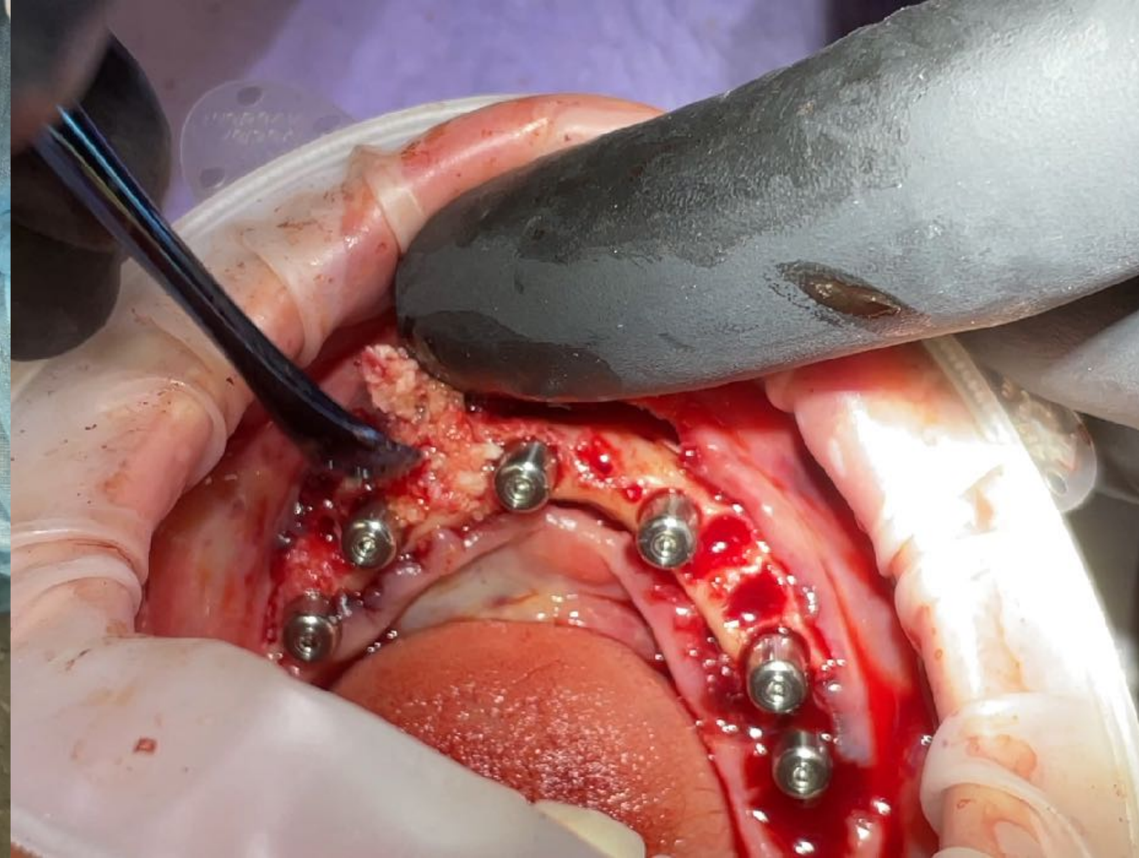
Dentin Graft

Dentin to Bone - Interface

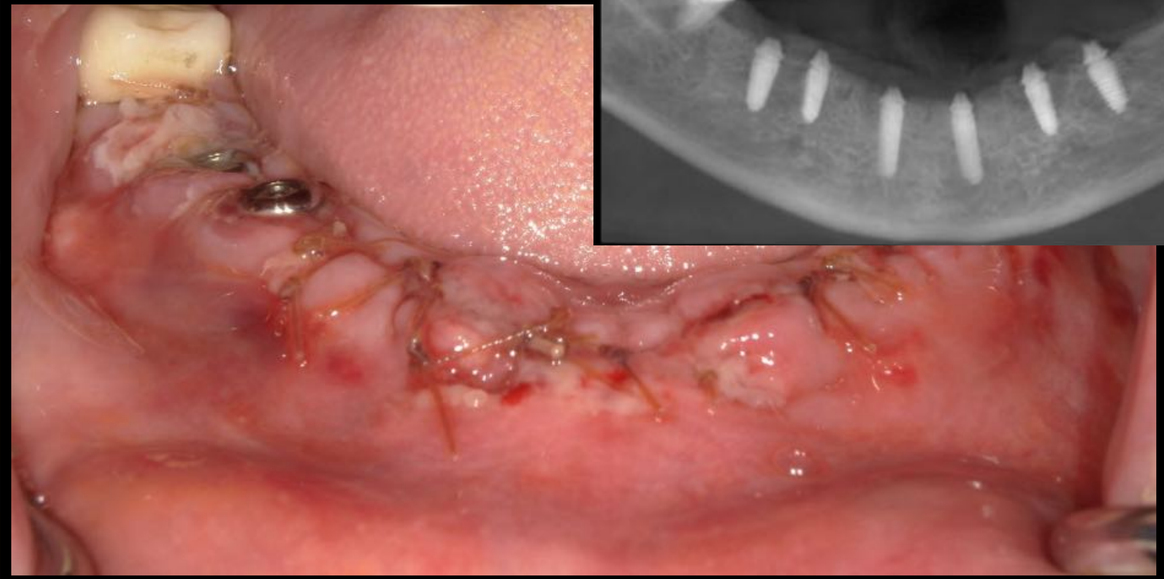
Dentin to Implant - Interface



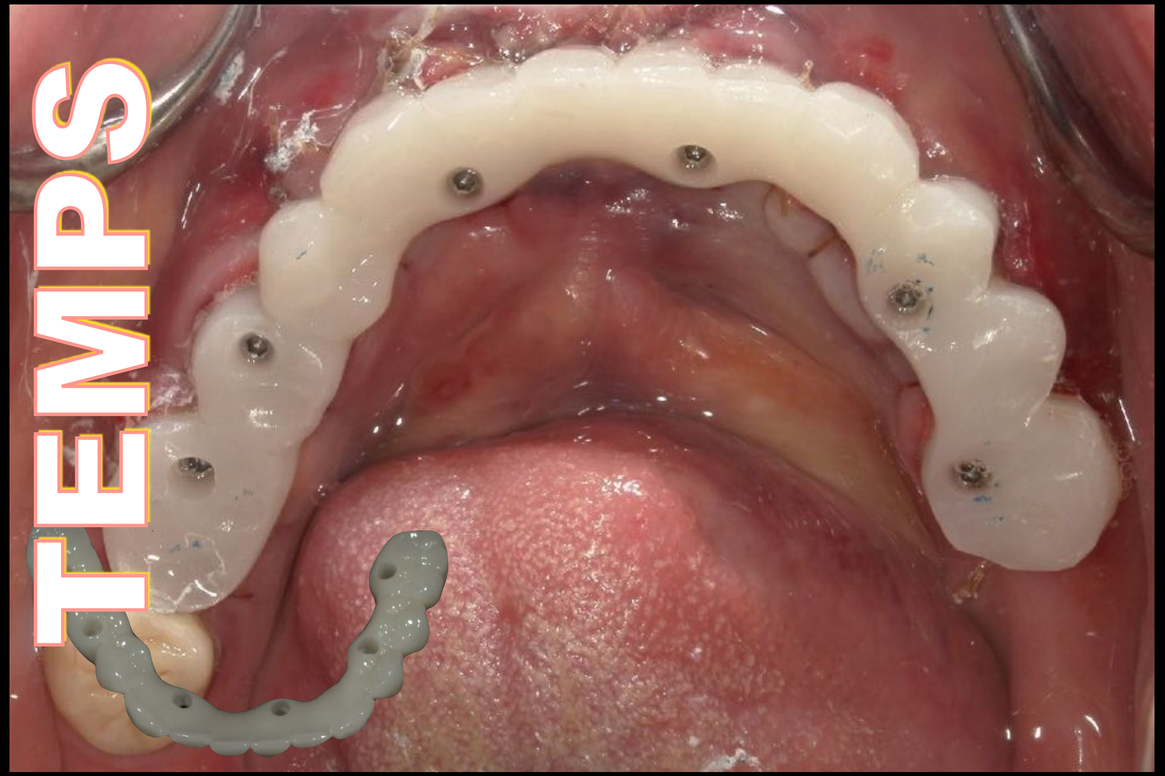

Dentin Graft/PRF




Post op



TEMPS

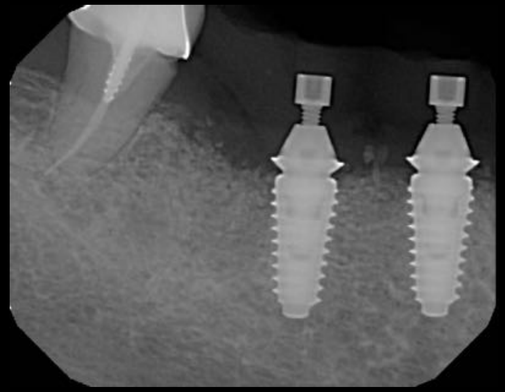

TEMPS

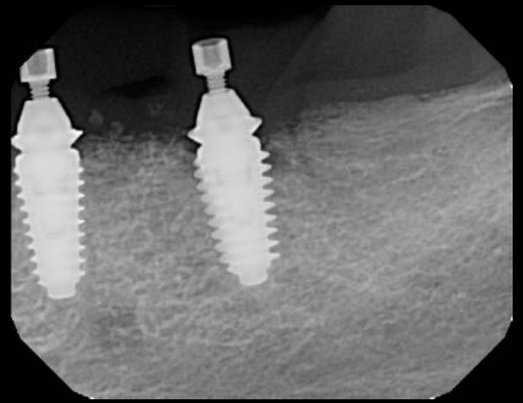
1 week

1 Month

1 Month

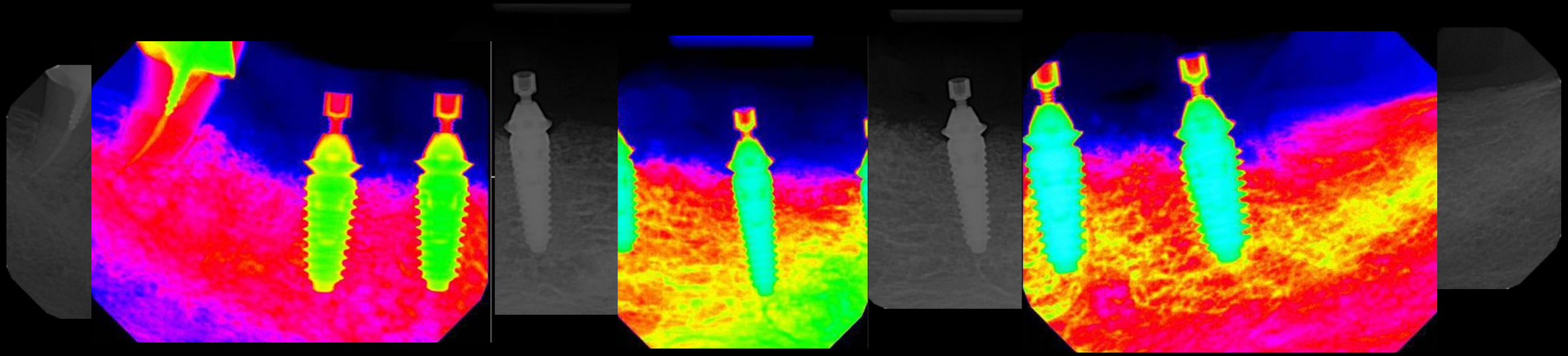
- Full template-Guidance





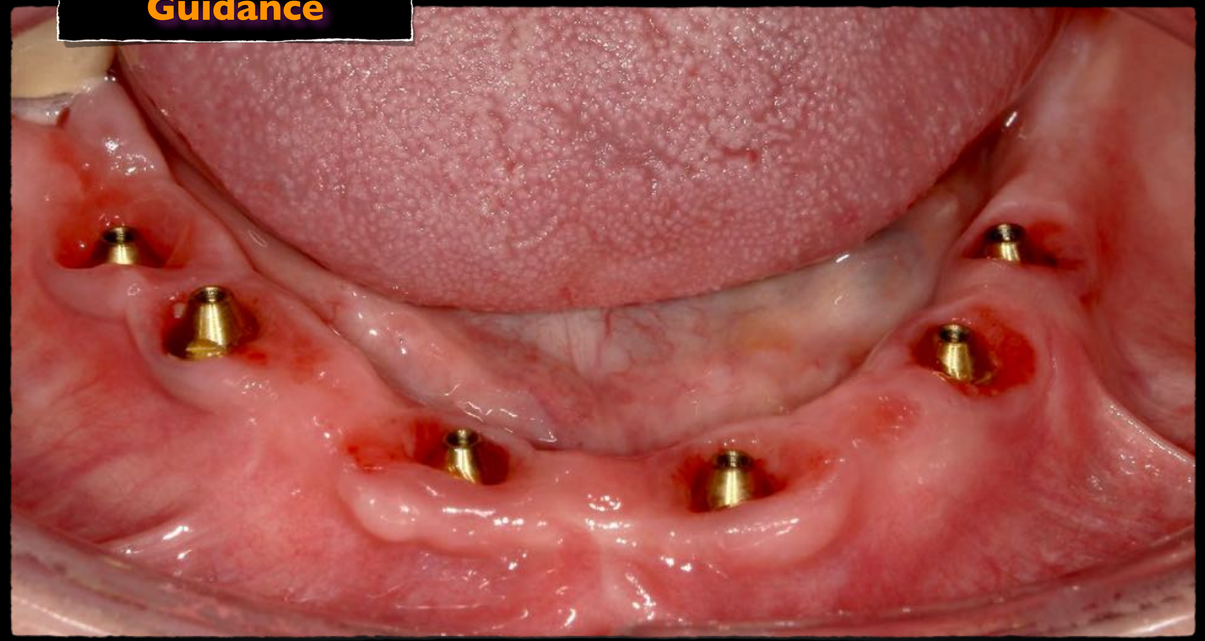
1 Month

- Full template-Guidance



4 Month

- Full template-Guidance

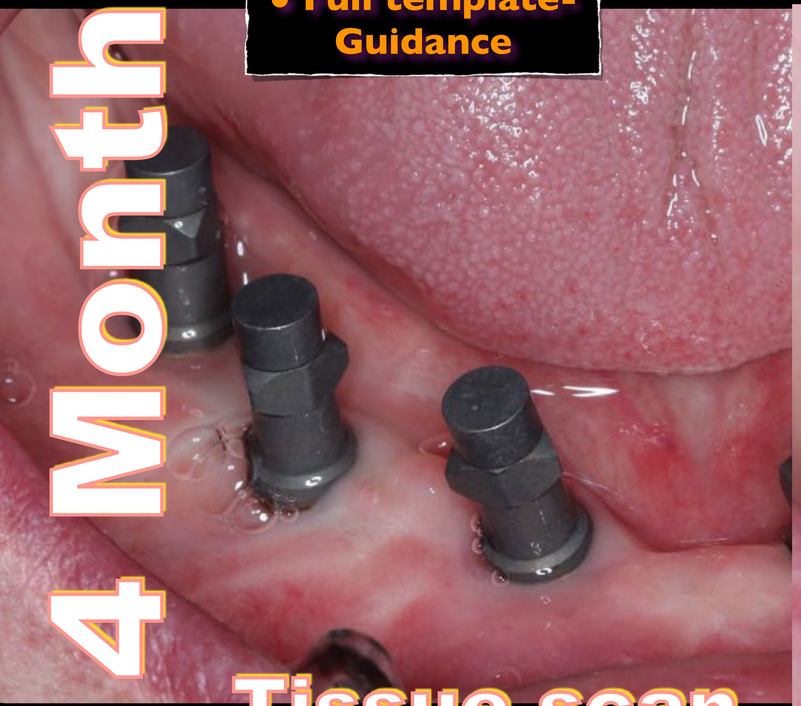


4 Month

- Full t
  Gui

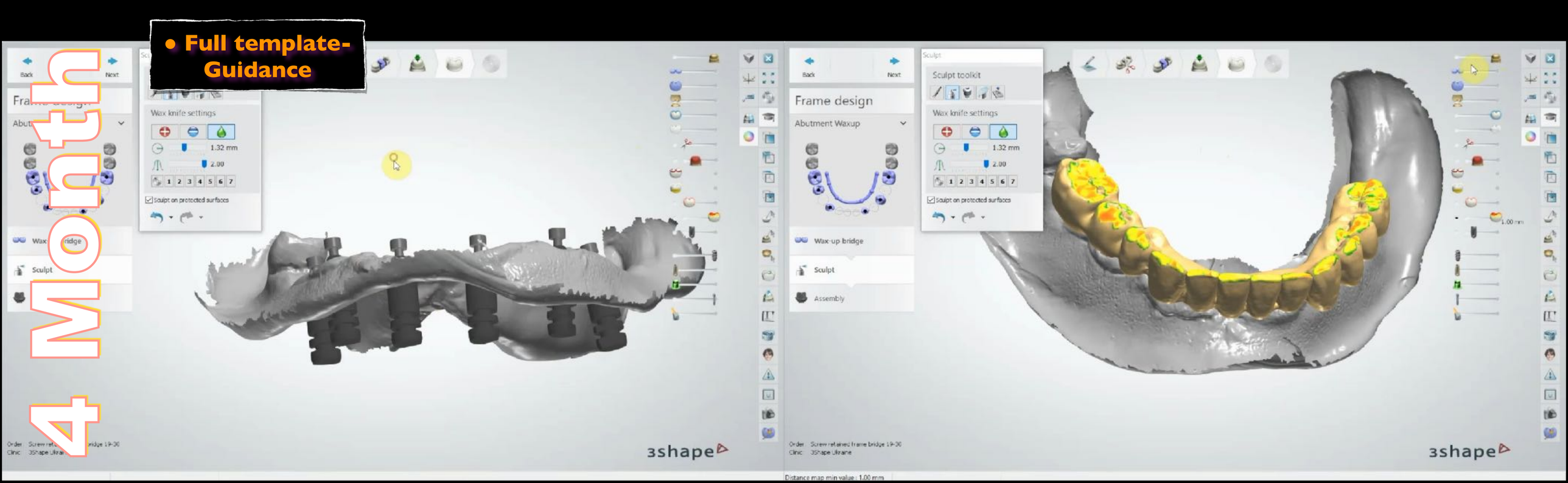
4 Month

- Full template-Guidance



Tissue scan

Photogrametry


• Full template-
Guidance
4 Month
Back
Next
Frame design
Abutment Waxup
Wax knife settings
1.32 mm
2.00
Sculpt on protected surfaces
Wax-up bridge
Sculpt
Assembly
Sculpt toolkit
3shape

8 Month

- Full template-Guidance


ITS NOT WHAT'S NEXT ITS WHAT NOW


0.6mm
0.9°
3.7mm↓
A
R
3.0
2.0
1.0
3.7
STAY ON TARGET


STAY ON TARGET
PERCISION & ACCURACY

SLOWDENTISTRY®

THANK YOU

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iketawil@mac.com

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