management of periodontal/peri-implant diseases in today's periodontal practice

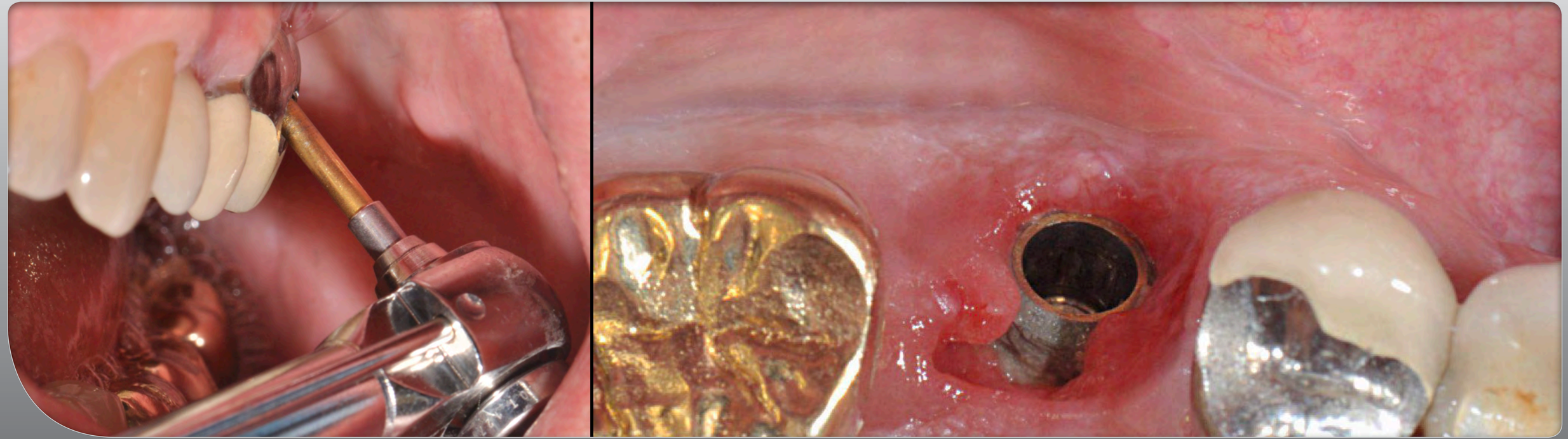
Sonia Leziy DDS, Dipl Perio, FCDS(BC), FRCD(C)

implant survival
[Lang et al 2004]

- implant is present in the patient's mouth at the time of examination
- does not specify whether there are any complications present
  - bone loss/ridge anatomy (peri-implantitis)
  - soft tissue health (mucositis)
  - restorative/functional complications
  - esthetic complications

the esthetic/restorative consequences of poor surgical planning and execution

severe malposition & probing 8-10mm. implant placed/restored 11-2018



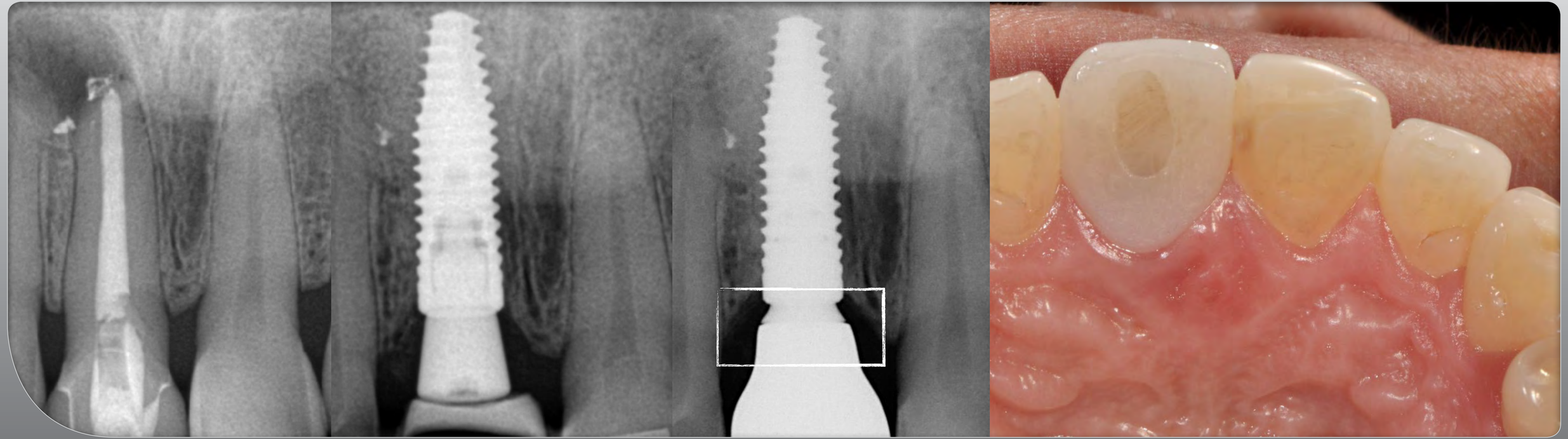
unrecognized poor technical handling by the lab

bonding & emergence profile

pre-op

integration check

6 mo. post-restoration

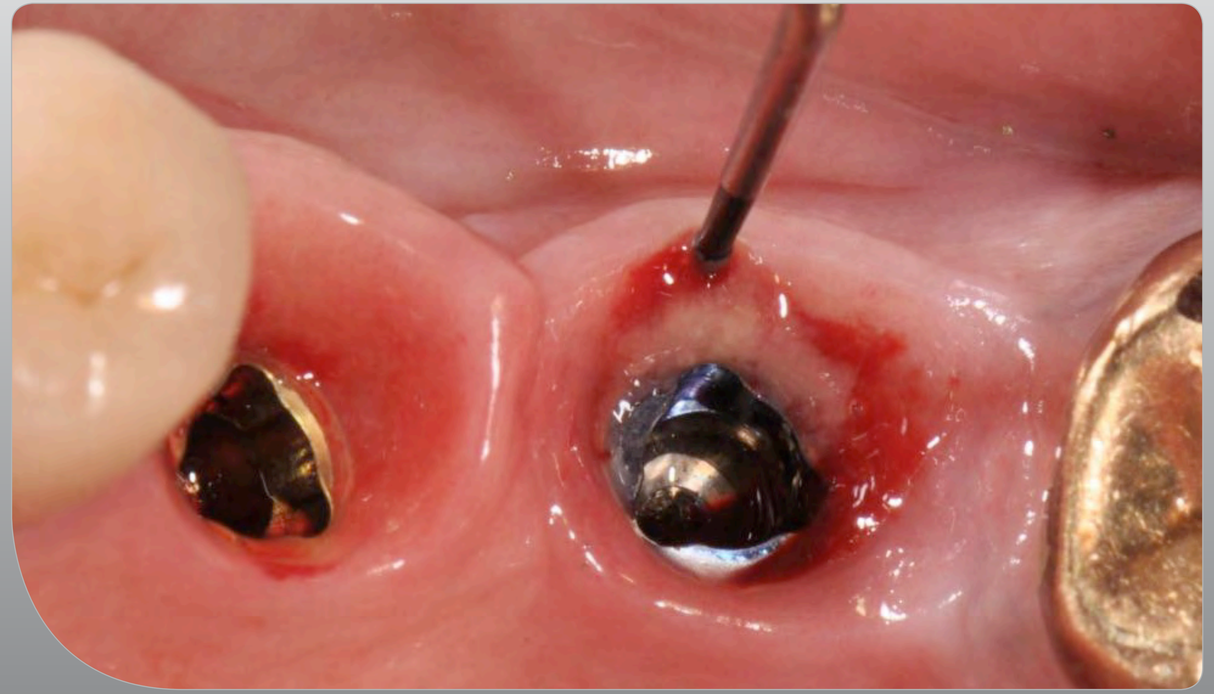


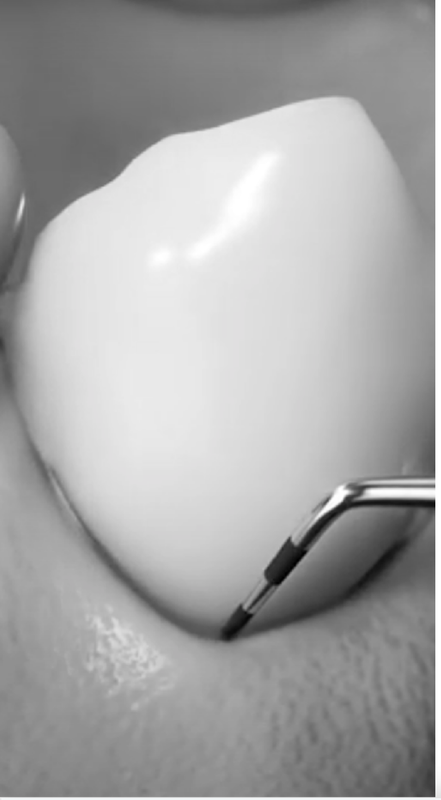
what is the prevalence of peri-implant disease?

we are currently referred 5-10 cases/week to manage peri-implant diseases

	Mucositis % implants	Mucositis % patients	Peri-implantitis % implants	Peri-implantitis % patients
	10-38%	20-63%	5-37%	10-47%
Koldsland et al 2010	27	39	37	47
Atieh et al 2012	31	63	19	10
Marrone et al 2012	38	31	23	37
Mir-Mari et al 2012	22	39	9	16
Atieh MA et al 2013	30	63	10	19
Daubert et al 2015	33	48	16	26
Atieh et al 2019	10	20	5	10

clinical appearance deceiving . need to probe to assess





probing implants

arguments against probing are unsupported by literature

epithelial connection repair in 24 hours, reformed by 5 days (Etter et al COIR 2002)

metal probe damage? No damage (Fakhravar et al Impl Dent 2012)

plastic probes flexible - advantage - some prostheses designs/emergence profiles

pathogen transfer. Return to baseline in 7 days (Christersson et al J Perio 1985)

probing depth - affected by implant-abutment design, emergence profile, placement depth

probing depth useful [essential] for individual monitoring . a risk indicator (≥5mm PD ↑ risk)

probing implants

BOP false positives . most clinicians probe with too much pressure.

probing can be difficult due to access limitations , prosthesis design, implant angle/depth

no superior probe [Cha et al IJOMI 2019]

RECOMMENDED FORCES WITH DIFFERENT PROBES TO ACHIEVE DESIRED PRESSURE

0.4mm tip (Marquis metal)	15N force
0.5mm tip (Hu-Friedy metal UNC156)	23N force
0.6mm tip (Premier PerioWise plastic)	24N force

- if peri-implantitis exists, restoration should be removed for probing [if screw retained]
  - measurements with/without prosthesis differ by 1-2mm.

    Serino G, Turri A, Lang NP. COIR 2012.
- if implants are healthy, restoration removal is not indicated

intaglio surface hygienic

impossible to probe 3 of 5 implants without prosthesis removal

radiographic monitoring

intraoral rads under-diagnose peri-implantitis & lack accuracy

BWs/PAs 2-dimensional assessment only (proximal bone levels) … CBCT assessment as a future standard?

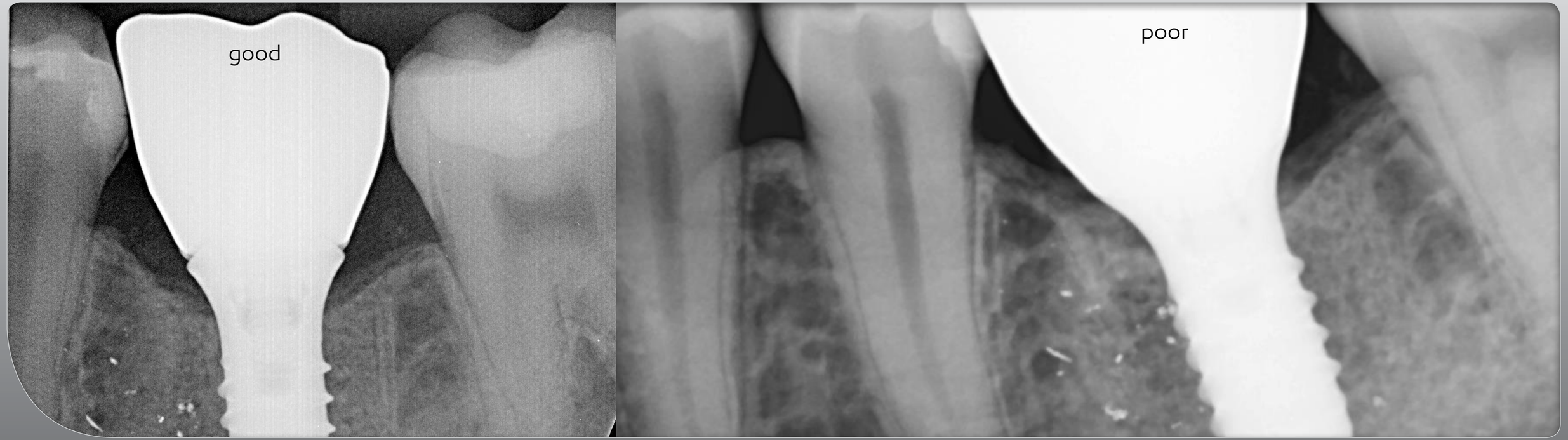
good specificity: when bone looks like it is missing … it is.

poor sensitivity: underestimates true bone loss (just like in perio)

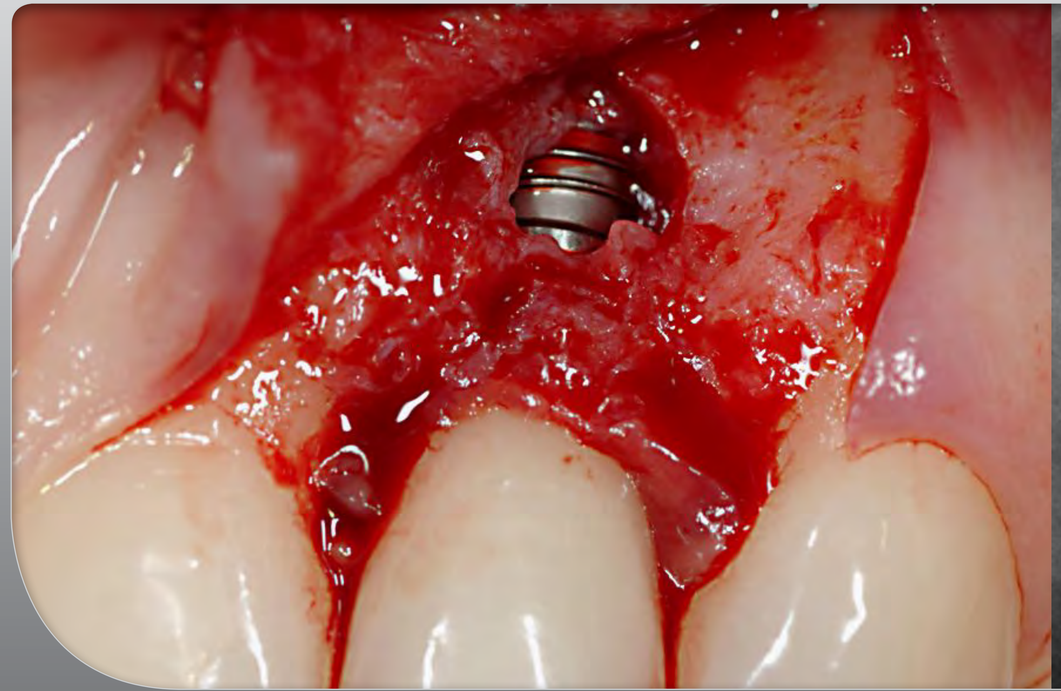
identify the implant-abutment gap: need to be 90° to the implant to see threads

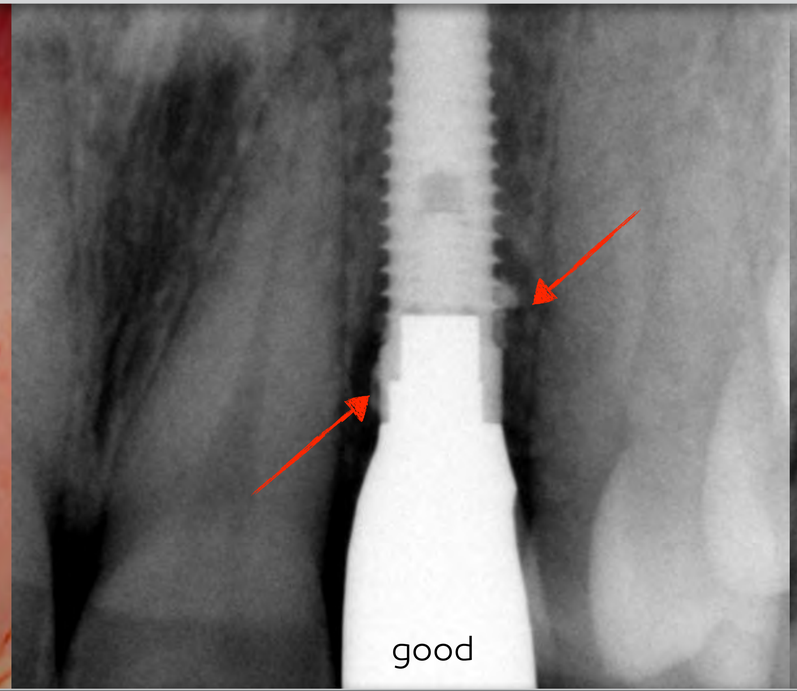
bone remodelling: equi-mating 2mmm, platform switch <1mm, TL 0mm [but consider depth & 1.8/2.8 collar]

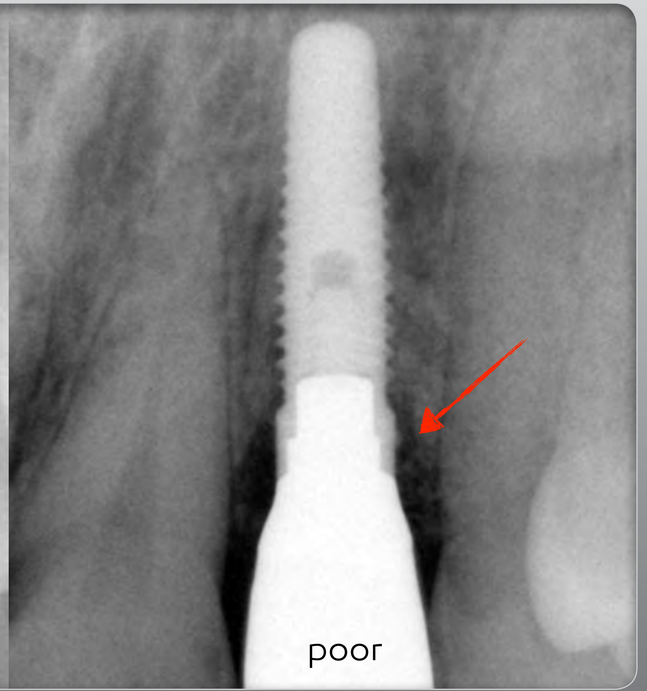
radiographic technique



radiographic technique





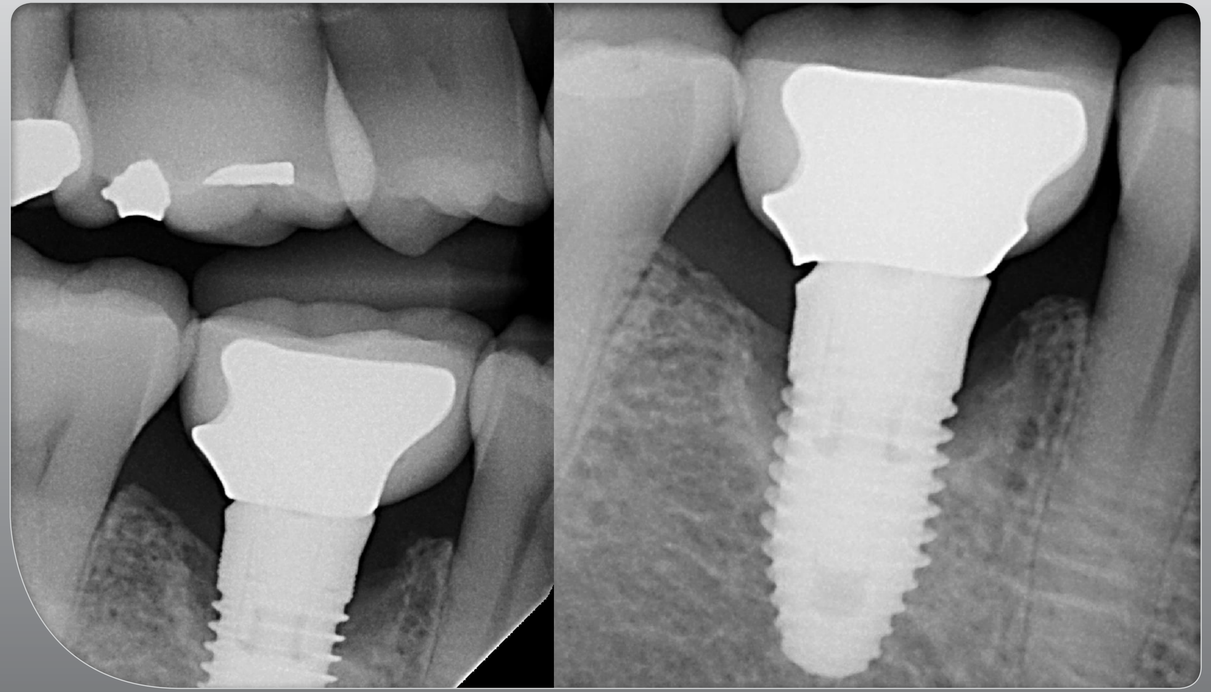


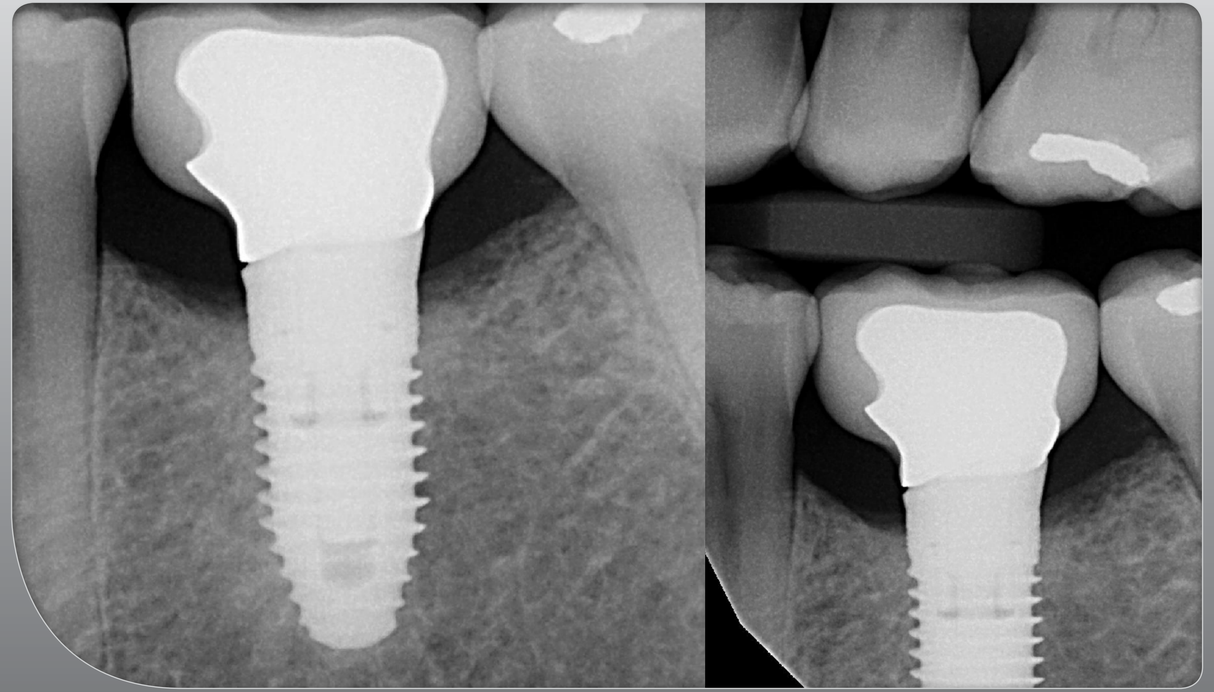
referral for ‘bone loss’ assessment

inadequate image quality -01/2023

cementation problems/moderate peri-implantitis 30 [46] . mucositis 19 [36]

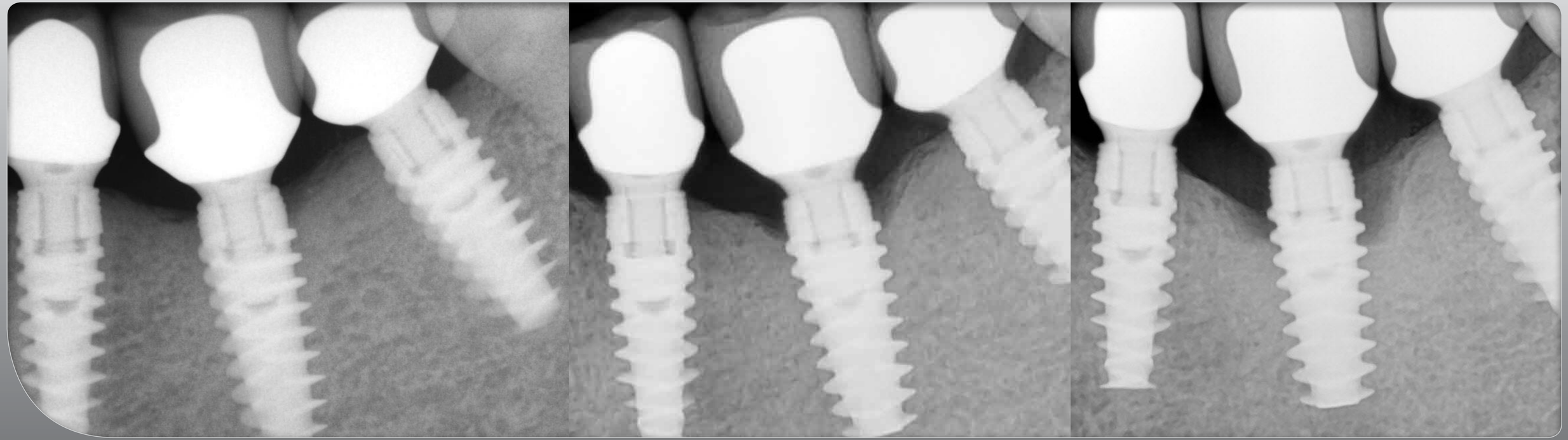
updated radiographs 03/2023





monitoring - but no intervention ?

patterns- 65% circumferential, 30% semicircular, 5% buccal



implantoplasty of non-graftable area

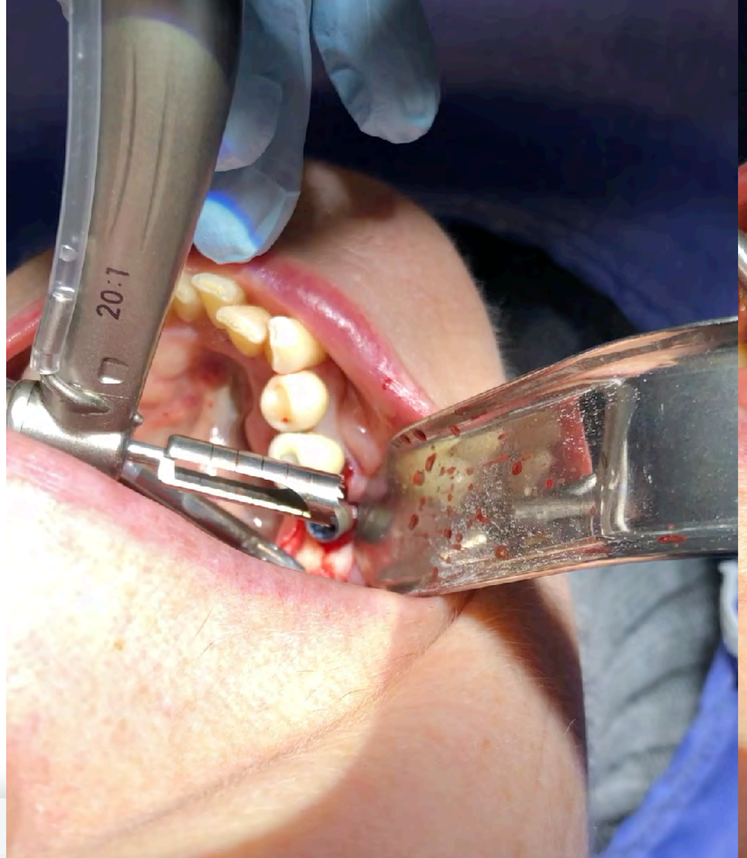
low risk of fracture

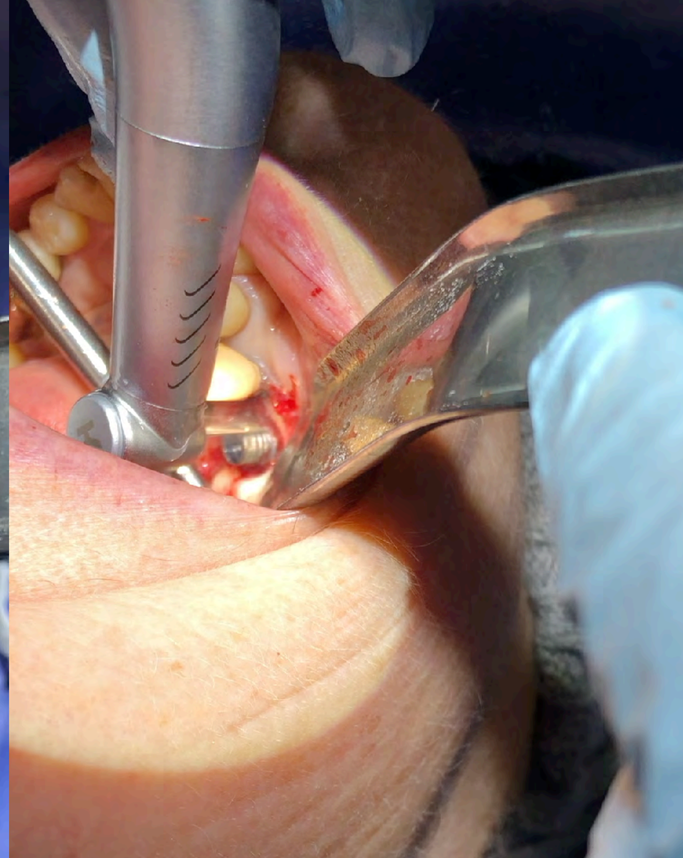
similar chemical surface composition

better fibroblast expression

easier to clean

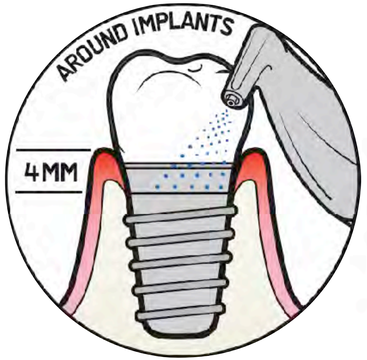
Schwarz F, John G, Becker J.
Clin Oral Investing 2017;2(7):2355-2361.

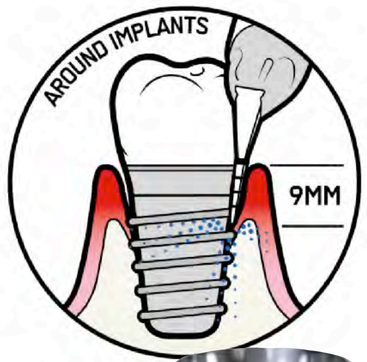


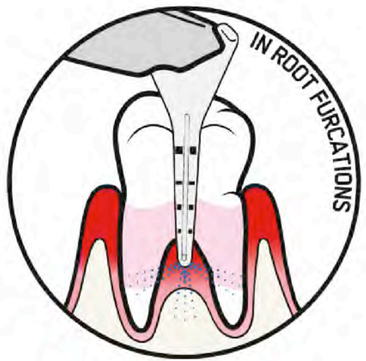


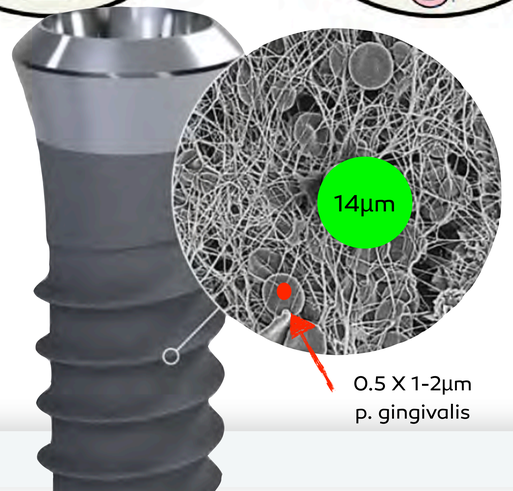
guided biofilm treatment

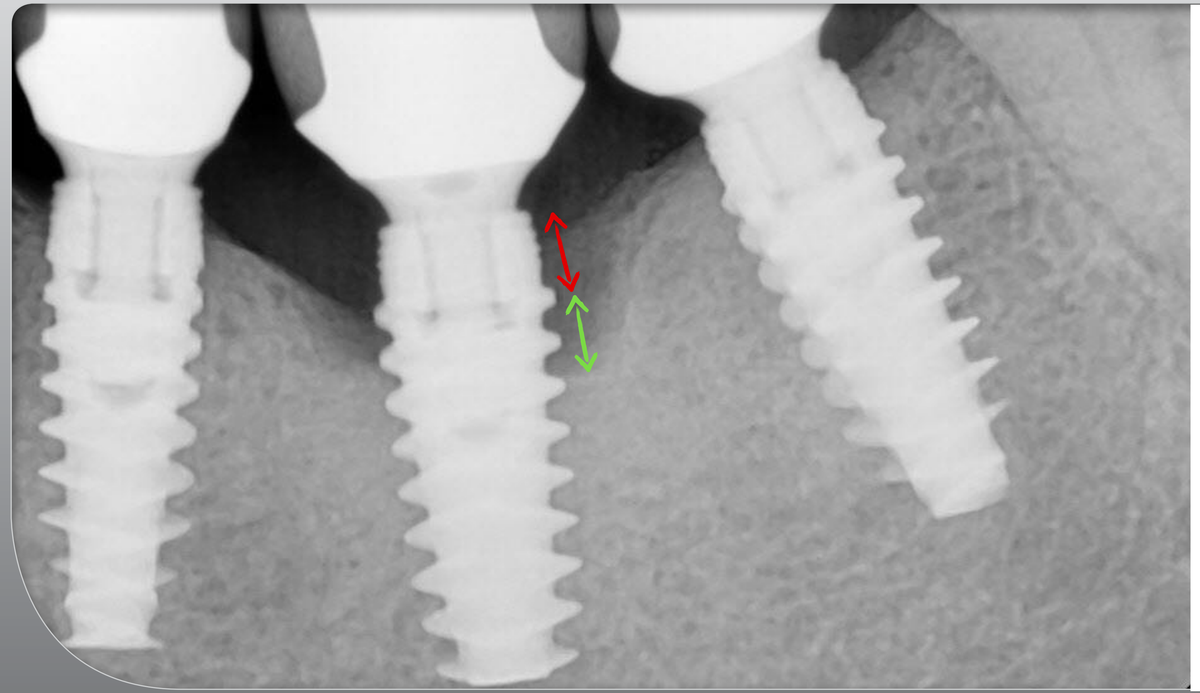
1. identify/diagnose disease
2. ID restoration-related complications
3. disclose/OHI/motivate
4. biofilm reduction- non-surgical & surgical
   - •airflow/perio-flowEMS®
   - •5mm depth (USA), 9mm depth (Canada)
   - •erythritol powder (14µm) (anti-biofilm)
5. bone graft and/or Straumann Emdogain® application
6. monitor & assess







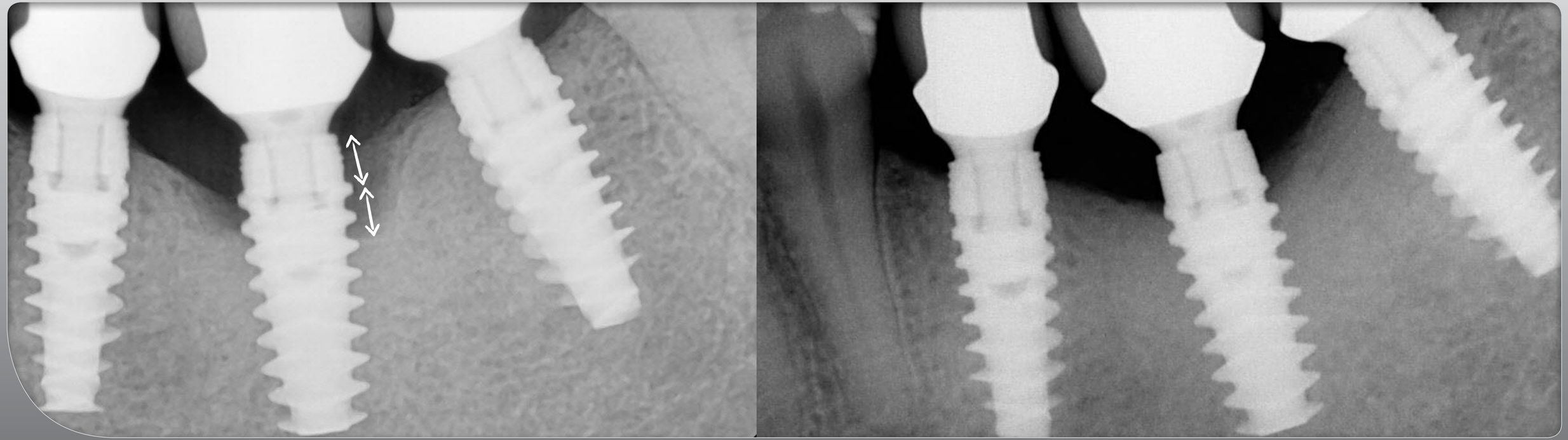




2019 (before flap/implantoplasty/detox/graft)

TREATMENT STEPS or explant

1. remove crown
2. flap
3. debride/detoxify ti brushes & airflow (+/- laser)
4. implantoplasty/protect from ti particles
5. airflow again
6. EMD/bone graft intrabony defect



2019 (before flap/implantoplasty/detox/graft)

2020

electrolytic implant detoxification

solution - hydroxycarboxylic acid, sodium salt, distilled water

adjunct to implantoplasty & GBR/soft tissue augmentation

eliminates biofilm . generates a super-hydrophilic surface

early experiences

14 active cases with 1 to 2 implants

- all have shown inflammation resolution (up to 6 months F/U)
- 6 reprobed to date
- 5 PD - WNL . no BOP/suppuration
- 1 unchanged PD but no BOP/suppuration (incomplete cycle/50%)
- 1 initial crestal soft tissue sloughing

digital practice concepts- reducing complications

images: 2D static & dynamic images . 3D images - cbcts, iOS, PIK/iCAM, facial/jaw motion . face scans *(outsourcing to service provider)*

design & plan: virtual waxup, face-in smile design *(outsourcing to service provider)*

manufacturing: surgical guide, transitional & definitive restorations *(outsourcing to lab/service provider)*

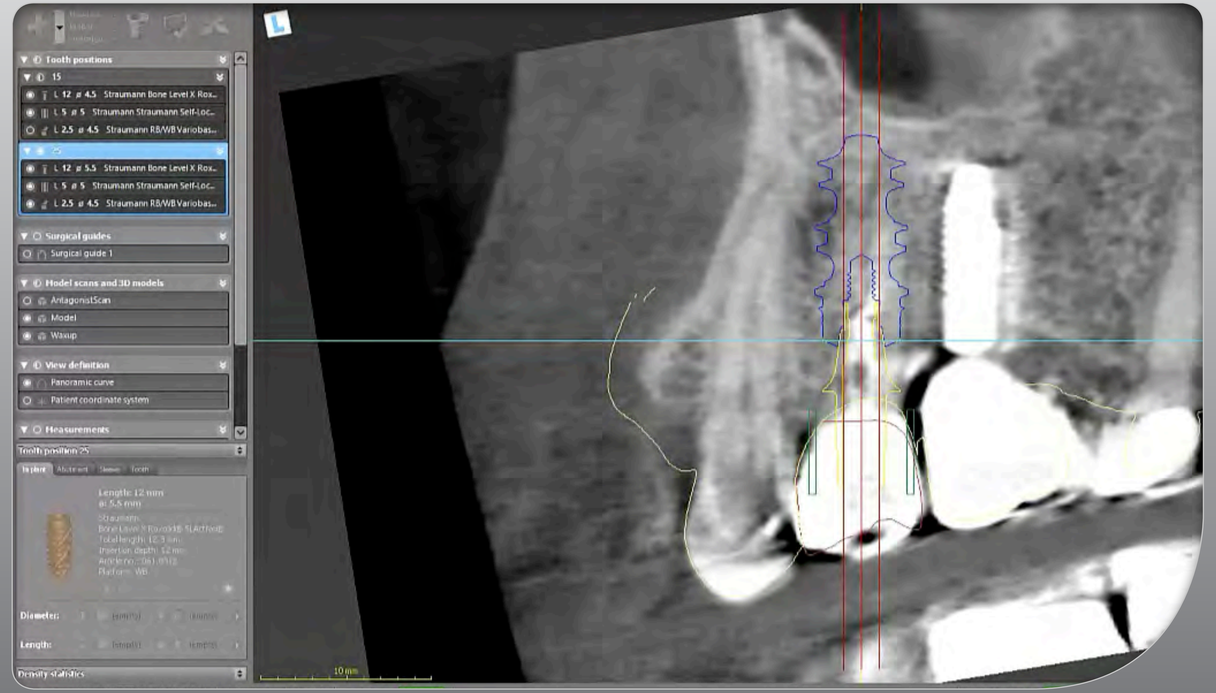
other: digital patient charts/communication. iOS planning/monitoring/tracking of recession . ortho/restorations . wear

virtual planning for guided blx

lab virtual design

communication software

clinician guided-lab planning
smile-in-a-box



virtual planning for guided blx

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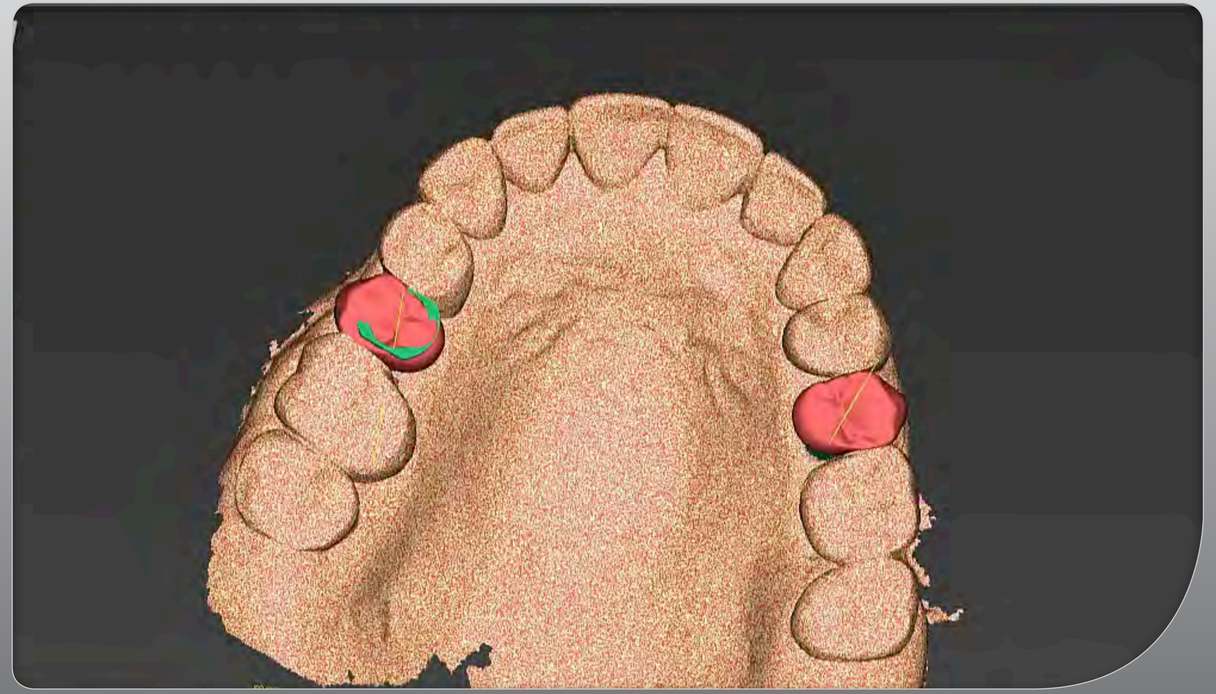


‘SMOP’ swissmeda
asynchronous communication software

cloud based communication

effective program for partial edentulism cases

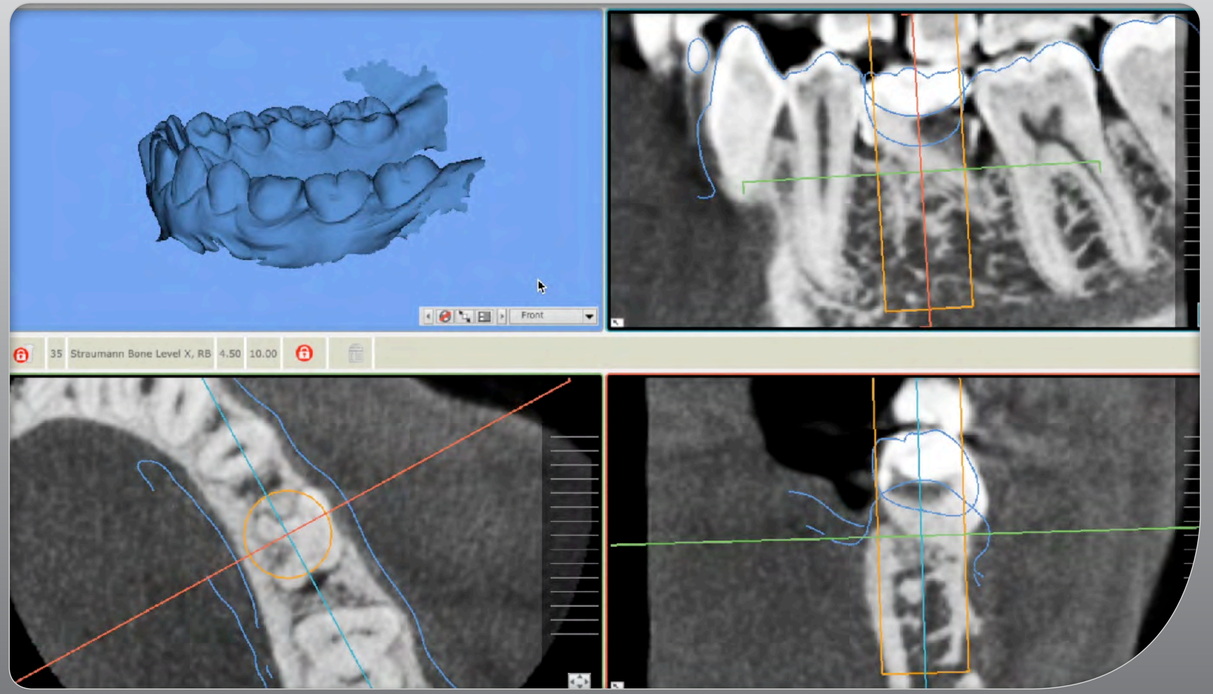
total control over virtual surgical plan

early input - clinician(s). lab & planning centres

expedite information flow & collaboration

reduce need for in-person or scheduled meetings

review make changes anytime/anywhere [even in phoenix]



ELATUS

clinic steps

periodontist

FULL arch cbct
optical scan (or impression)
preliminary analysis
lab prescription
large file transfer to laboratory

collaborative interface

interactive platform- 2021
swiss meda SMOP

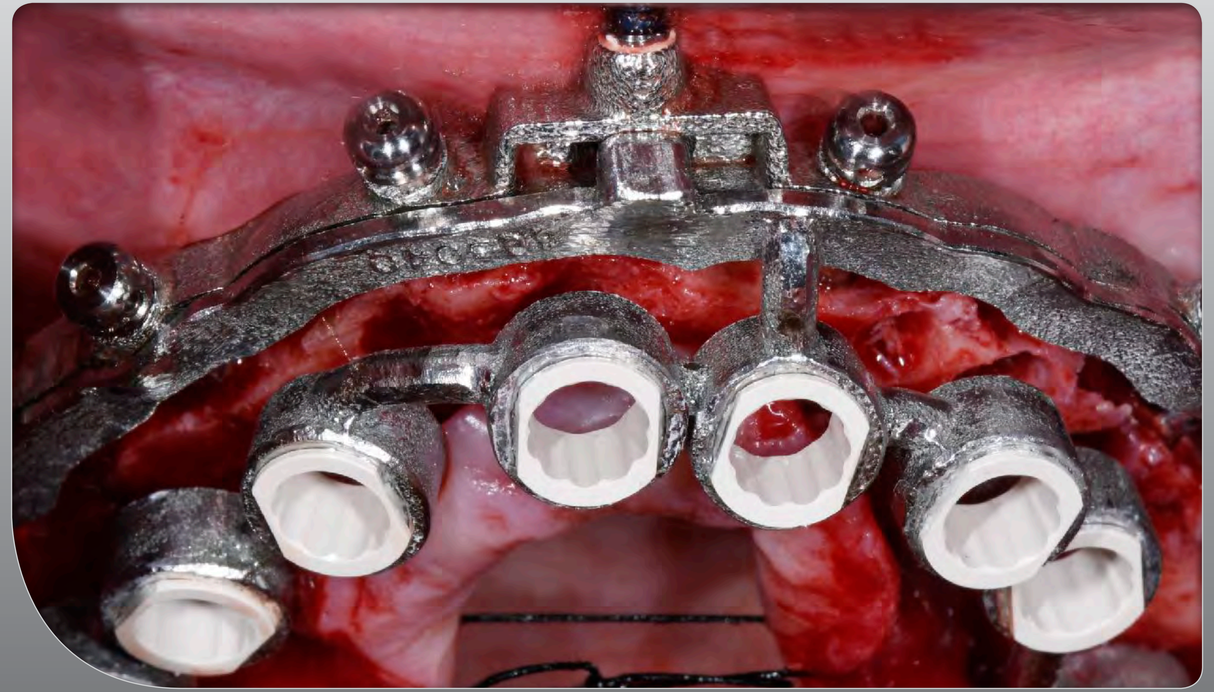
outsourced steps

cbct cropping . pan curve
optical scan & cbct alignment
virtual tooth/anatomy design
virtual implant placement
face-in planning software

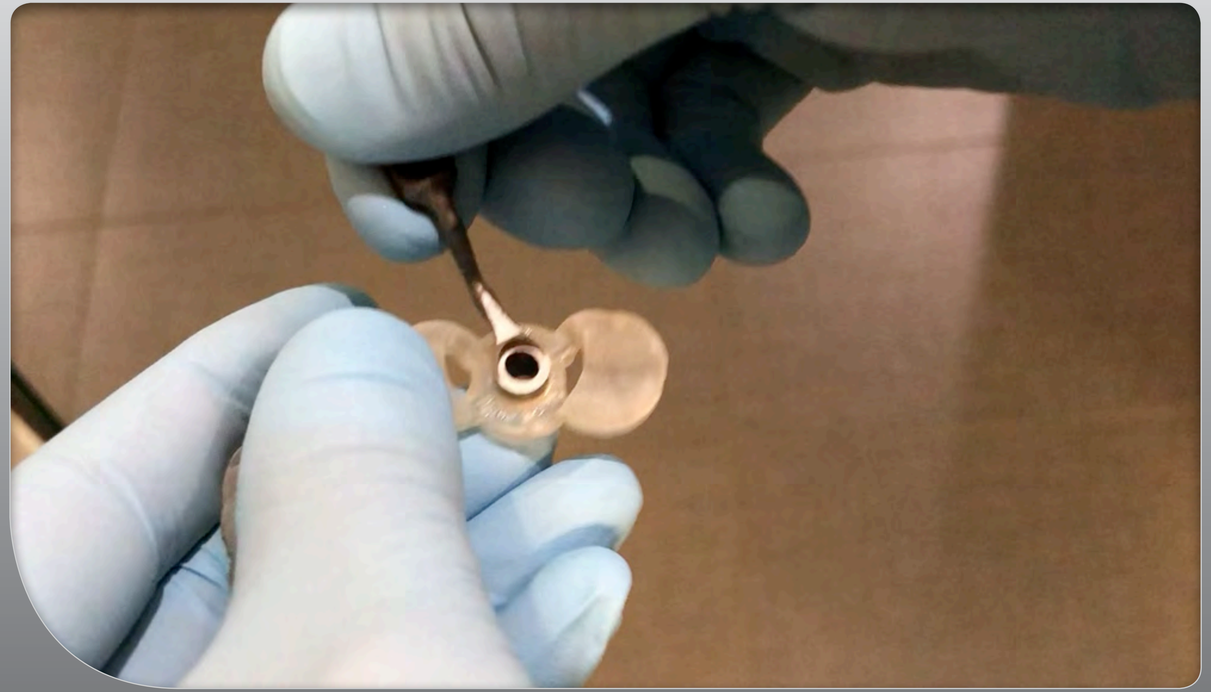
lab

outsourced model printing
surgical guide fabrication
transitional pros components

pilot drill guide → full guidance . small → fully edentulous



freeing up a hand with locking handles



locking handle ‘handling’

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THE JOURNAL OF PROSTHETIC DENTISTRY

RESEARCH AND EDUCATION

Precision and trueness of implant placement with and without static surgical guides: An in vitro study

Arndt Guentsch, DMD, PhD, MHBA,[a] Laxmi Sukhtankar, DDS, MS,[b] Hongseok An, DDS, MSD,[c] and Paul G. Luepke, DDS, MS[d]

ABSTRACT

Statement of problem. Malpositioning of implants is one of the main factors leading to hard- and soft-tissue deficiencies. Whether static computer-guided implant placement increases accuracy and prevents malpositioning is unclear.

Purpose. The purpose of this in vitro study was to determine accuracy defined by trueness and precision (according to International Organization for Standardization 5725) of computer-assisted implant surgery (fully guided and partially guided) in comparison with freehand single implant placement.

Material and methods. Implants (n=20) were placed fully guided (sleeve-bone distance of 2, 4, or 6 mm), partially guided (guide used for pilot drill), or free hand in identical replicas produced from a cone beam computed tomography (CBCT) scan of a partially edentulous patient. The achieved implant position was digitized by using a laboratory scanner and compared with the planned position. Trueness (planned versus actual position) and precision (difference among implants) were determined. The 3D-offset at the crest of the implant (root mean square between virtual preoperative planning and postoperative standard tessellation language file) was defined as the primary outcome parameter. The means, standard deviation, and 95% confidence intervals were analyzed statistically with 1-way ANOVA and the Scheffé procedure.

Results. Fully guided implant surgery achieved significantly lower 3D deviations between the planned and actual implant position with 0.22 ±0.07 mm (2-mm sleeve-bone distance) than partially guided 0.69 ±0.15 mm and freehand placement 0.80 ±0.35 mm at the crest ($P<.001$). The distance among the implants in each group was again lowest in the fully guided group and highest in the freehand group.

Conclusions. The static computer-assisted implant surgery showed high trueness and precision. The closer the sleeve to the bone, the more accurate and precise the method. Freehand implant placement was less accurate and precise than computer-assisted implant surgery (partially or fully). (J Prosthet Dent 2020;■■■:■■■)

Dental implant–supported restorations are a reliable option with good long-term results.[1] However, key factors that make implants reliable include successful osseointegration,[2] placement in a position that reduces surgical complications, such as nerve injury or cortical plate perforation,[3] and an implant position that is compatible with the prosthesis.[4] Otherwise, the functional or esthetic result might be less than optimal.[5]

The most common pathological clinical findings associated with dental implants are hard- and soft-tissue deficiencies. Hard-tissue defects at implant sites encompass intraalveolar, dehiscence, fenestration, horizontal ridge, and vertical ridge defects. Soft-tissue defects include volume and quality deficiencies with a lack of keratinized tissue. These deficiencies can cause complications, including marginal bone loss, soft-tissue inflammation, and soft-tissue recession. Among the etiologies for tissue deficiencies, incorrect positioning of an implant can be avoided by proper treatment planning and the accurate

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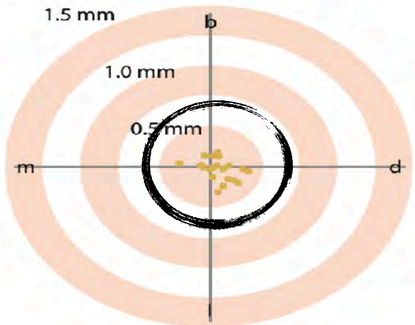
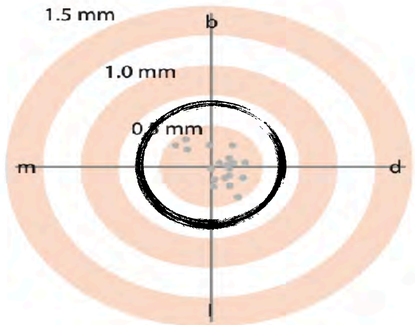
[c]Assistant Professor, Department of General Dental Sciences, Prosthodontics, Marquette University School of Dentistry, Milwaukee, Wis.
[d]Professor and Chair, Department of Periodontology, The University of Tennessee Health Science Center, Memphis, Tenn.

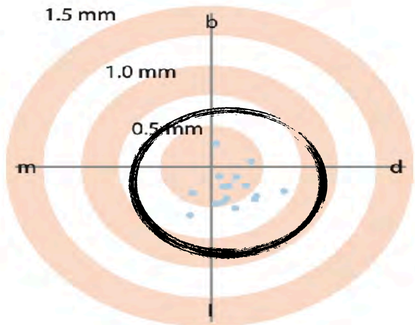
Straumann protocol reference
[NAMLIT-1277]
H2/H4- greatest trueness & precision



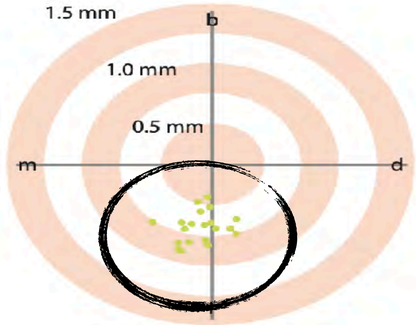
Fully guided
(H2/2mm)



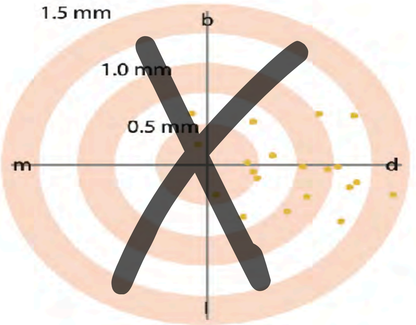
Fully guided
(H4/4mm)



Fully guided
(H6/6mm)

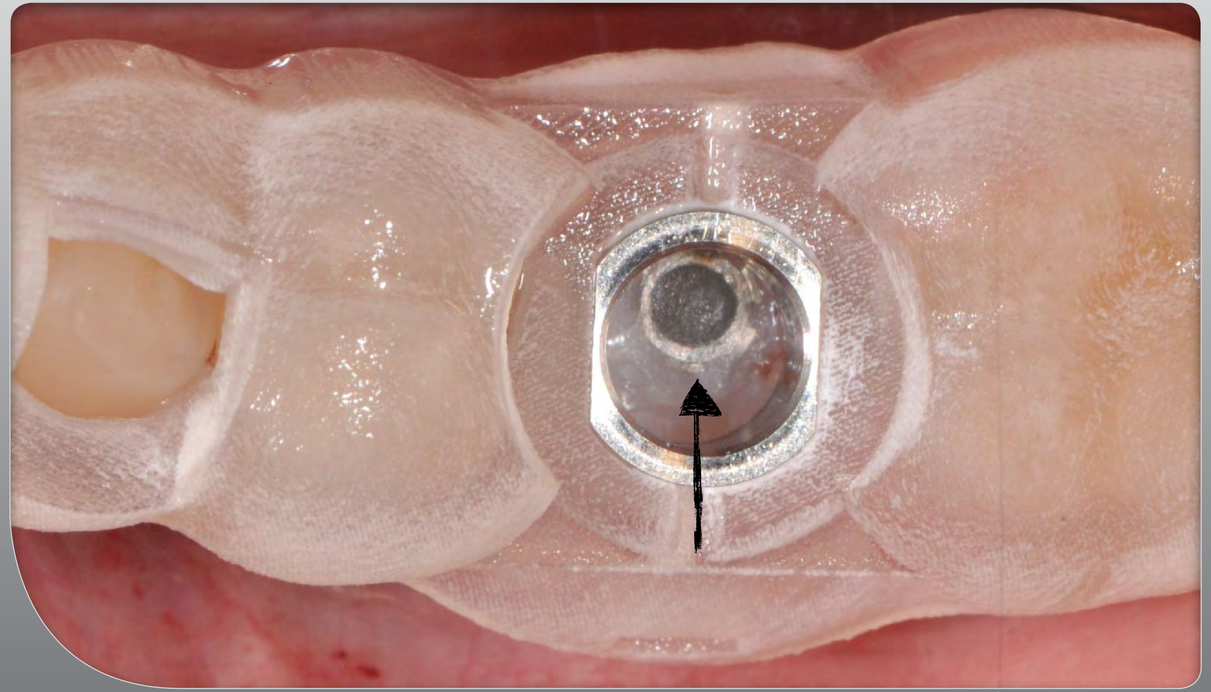


Partially guided
(Pilot drill)

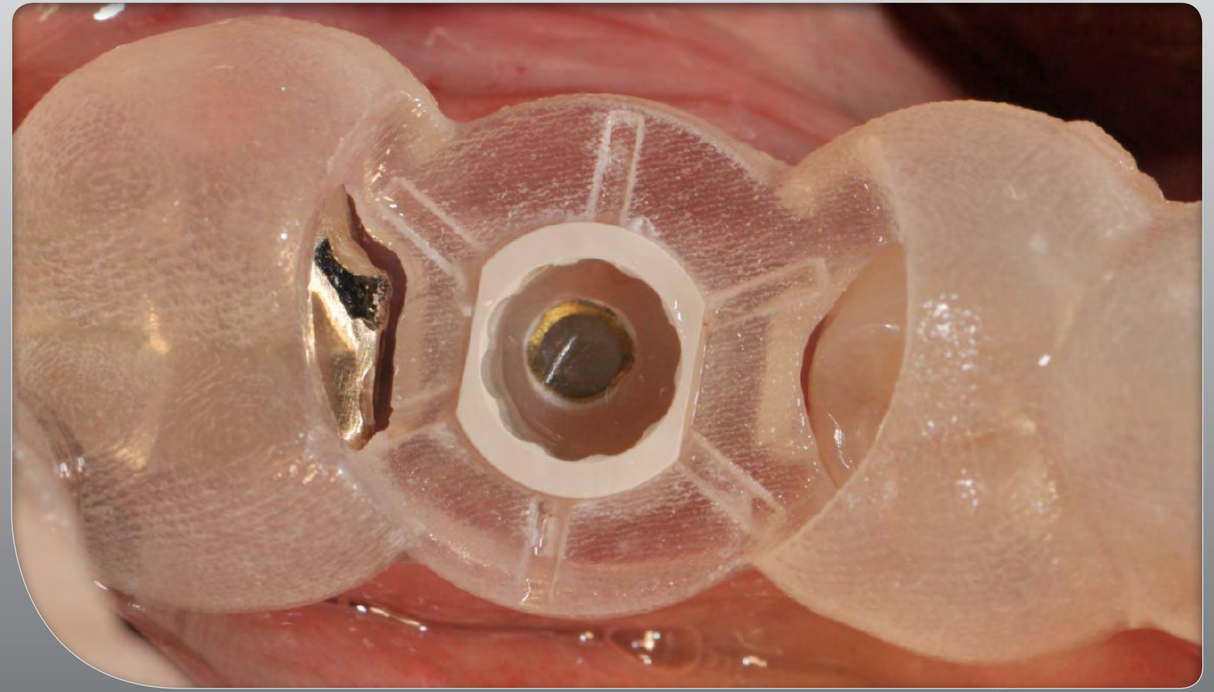


Free hand
(No guide)

understanding/managing **non-guided steps** in immediacy/extraction sockets



partially free-handed

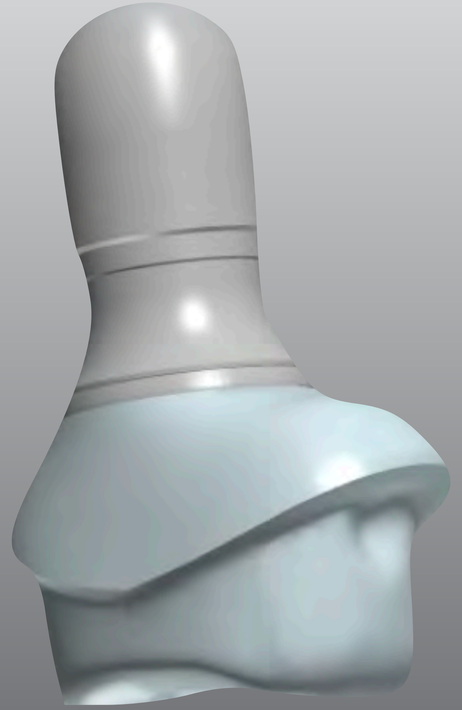


fully guided

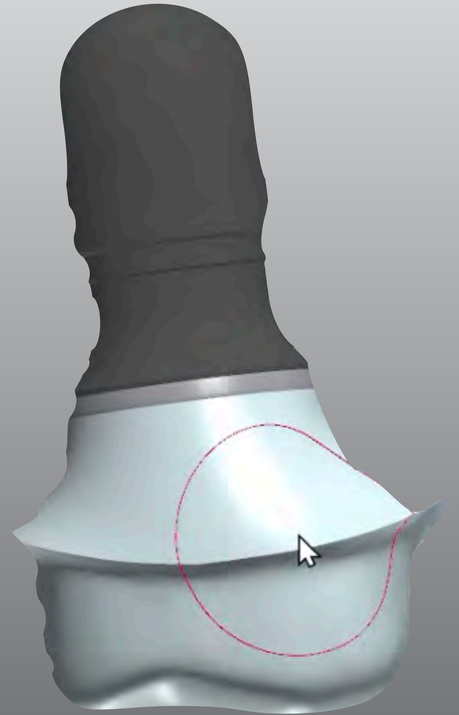
prefabricated restorative components

small/large provisional restorations . custom HAs & PMMA bonded restorations

1st design
bulky subcritical contour

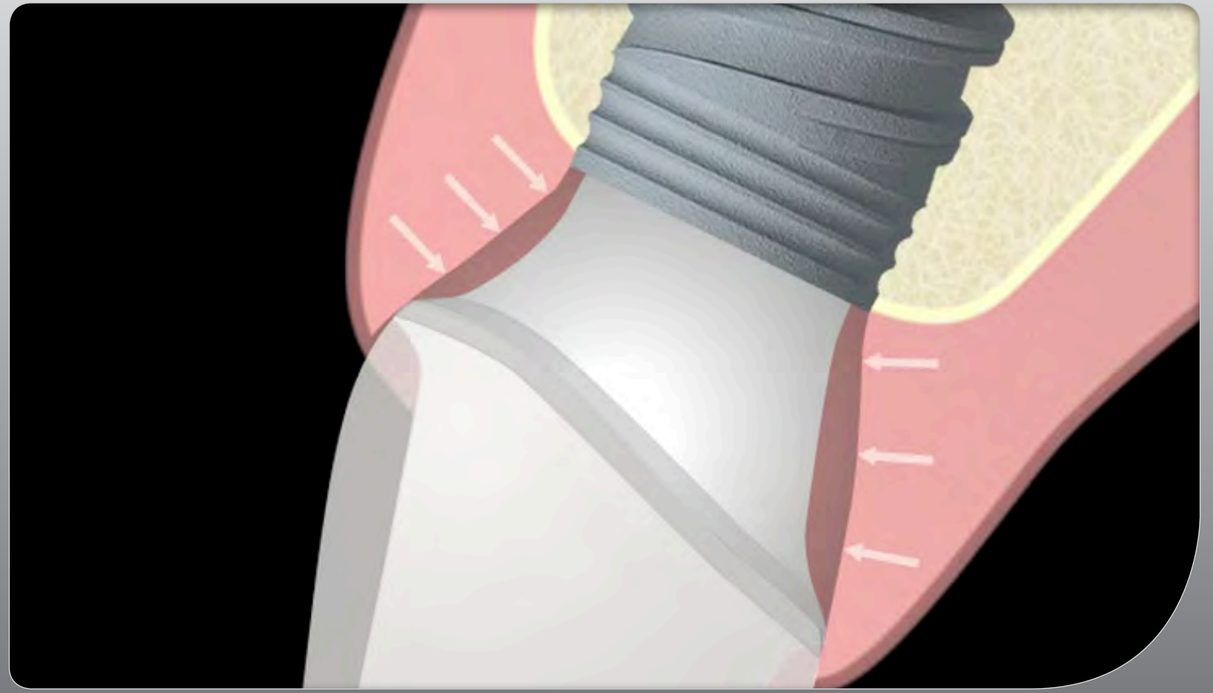


redesign
concave subcritical contour

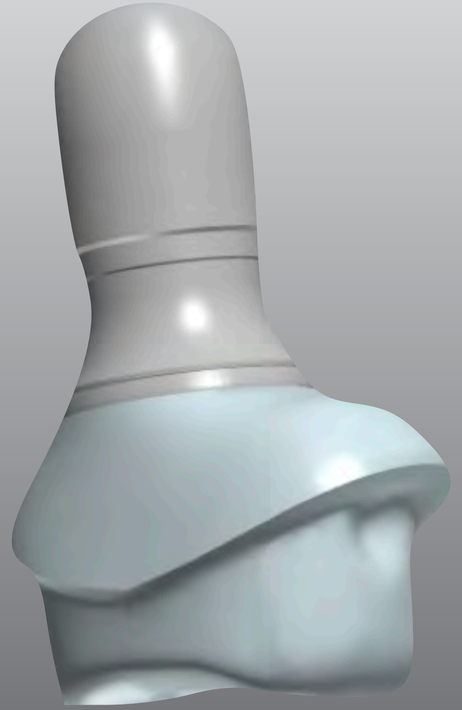


critical vs. subcritical contour

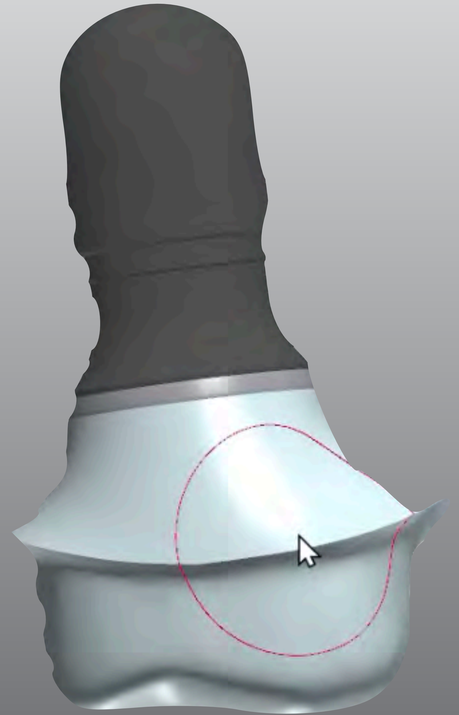
Gonzalez-Martin O, Lee E, Wieisgold A et al. IJPRD 2020



1st design
bulky subcritical contour



redesign
concave subcritical contour



1 non-engaging base - vertical timing

2 2 weeks postop- ideal tissue contour

3 2 weeks postop - full tissue support

1.

2.

3.

timing

case selection/minimizing complications

delayed placement & restoration concepts

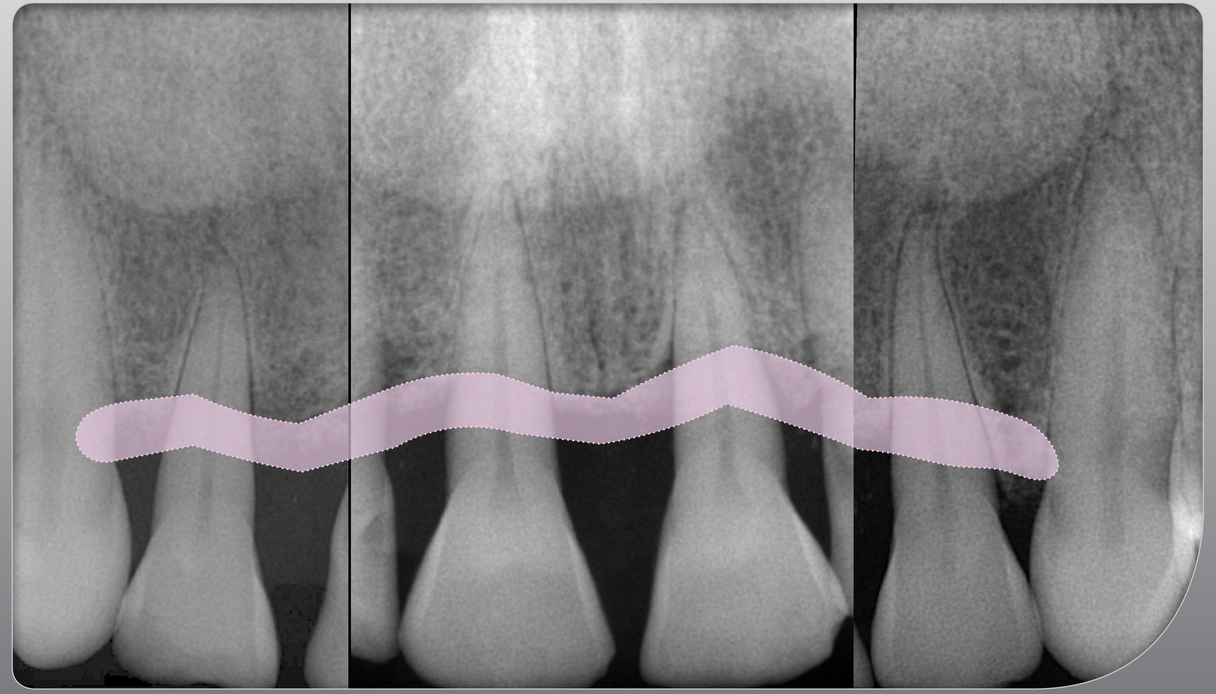
CASE ILLUSTRATION

preoperative - stage IV periodontitis, grade A

periodontal patients - the challenge for implant dentistry - a higher incidence of biologic complications and failures, especially with no or irregular supportive periodontal therapy.

Costa FO, Takenaka-Martinez, S, Coat L et al. J Chin Periodontal. 2012; 39(2).
Sgolastra, F, Petrucci A, Severino M et al. Clin Oral Implants Res. 2015;26(4).
Cairo F, Landi L, Gatti C et al. SIdP survey. Oral Diseases 2018; 24.
Lin, CY, Chen Z, Pan WL, Wang HL. Int J Oral Maxillofac Implants. 2020; 35(1).

preoperative - stage IV periodontitis, grade A



- systematic review & meta-analysis reviewing 21 studies
- 6 outcomes that favored ridge preservation procedures
  - horizontal bone 1.86mm
  - vertical bone 1.05mm
  - buccal bone height 1.55mm
  - lingual 1.14mm
  - mesial bone level 0.59mm
  - distal bone level 0.33mm

bassir sh, alhareky m, wansrimongkol b et al. et al. IJOMI 2018

a-PRF - 700g X 8 min

i-PRF - 300g X 5 min

sustained growth factor release for 7-14 days

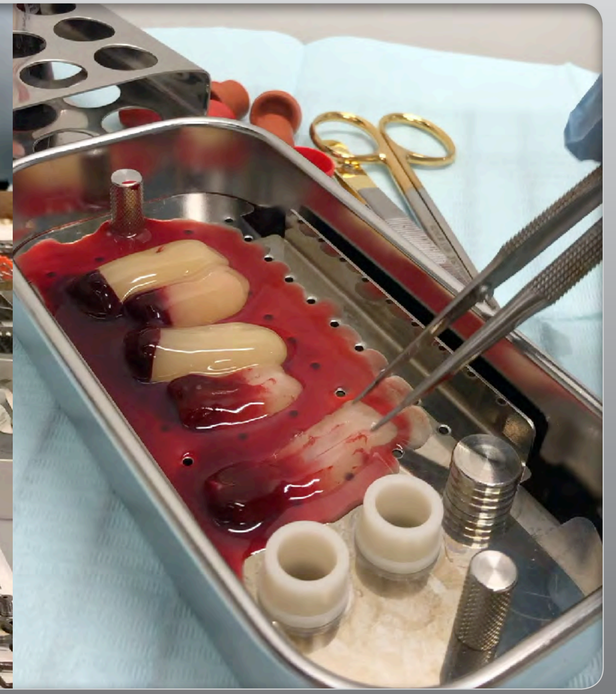
improve cell migration/proliferation, support hemostasis

anti-inflammatory and antibacterial properties

soft tissue healing & time benefits

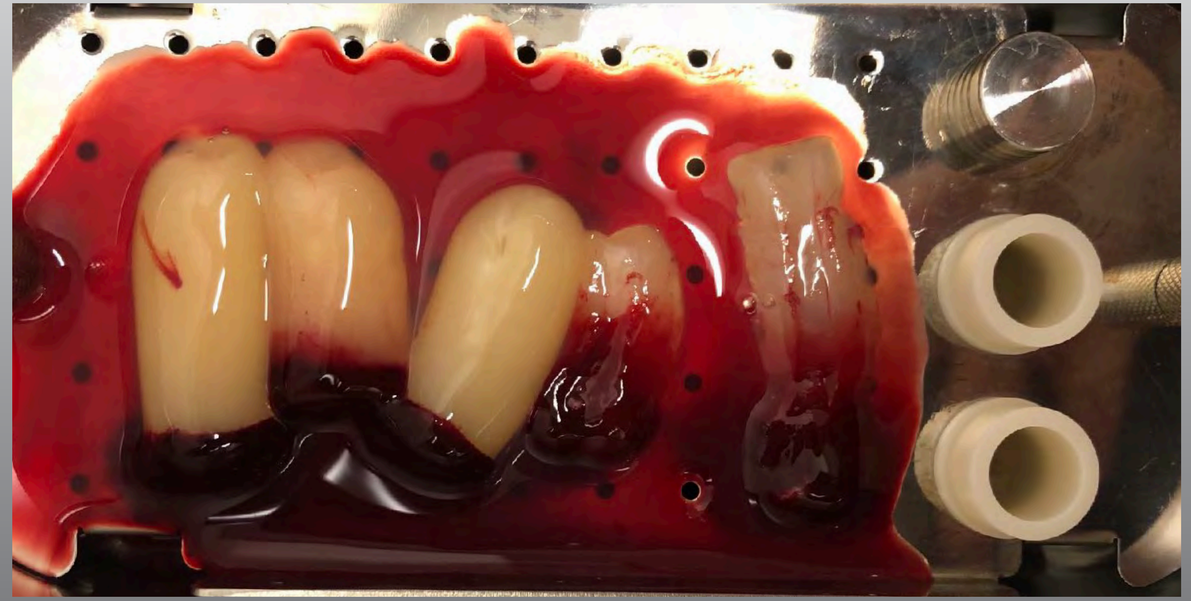
enhance bone graft handling properties

Miron RJ, Understanding Platelet-Rich Fibrin. Quintessence Publishing. 2021



(H-centrifuge)

(fixed angle-centrifuge)



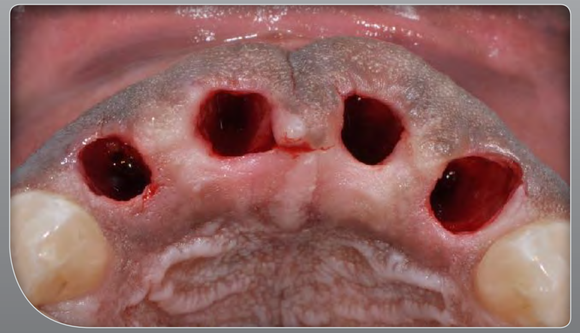
materials: straumann cancellous allograft/i & a-PRF

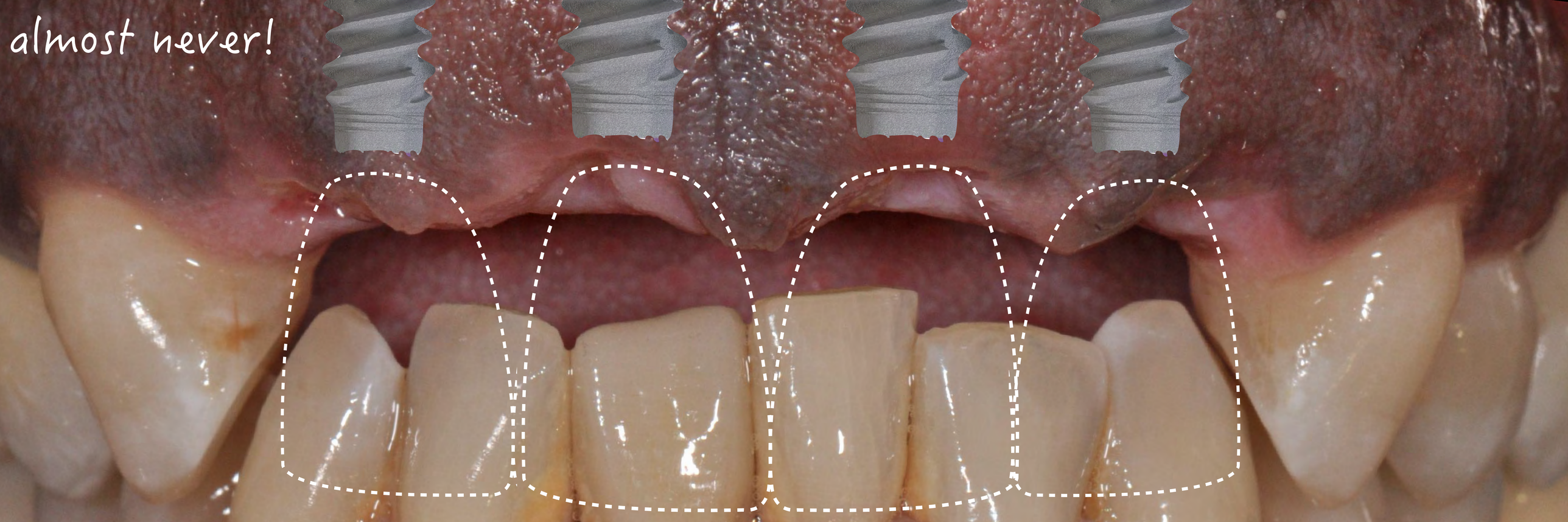
ARP <u>may</u> minimize post-extraction ridge changes.

<u>but</u> no evidence for improved implant/prosthodontic success.

<u>also</u> no evidence for ↓ additional augmentation @ implant placement.

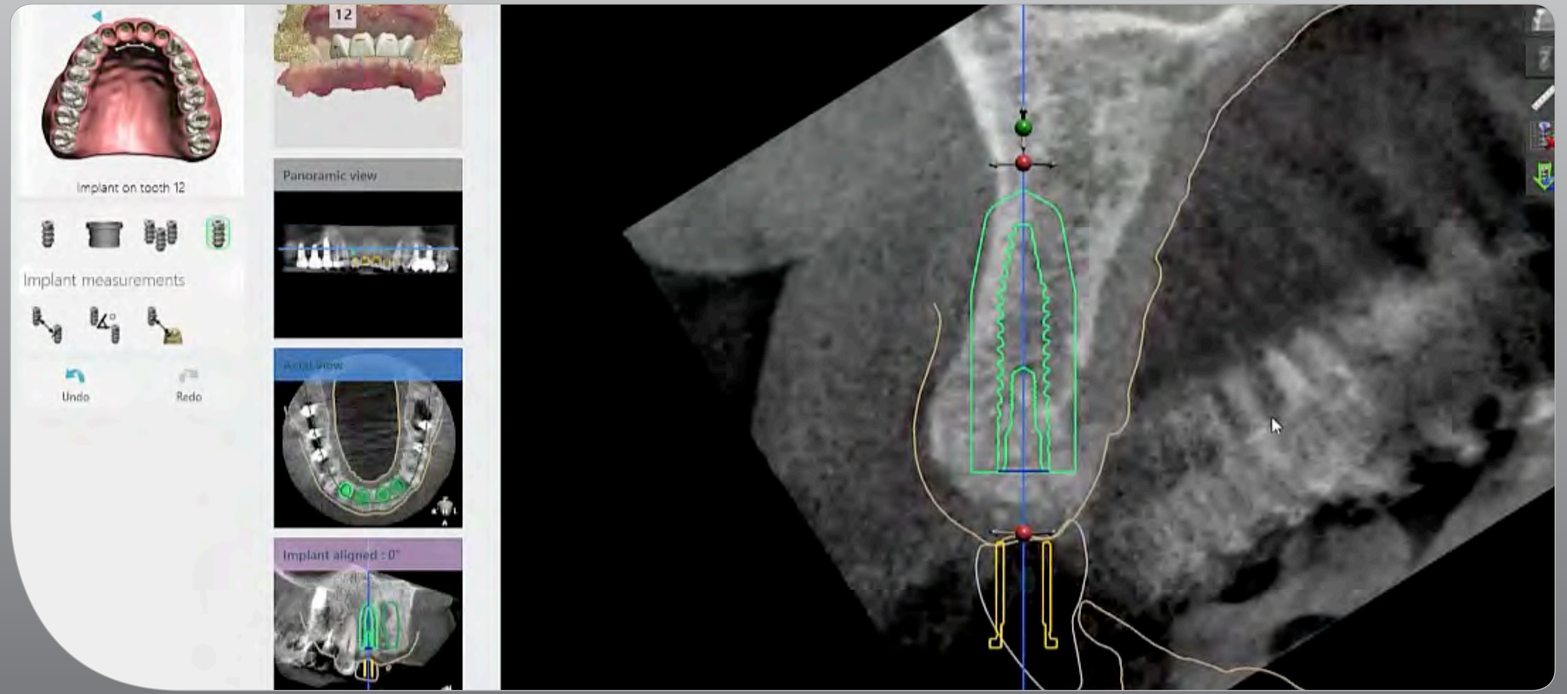
Atieh MA, Alsabeeha NH, Payne AG et al. Cochrane Database Syst Rev. 2021 Apr 26;4(4).




almost never!

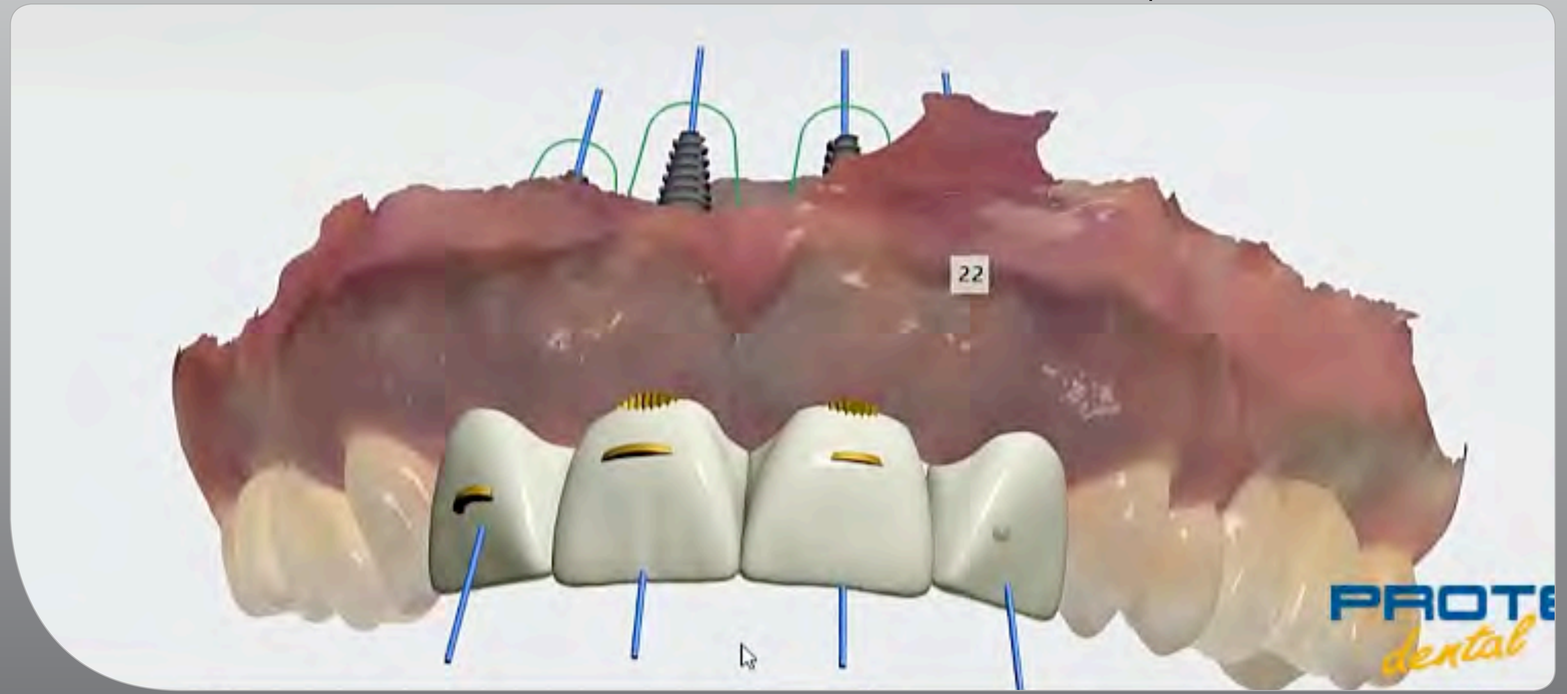
virtual vision of the restorative outcome

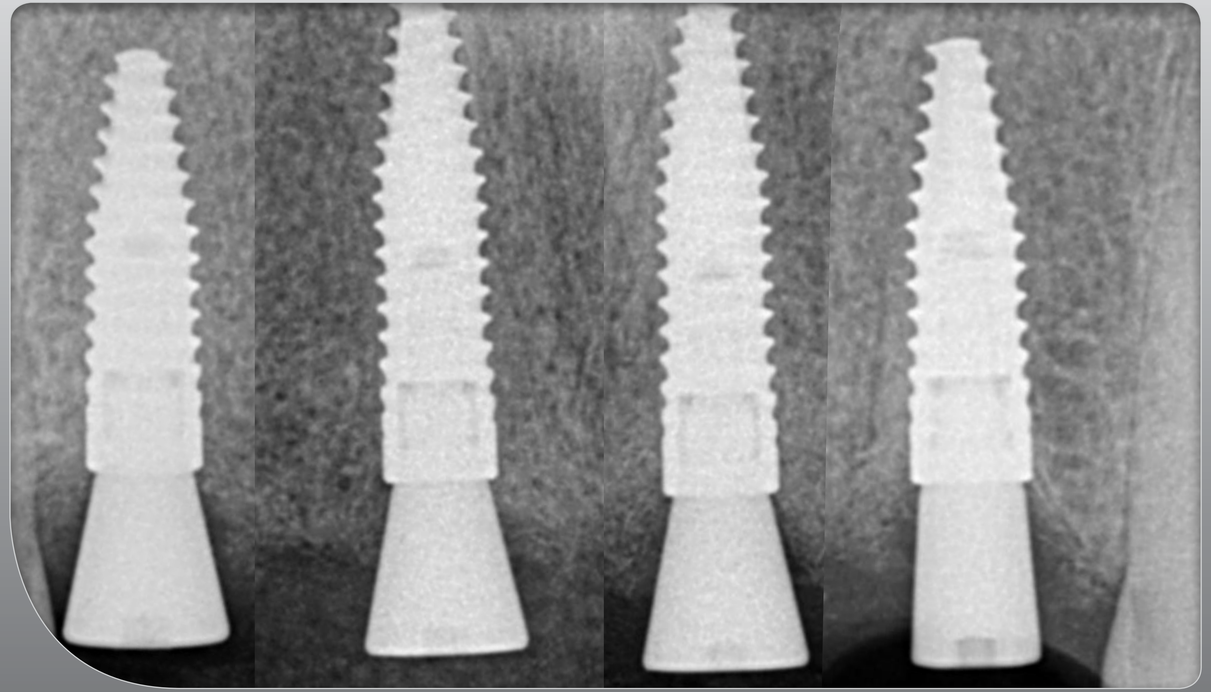
preliminary plan 2.9 ⌀ 12/22 [7/10] & 3.3 ⌀ 11/21 [8/9]



12/22 [7/10] changed to 3.3 ⌀ to allow for angled screw correction

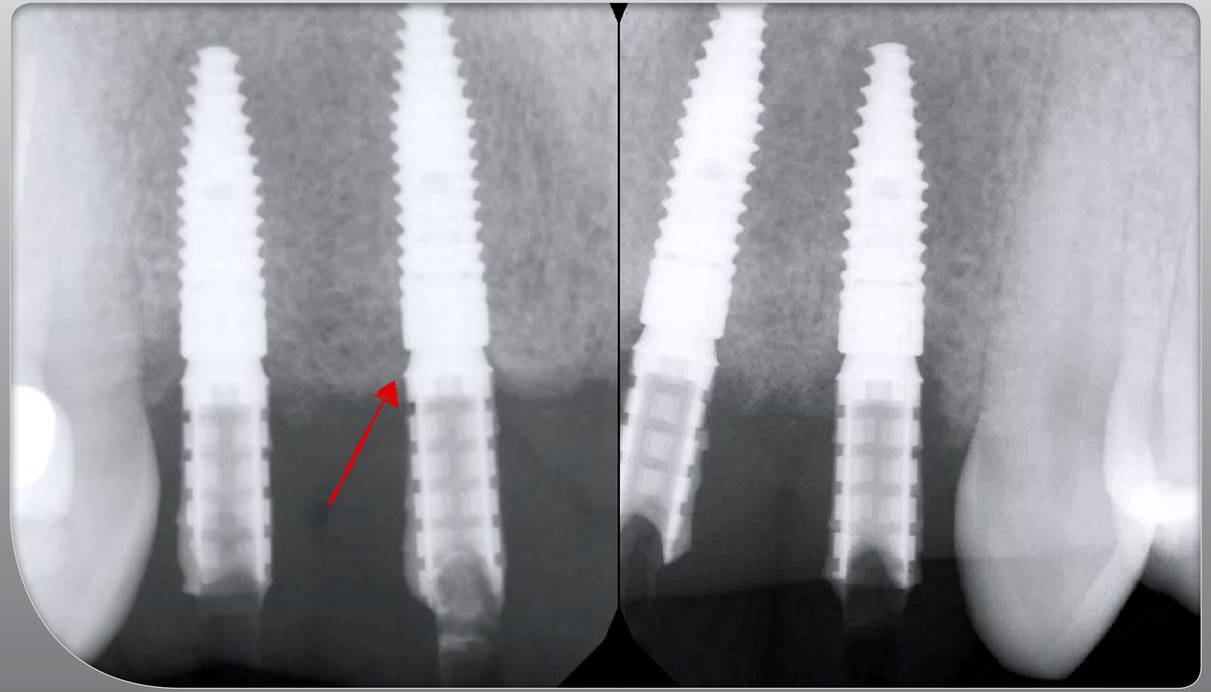
5-10° correction is required in most cases



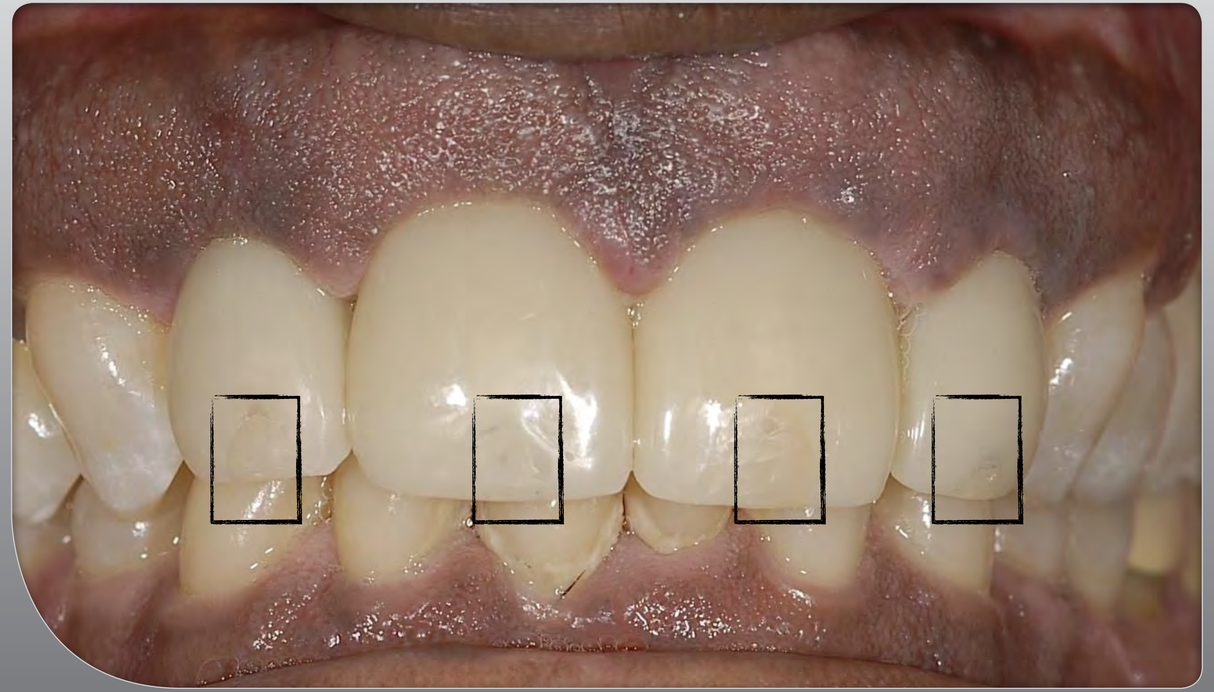


4 months post-surgery

temp abutments/PMMA crowns
[PMMA interface deep/wide]

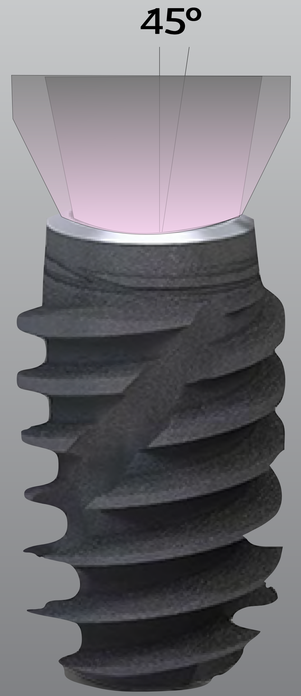


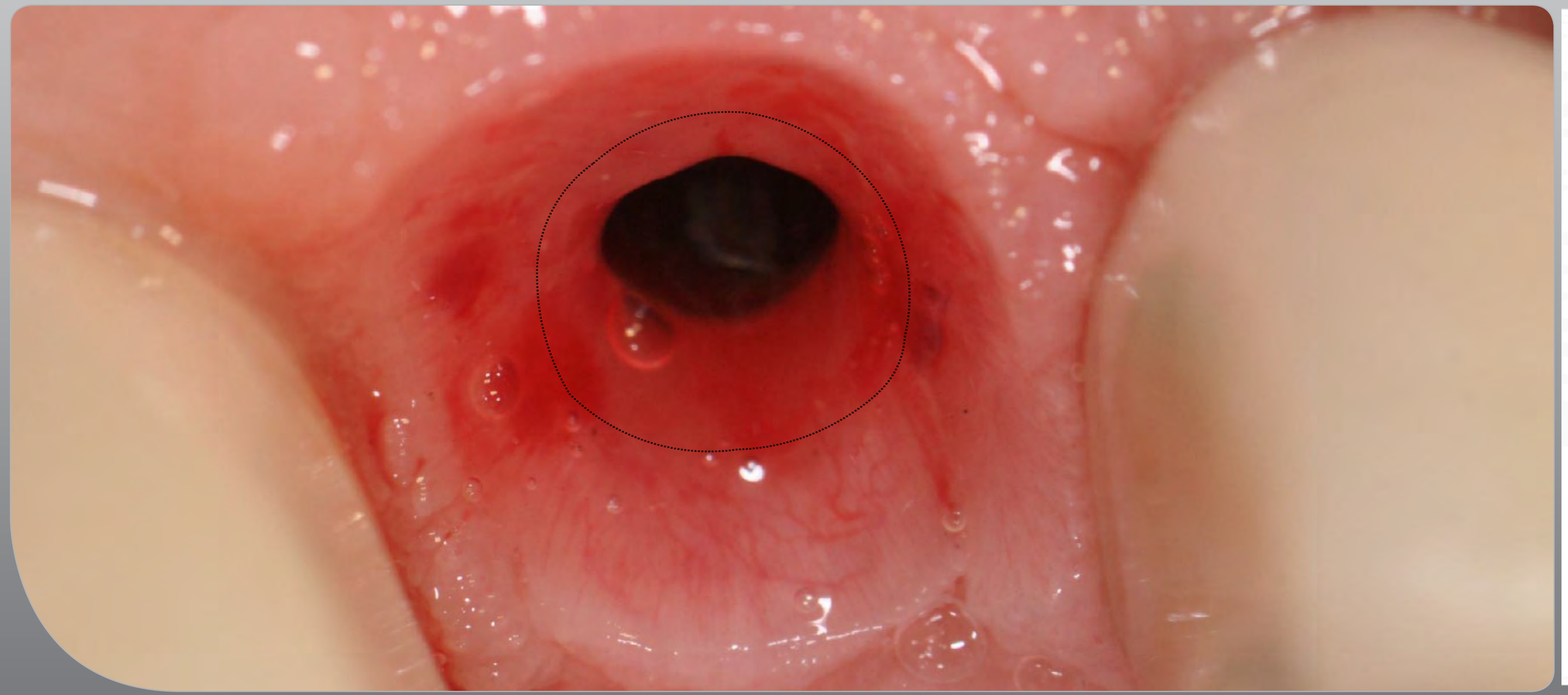
provisional restorations - incisal/facial access holes
as anticipated from virtual plan



impact of transmucosal component design at the **level of the apical barrier epithelium**

narrow ↓ crestal bone remodelling vs wide profiles





Received: 27 September 2014 | Revised: 12 July 2018 | Accepted: 9 August 2018

DOI: 10.1111/clr.13347

ORIGINAL RESEARCH

WILEY

Histological and micro-CT analysis of peri-implant soft and hard tissue healing on implants with different healing abutments configurations

André Barbisan Souza[1] | AbdulMonem Alshihri[1,2] | Peer W. Kämmerer[3] | Mauricio G. Araújo[4] | German O. Gallucci[1]

[1]Division of Regenerative and Implant Sciences, Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, Boston, Massachusetts

[2]Department of Prosthodontics and Biomaterial Sciences, King Saud University, Riyadh, Saudi Arabia

[3]Department of Oral, Maxillofacial and Plastic Surgery, University Medical Centre Mainz, Germany

[4]Department of Dentistry, State University of Maringa, Parana, Brazil

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German O. Gallucci, Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, Boston, MA.
Email: german_gallucci@hsdm.harvard.edu

Funding information
USPHS/NIDCR Implants; Department of Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine

Abstract

Objective: The aim of this study was to assess the effect of different abutment configurations on peri-implant soft and hard tissue healing.

Materials and Methods: Two-piece dental implants, 3.5 mm in diameter and 8 mm in length, were placed in four beagle dogs. Two different transmucosal healing abutment configurations were randomly selected: one with a wider emergence profile (WE) (45° angulation with implant long axis) and the other with a narrow emergence profile (NE) (1.5° angulation with implant long axis). After four months of healing, the animals were sacrificed. Micro-CT scans were taken for mesio-distal analysis. Subsequently, the blocks were prepared for bucco-lingual histometric analyses. Several measurements were taken using the following reference points: marginal mucosal level (MML), apical barrier epithelium (aBE) implant shoulder (IS), marginal bone crest (BC), and first bone to implant contact (fBIC).

Results: In the micro-CT analysis, the distance from IS-fBIC was 1.15 ± 0.66 mm for WE and 0.12 ± 0.21 mm for NE ($p = 0.004$). The IS-BC of WE was −0.54 ± 0.80 mm, whereas NE presented 0.75 ± 0.48 mm ($p = 0.002$). The histometric analysis showed that both groups presented comparable dimensions of peri-implant biologic width ($p > 0.05$). However, in the distance from IS to BC, the WE showed a mean distance of −0.66 ± 0.78 mm while NE was 0.06 ± 0.42 mm ($p = 0.039$). The IS to fBIC was 0.69 ± 0.68 mm for WE while NE was 0.30 ± 0.20 mm ($p = 0.041$).

Conclusion: The design of the transmucosal component can influence the establishment of the peri-implant biologic width. The flat and wide emergence profile induced an apical displacement of the peri-implant biologic width and more bone loss.

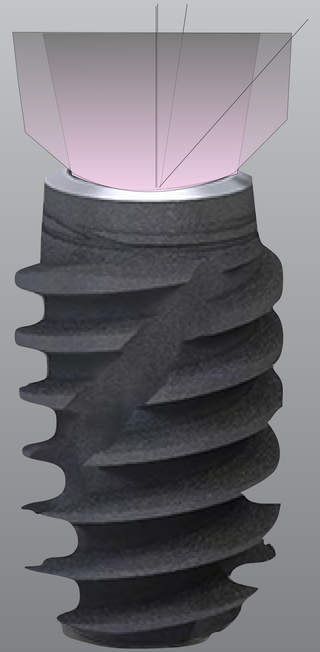
KEYWORDS
abutment design, bone remodeling, peri-implant healing

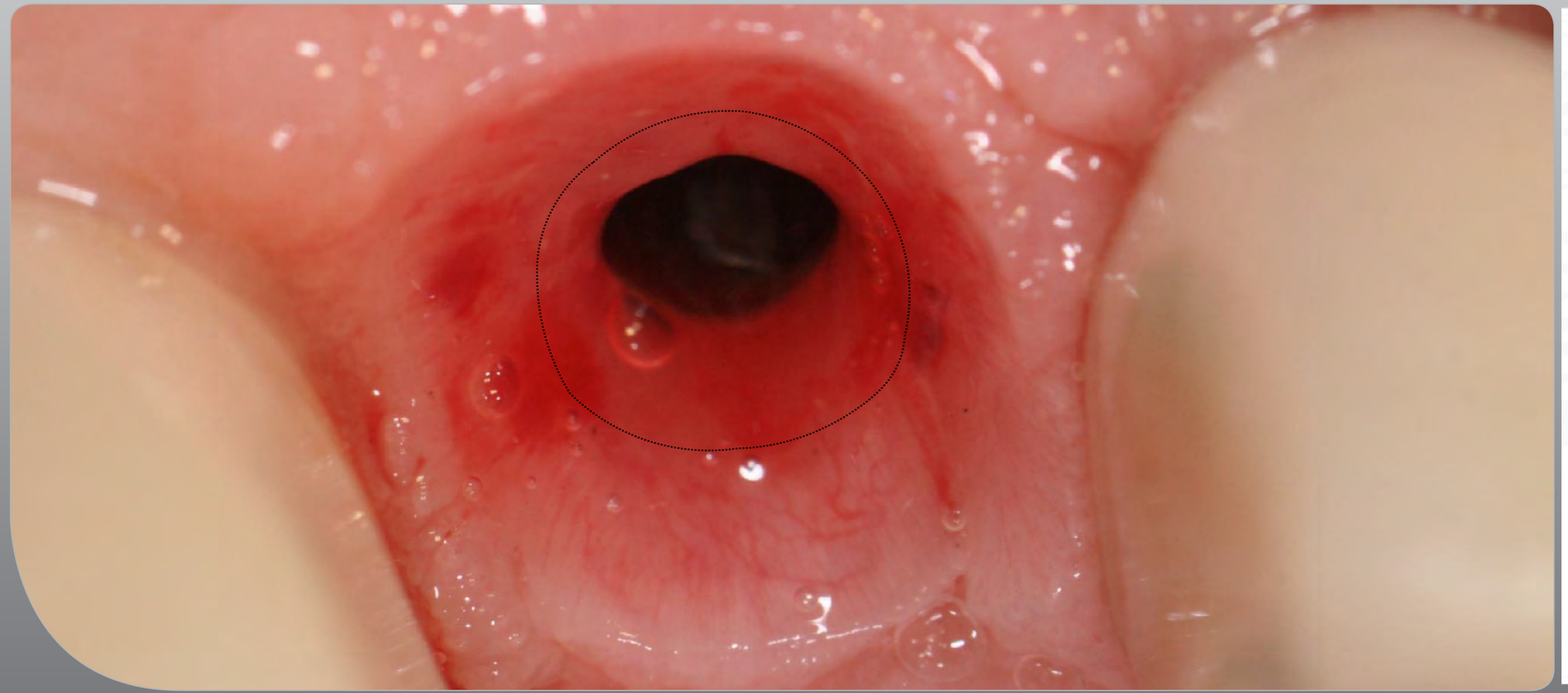
1 | INTRODUCTION

Dental implant treatment outcomes are influenced by associates' long-term survival and success rates (Albrektsson, Zarb, Worthington, & Eriksson, 1986; Buser, Weber, & Lang, 1990). The survival rate is conditioned by the integrity and stability of the osseointegration phenomenon, in addition specific criteria such as peri-implant soft and hard tissue stability and patient-centered outcomes are also considered when assessing implant success (Papaspyridakos, Chen, Singh, Weber, & Gallucci, 2012). The

impact of transmucosal component design at the **level of the apical barrier epithelium**

narrow ↓ crestal bone remodelling vs wide profiles





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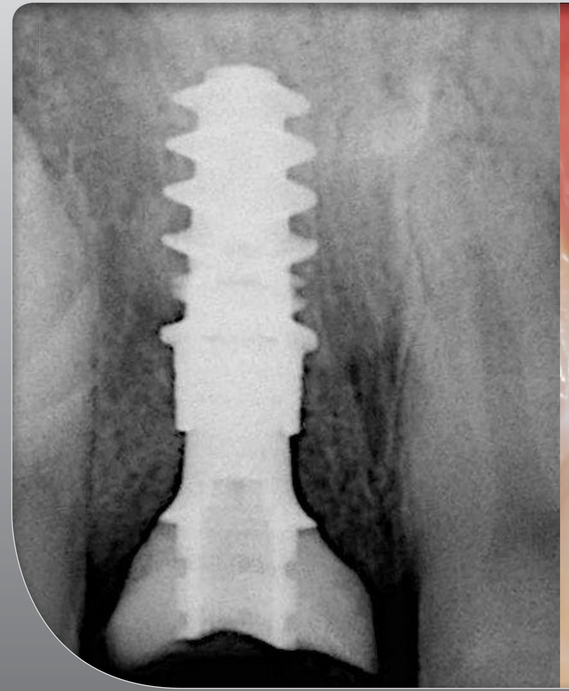
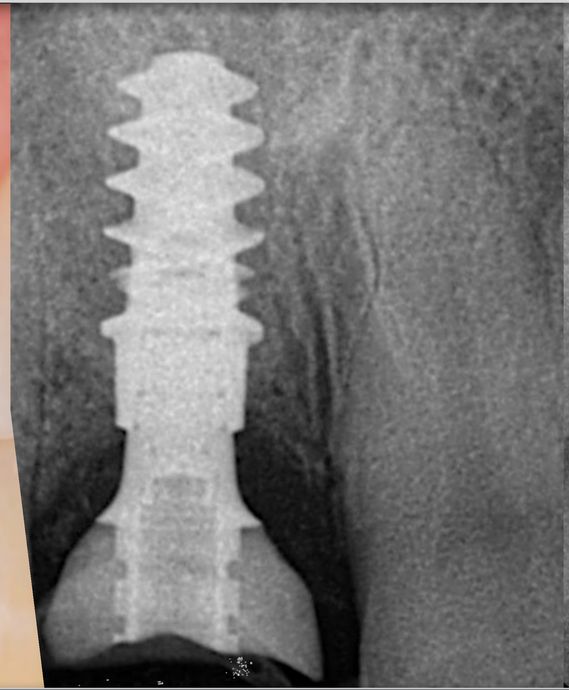
day of surgery

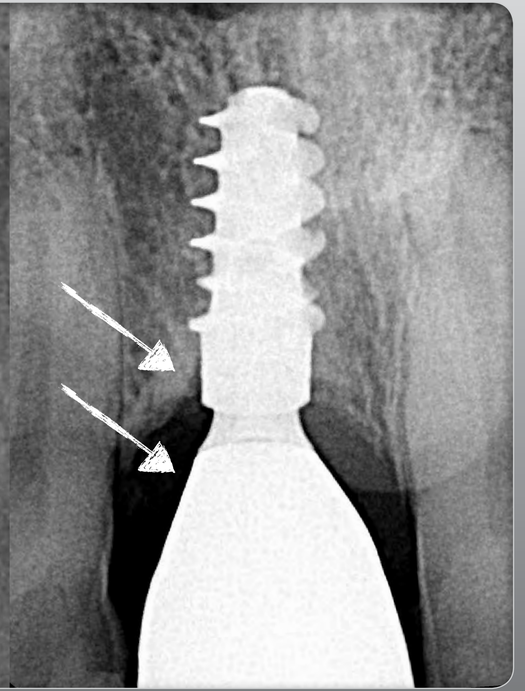


7 months post-op

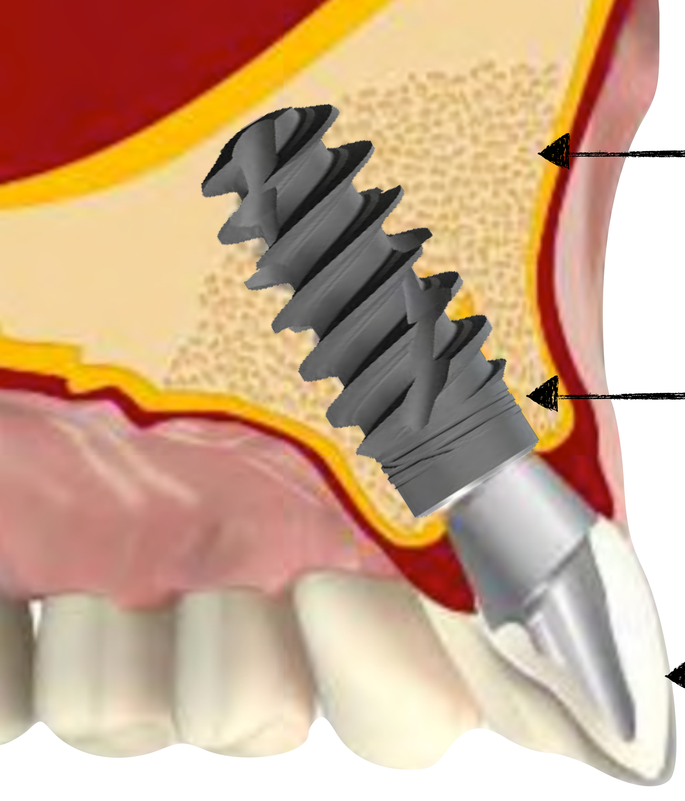
7 months post-op



2.5y post-restoration



timing immediate placement & restoration concepts



primary stability & ↓ micromovement

the bone
extraction site (adequate ridge for engagement)
intrasurgical bone density assessment
manipulation - bone density based drilling protocol

experience/analog concepts

the implant
1° length (minimum ?) . diameter (space for bone) . design elements
2° surface technology (SLActive)

implant design

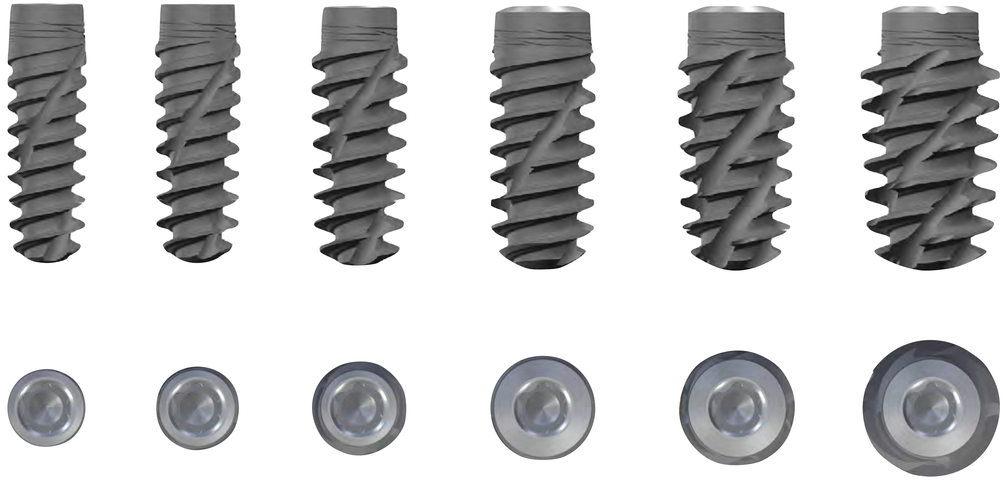
blx/tlx

mechanical forces & function
occlusion & OB/OJ
function - in/out of occlusion
habits

patient selection & education

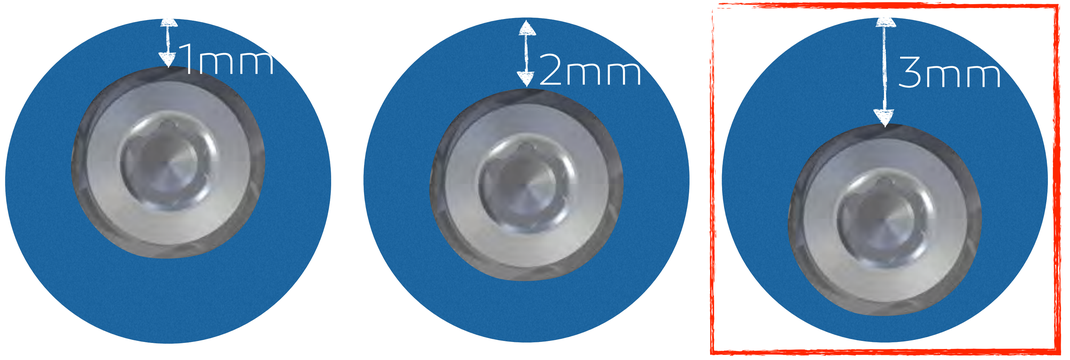
BLX prosthetic versatility

diameter change does not impact restorative plan

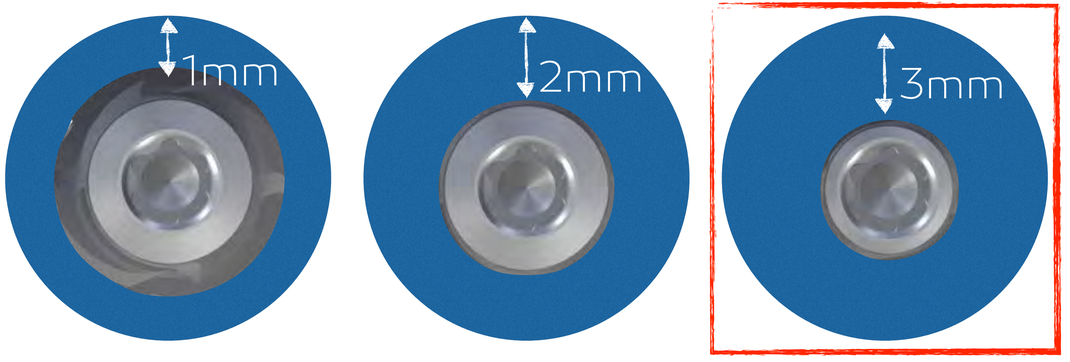


3.5⌀ 6.5⌀

immediate implants & buccal bone volume

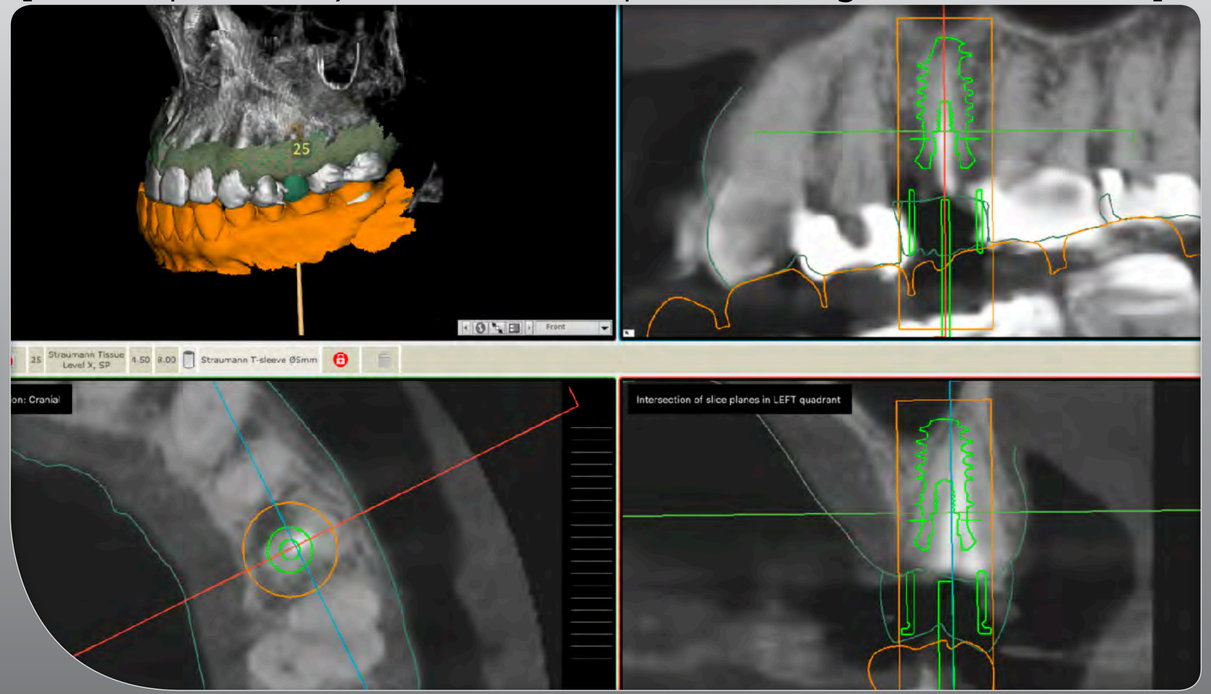


roxolid . allowing use of smaller diameters



TLX 4.5[RT/SP] X 8 - microgap position advantage

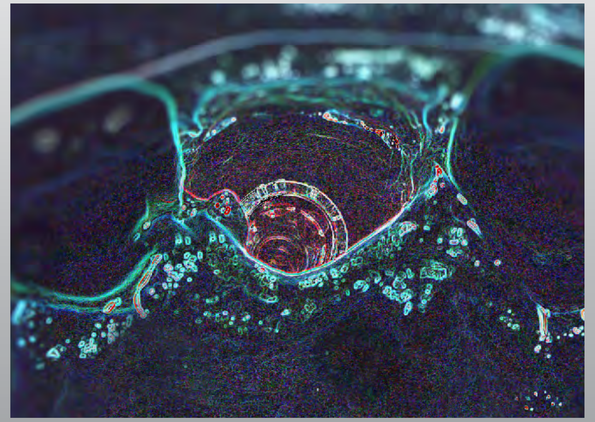
[5.5 ⌀- proximity to roots & requires non-guided insertion]



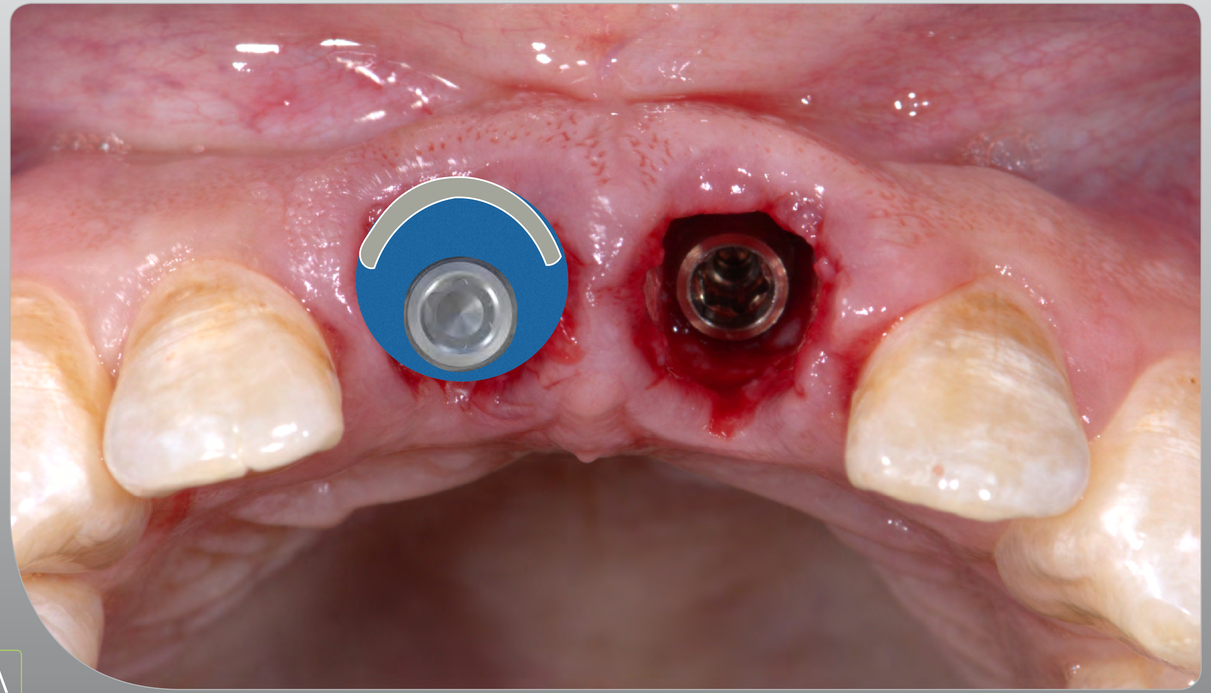
BLX 5.0 X 8 - ↑ diameter - ↑primary stability

intrasurgery ⌀ change - no effect on pros components

root resorption & ankylosis



facial socket shields



working with a new planner - poor CHA design

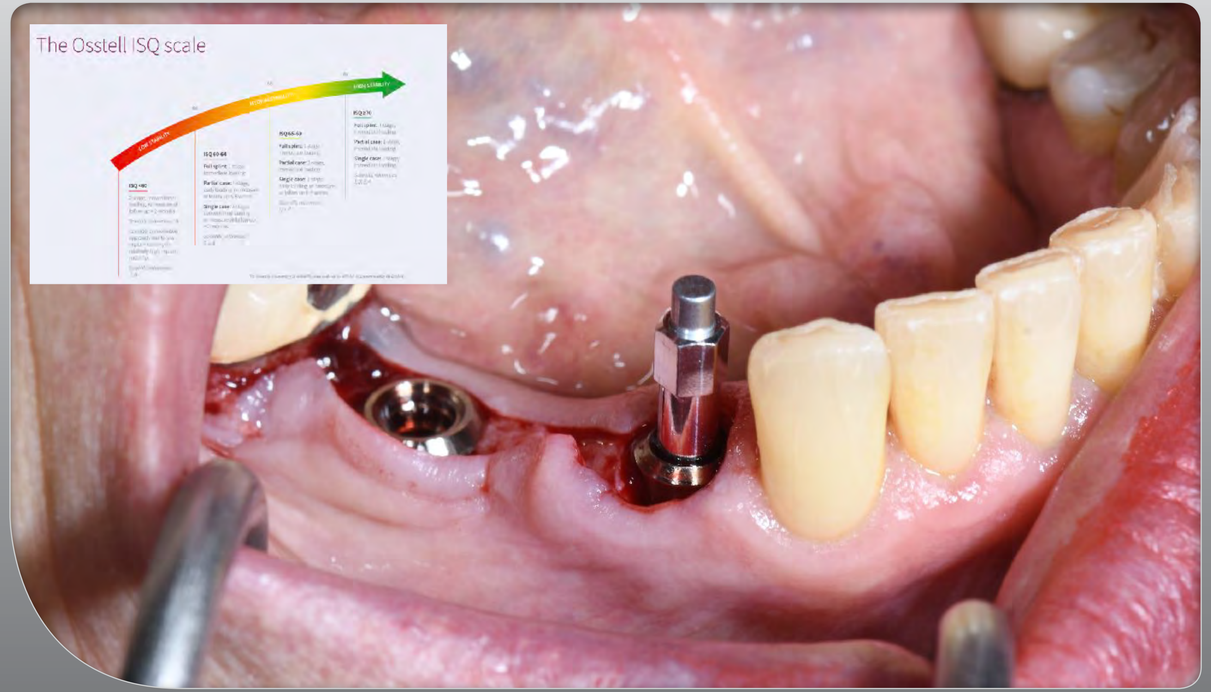
ELATUS

1-year post restoration

digital technologies

shaping our planning & treatment decisions
monitoring our outcomes
using tools & apps to assess/improve results

restorative decisions guided by insertion torque & osstell ISQ



immediate 4.1 X 14 TL implant

recognizing the power of big data
discovery - find/understand/compare
computers/software using our data - develop workflows . improve outcomes

... documenting our 'individual/new practice' implant results [up to 2 years 301 cases]

- 10 smokers . 5 vapers
- 98 immediate implants
- 203 delayed (35 exo/ridge preservation vs. 168 exo/PRF)
- 10 full arch . various permutations of partial edentulism (2-8 implants)
- 1 early failure (40% deficient bone fill / immediate protocol)- diabetic - explanted
- 1 early crestal bone loss- immediate protocol/metabolic syndrome/poor OH - put to sleep
- 1 early crestal bone loss- delayed protocol/RPD overload . implant salvage surgery - resolved

...emerging - the straumann registry

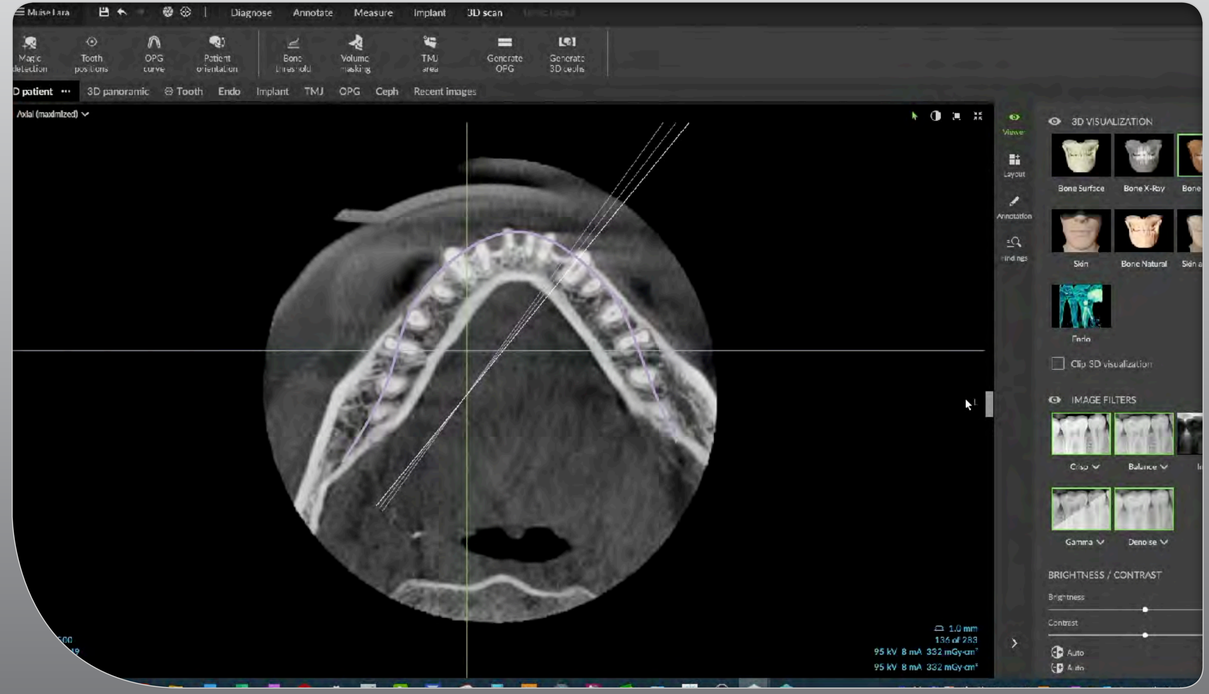
a potentially powerful data ecosystem

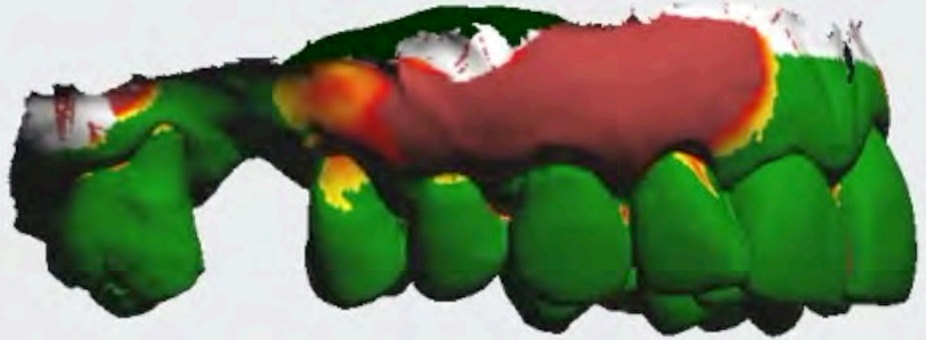
connective tissue graft
> submucosa

tuberosity graft
> lamina propria

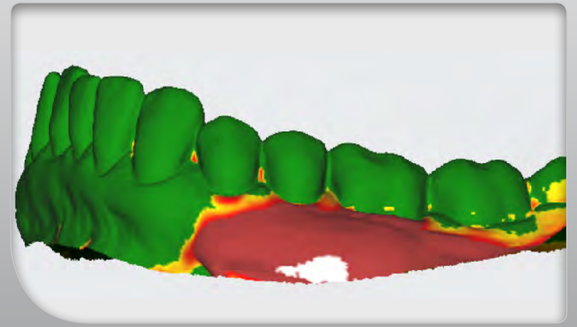
CT graft
coronally advance margin & enhance phenotype

preop CBCT & site evaluation . *large volume gingival augmentation* . iOS tracking of treatment outcomes

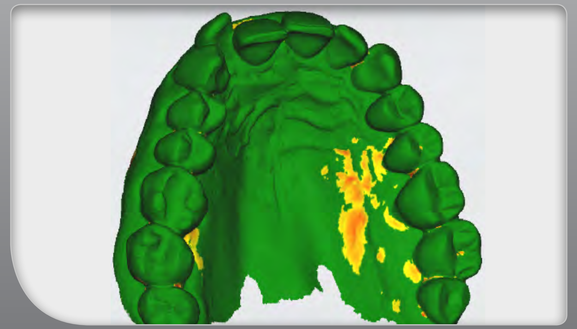




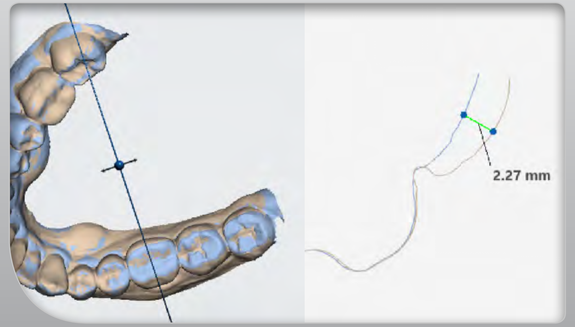
recipient site 2-4mm recession - CRC



donor site



≤ 2.27mm volume ↑



0.48mm volume ↓

digital follow-up at 12 months post-surgery- CTG

donor site	recipient site
superficial graft harvest open wound	full thickness apical approach access point 34D
a-PRF/i-PRF & collagen tape epithelial discard	100% root coverage
up to 0.48mm *volume loss*	up to 2.27mm *volume gain* @ 3mm-6mm below margin
VAS pain: 3/10	VAS pain: 3/10

straumann dermal matrix graft
an autogenous graft substitute

dermal/reticular side
[larger pores/absorbs blood]

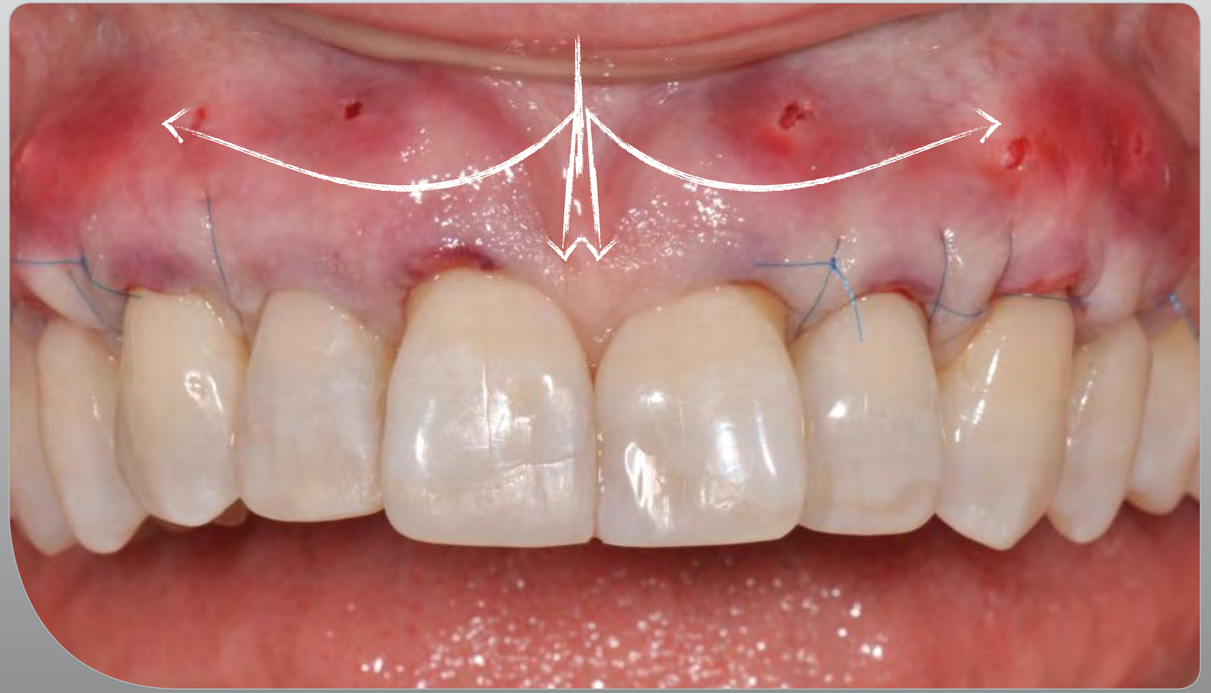
basement membrane/papillary side
[smaller pores/repels blood]

CASE ILLUSTRATION

dermal grafts
the types of results that are possible

recommended access points *today*

recommended ‘VISTA’ points *today*



flap design changes . apical-coronal approach

mucosal access points & VISTA

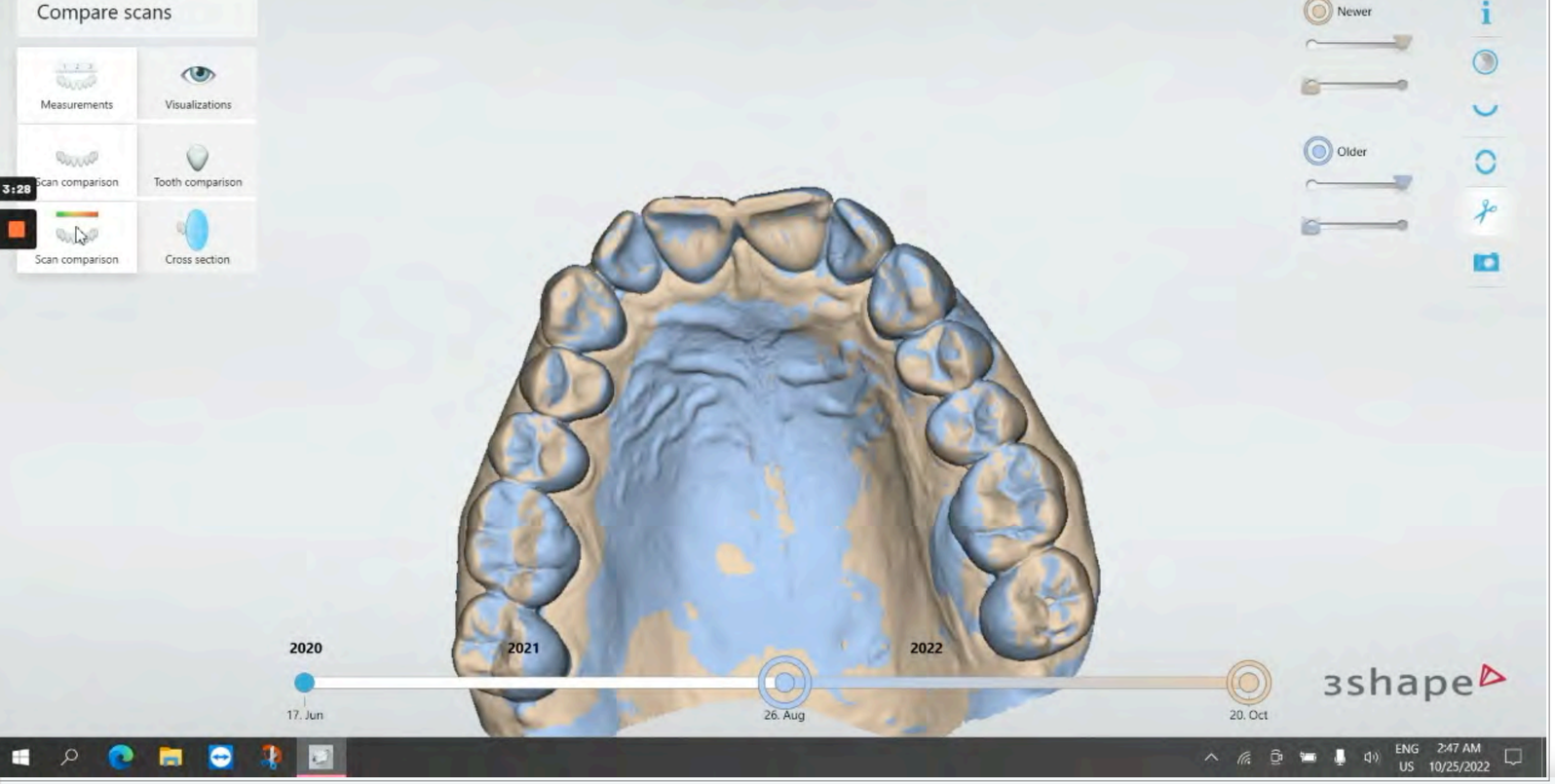
Straumann acellular dermal matrix allograft

preop

3 weeks postop

1 year outcome

preop



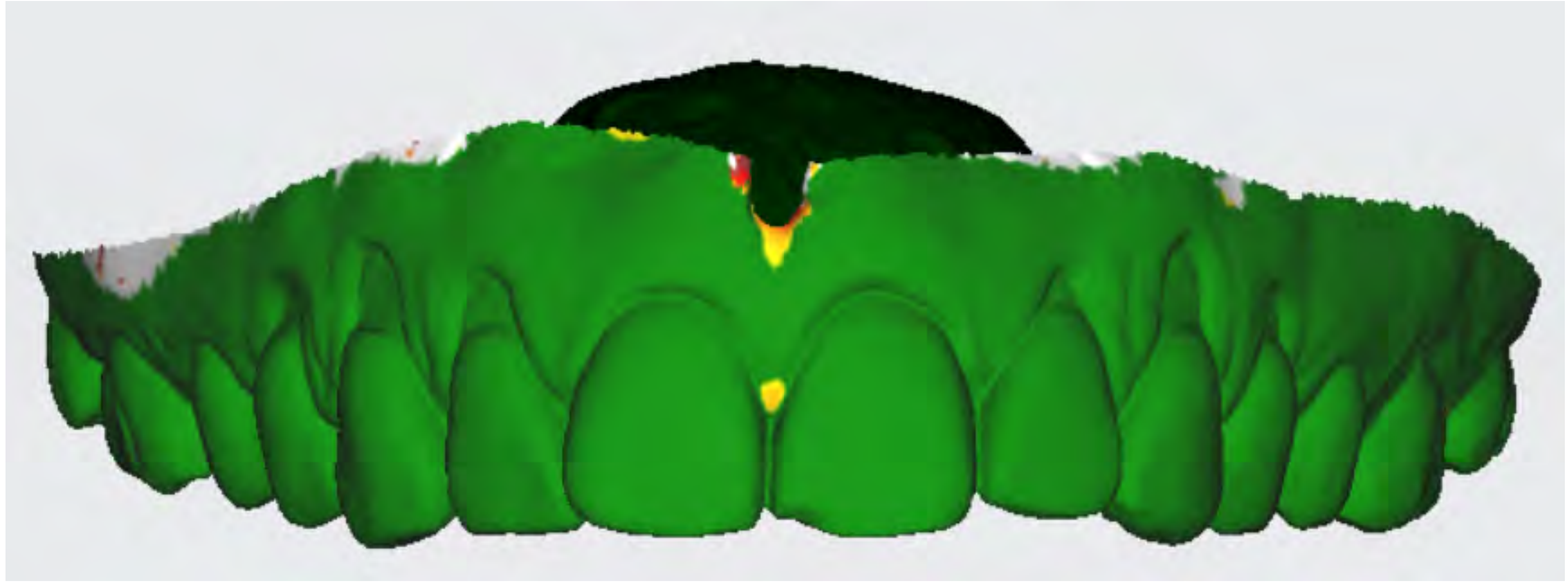
Straumann dermal matrix graft

1 year follow-up

heat map [change vs. stability over time]

- green - indicates high correlation
- red - soft tissue volume changes
- 100% root coverage
- volume gain ~ 1.5 - 3mm

making better treatment decisions using optical scans [patient monitoring]



treatment initiated if:

- symptoms increase
- inflammation increase
- restorative/orthodontic plan demand treatment
- esthetic demands
- **iOS recession change is documented**

50/389 referred cases monitored for 1 + years

[09/2020 to 08/2022]

only 2/50 had recession ↑

@sonialeziy

www.videntalspecialists.com

thank you