Making Fixed Prosthesis Installation Safer by Preventing Several Risk factors for Peri-implant Disease

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December 7, 2022

Update from November 3, 2022 presentation by Drs. Svoboda & Arlin - Sponsored by Shaw Lab Group

Part 1 of 4

Understanding the Microscopic Nature of Dental Diseases

Slides 2-29

Dr. Arlin: "Implant Dentistry has Many Risk Factors for Peri-implant Disease" – It's Complicated (Dr. Svoboda)

Host / Systemic

Patient Age

Health / Medications

Periodontitis History

Smoking / Dosage

Genetic Factors

Host / Local

Bone:
Quality/Quantity

Soft Tissue:
Biotype /Keratinization

Plaque Control

Excessive Load

Dentist/Operator

Experience/Expertise

Surgical Techniques/Protocols

Prosthetic Systems

Screw-in (Hygiene Access /Fit)

Cement-in (Cement/Fit)

Biomaterial

Biocompatibility

Implant Material

Implant Surface

Implant Design

Excessive Load

- Host Related
  Transmucosal
  Parafunction/Bruxism

Prosthetic Systems

Implant: Size / # / Distribution

Materials / Occlusion

Splints / Cantilevers / Ratio /

Fit / Hygiene Access /

- Early vs Late Effects
- Mechanical Effects
- Biological Effects

Surgical Techniques

- Sterile vs Aseptic
- Prophylactic Antibiotics
- Surgical Incision
- Surgical Trauma
  Excess Heat
  Excess Compression
  Inadequate Congruency

-Malpositioned Implants

Oro-facially
Mesio-distally
Apico-occlusaly
Invasion of Anatomy

Surgical Protocols

-Flap vs. Flapless

-1 vs 2 stage

-Immediate Placement

-Early Placement

-Delayed Placement

-Failed Replacement
immediate / early / delayed

-Immediate Loading

-Number of Implants

-Implant Connection to Natural Teeth

Implant Design

-Crestal Module

-Platform Shift

-Fracture Risk
Material
Diameter
Load
Connection

-Narrow Implants

-Wide Implants

-Tapered Implants

Compilation of Publications + Dr. Arlin's Experience as a Periodontist

Specific Risk Factors for Peri-implantitis

Patient Factors

History of Periodontitis

Bone Deficiency

Professional Maintenance

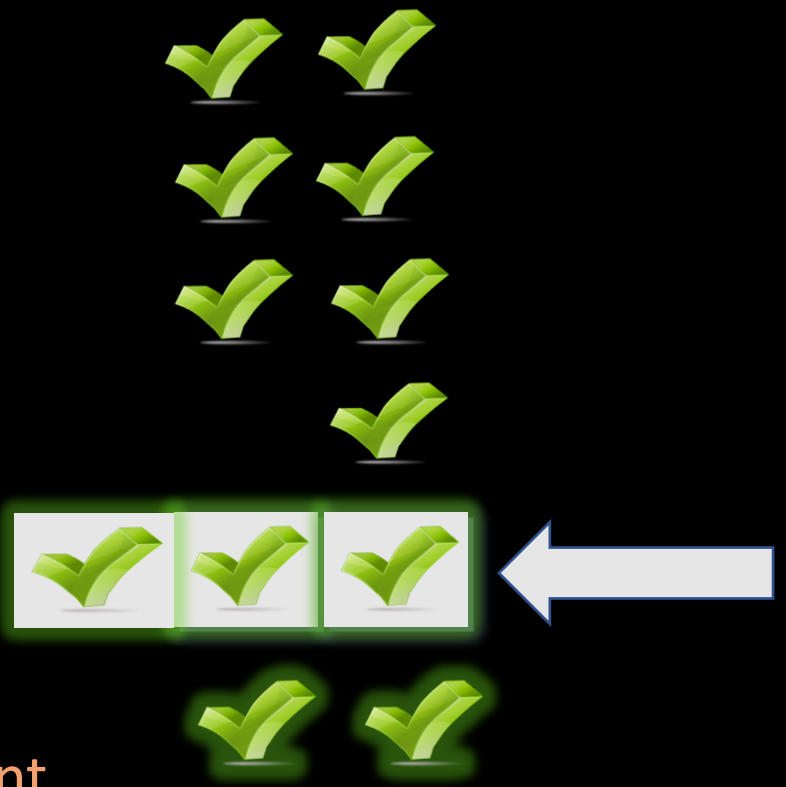
Diabetes/Smoking

Cleanable & Cleaned

Poor Plaque Control

Dentist Controlled

Prosthetic Systems
Cleanable, fit, excess cement



Murray Arlin. Analysis of 15,000 Dental Implants placed over a 30 year period. Spectrum Implants Special Issue Dec 2020.

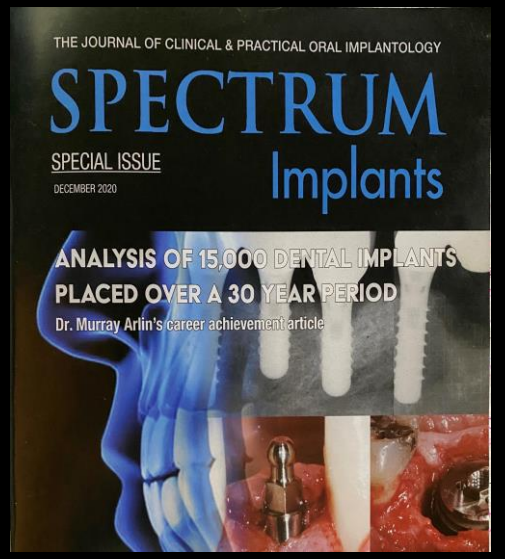
Dr. Arlin's Implant Survival Rate (Still in the Mouth)

5 % lost by 2 years

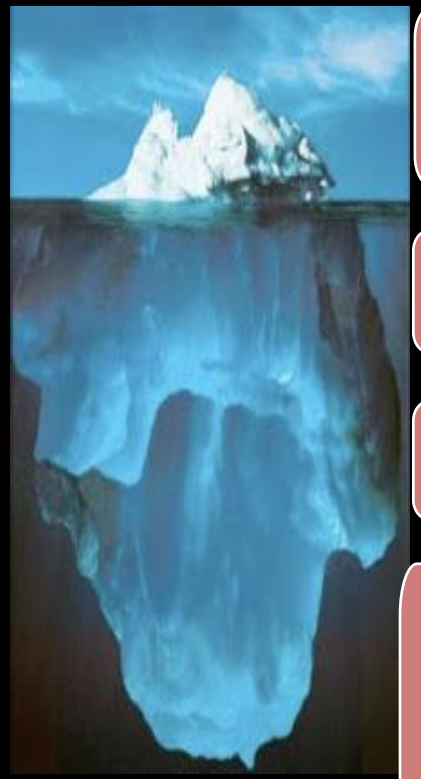
8 % lost by 10 years

These results are like many other studies

Looks pretty good at the Implant Level
What About the Patient's Experience?



Patient's Experience over 10 years



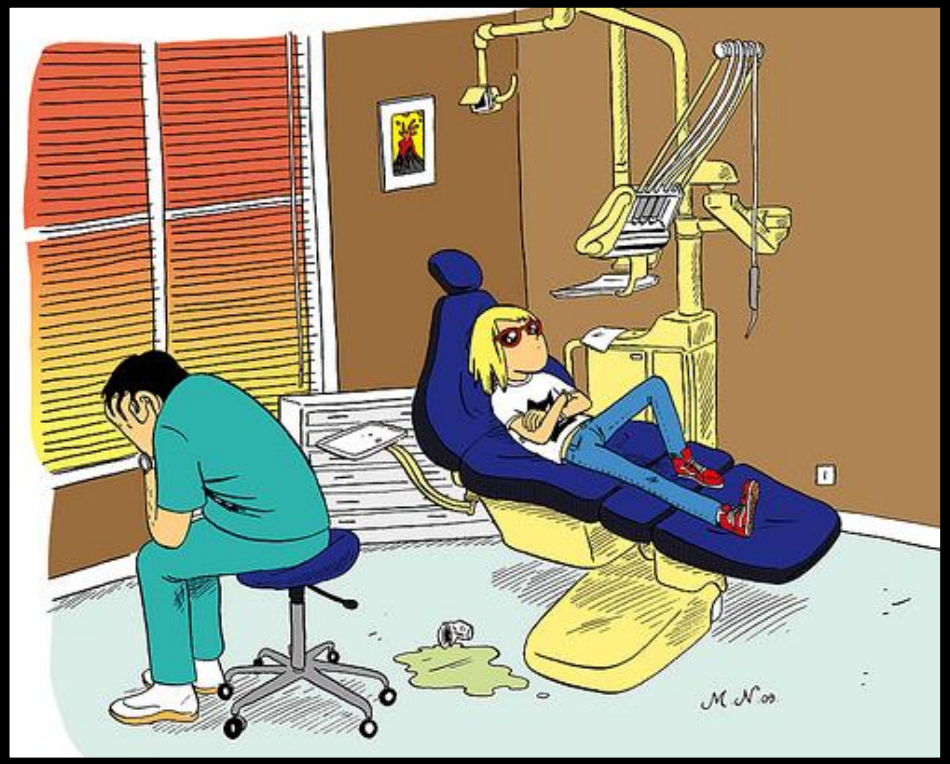
Implant Failures	14%
Peri-implantitis	20%
Mucositis	47%
*Peri-implant Disease &/or Failure	81% Ouch!

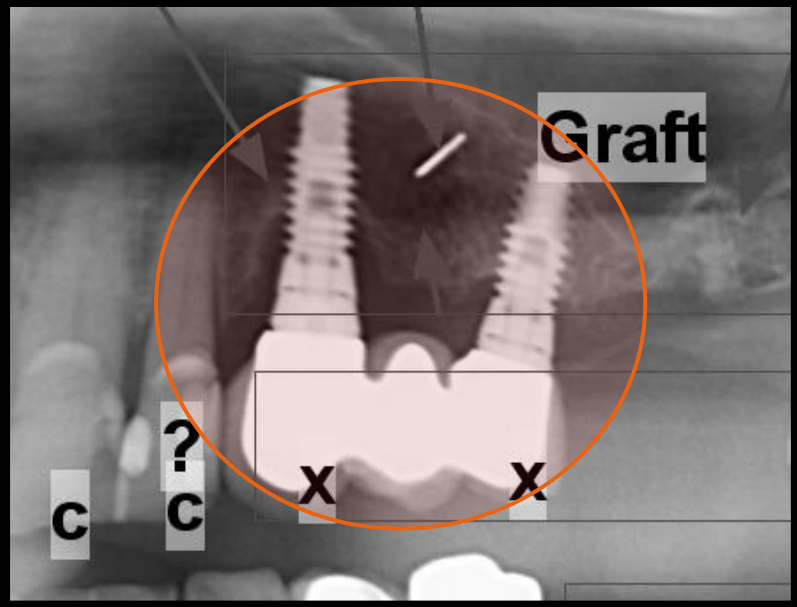
Interesting!

Same for Cement-in & Screw-in Installation

Evidence Based Research Results - Rokaya D et al. Peri-implantitis Update: Risk Indicators, Diagnosis, and Treatment. European J of Dentistry **2020**: V14, No.4:672-682. A Review

Complications Disappoint Patients & are Not Good for Business



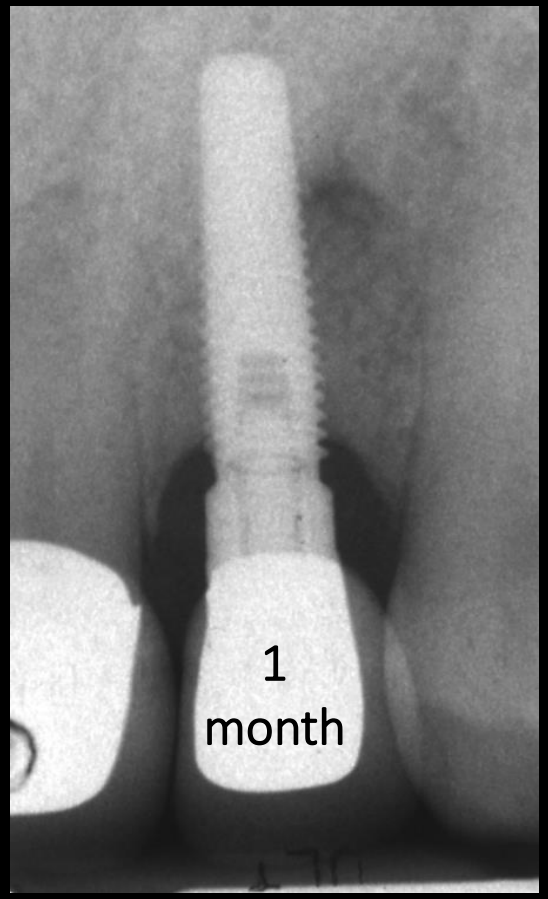


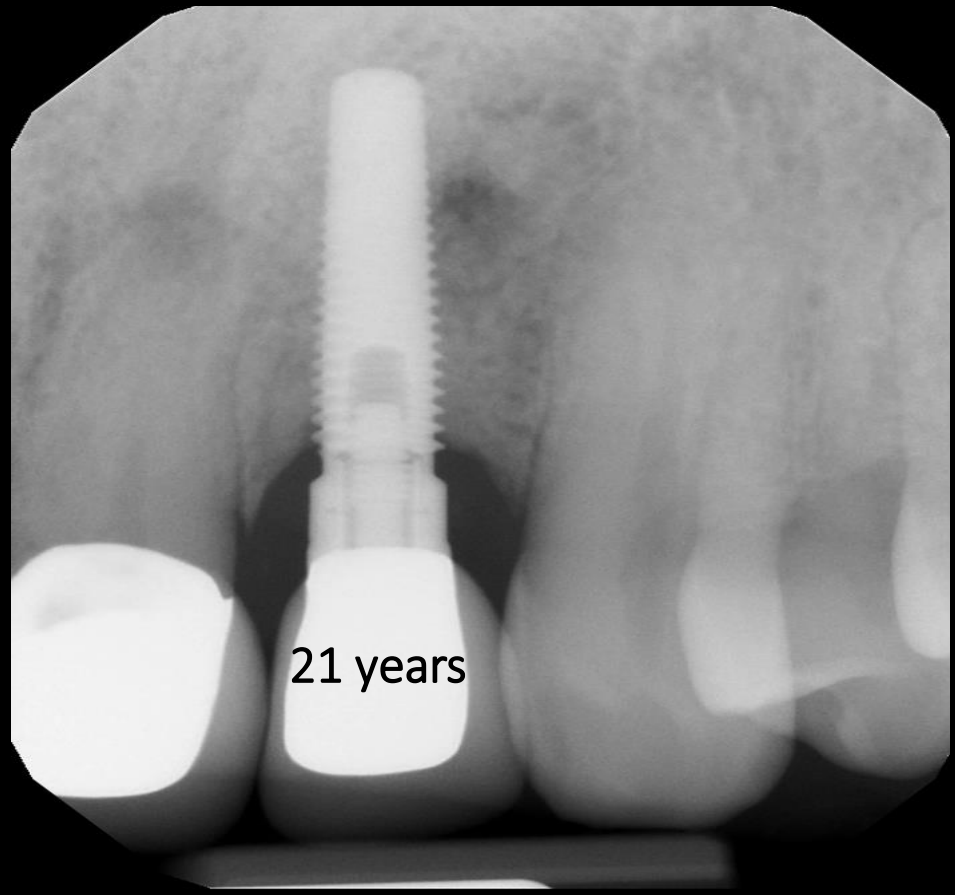
Stimulate a Whole Cascade of Liabilities for Dentists, Referral Sources, Labs, Implant Companies

Some implants in some patients can last a long time & tissues can look nice

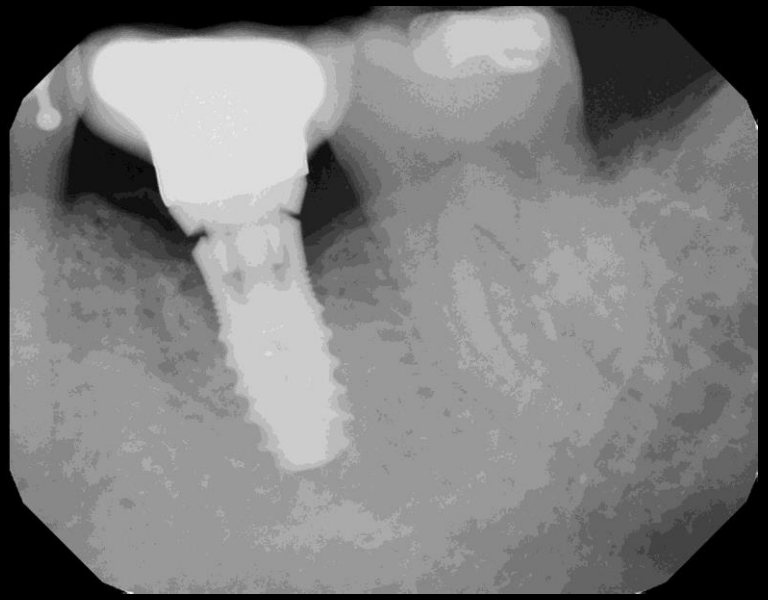
From Dr. Murray Arlin's & referring Dentists' Cases

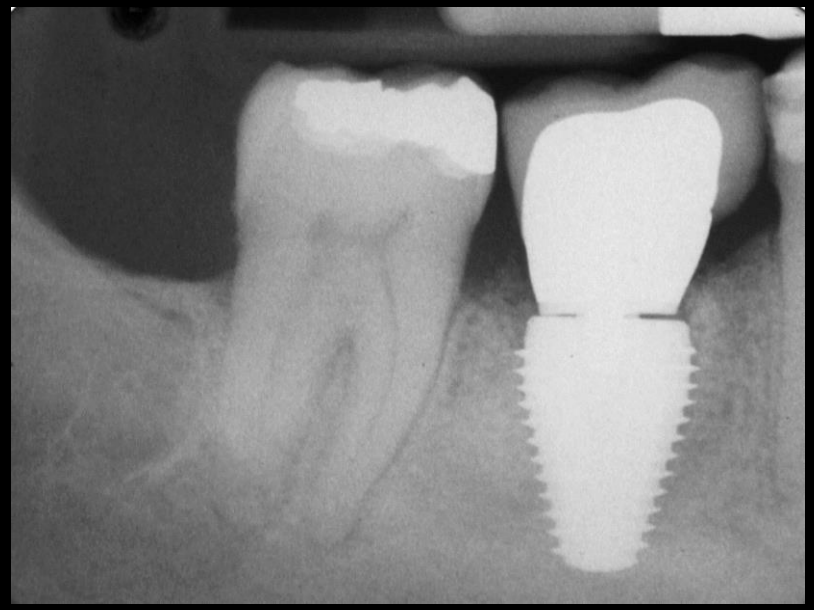
Connections & bone levels appear to be stable





These misfit connections are Macroscopic & easy to see in x-ray images.

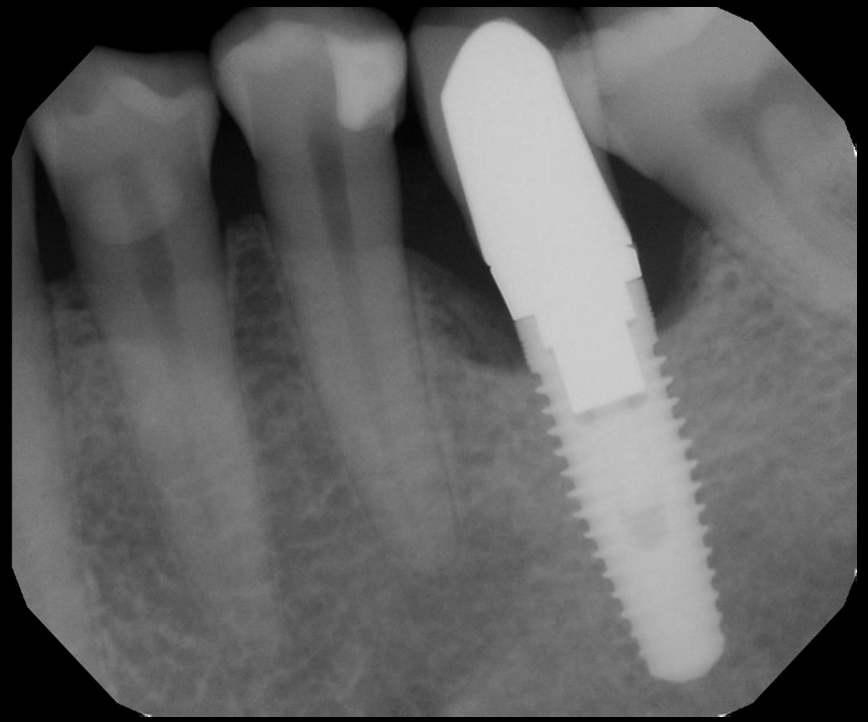




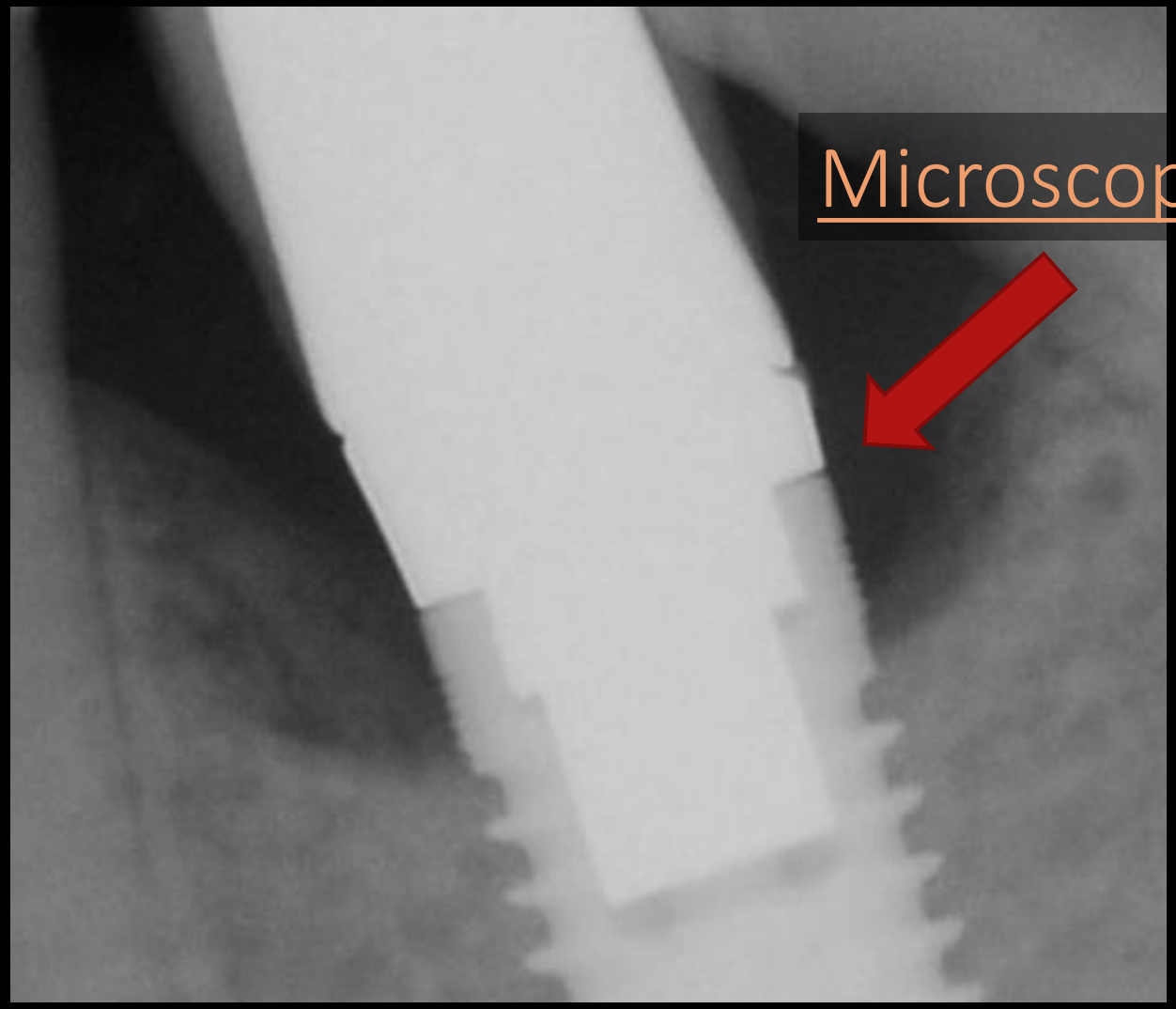
What causes these problems?
How can we prevent them?

Most Implant-abutment misfits are NOT easy to see

Mobile Abutment: Pockets > 9mm

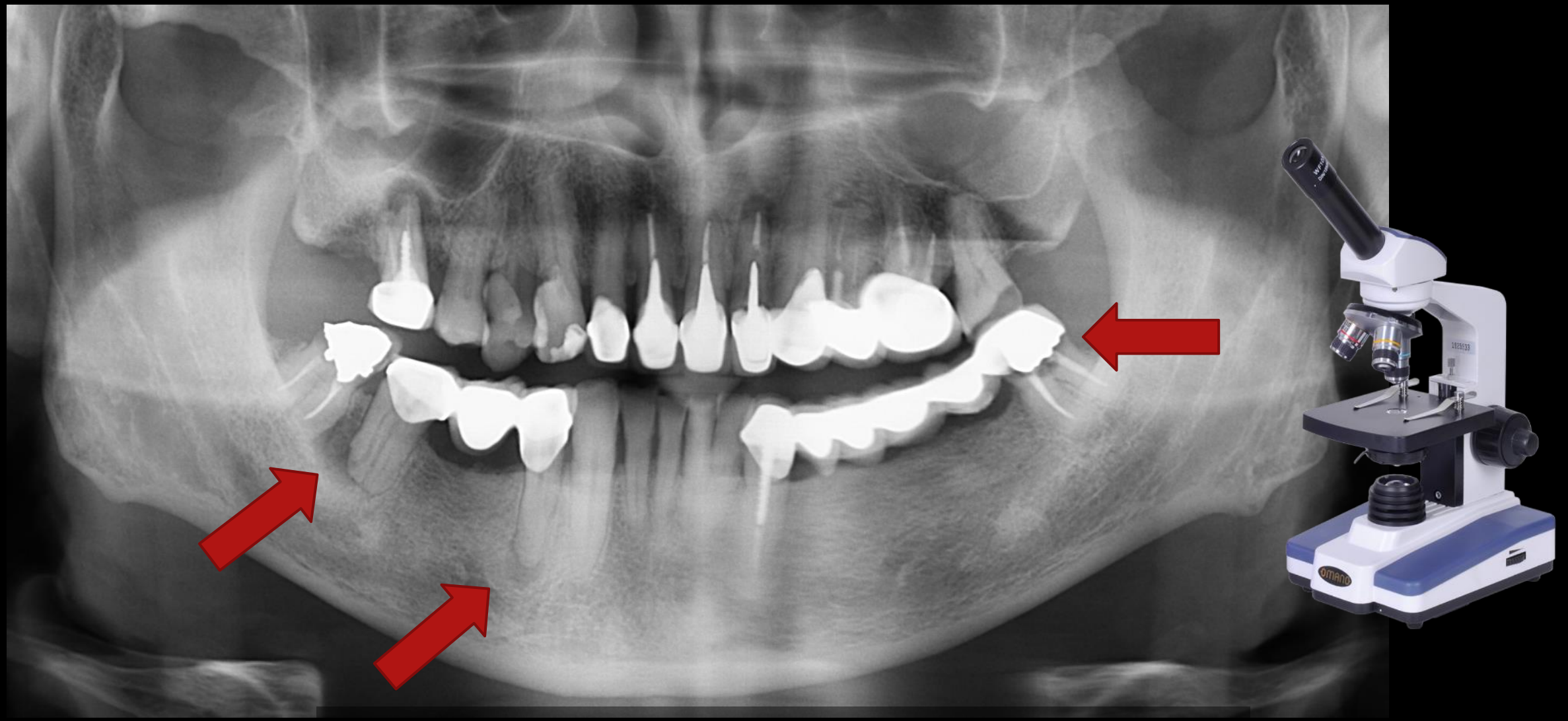


Damage is easy to see



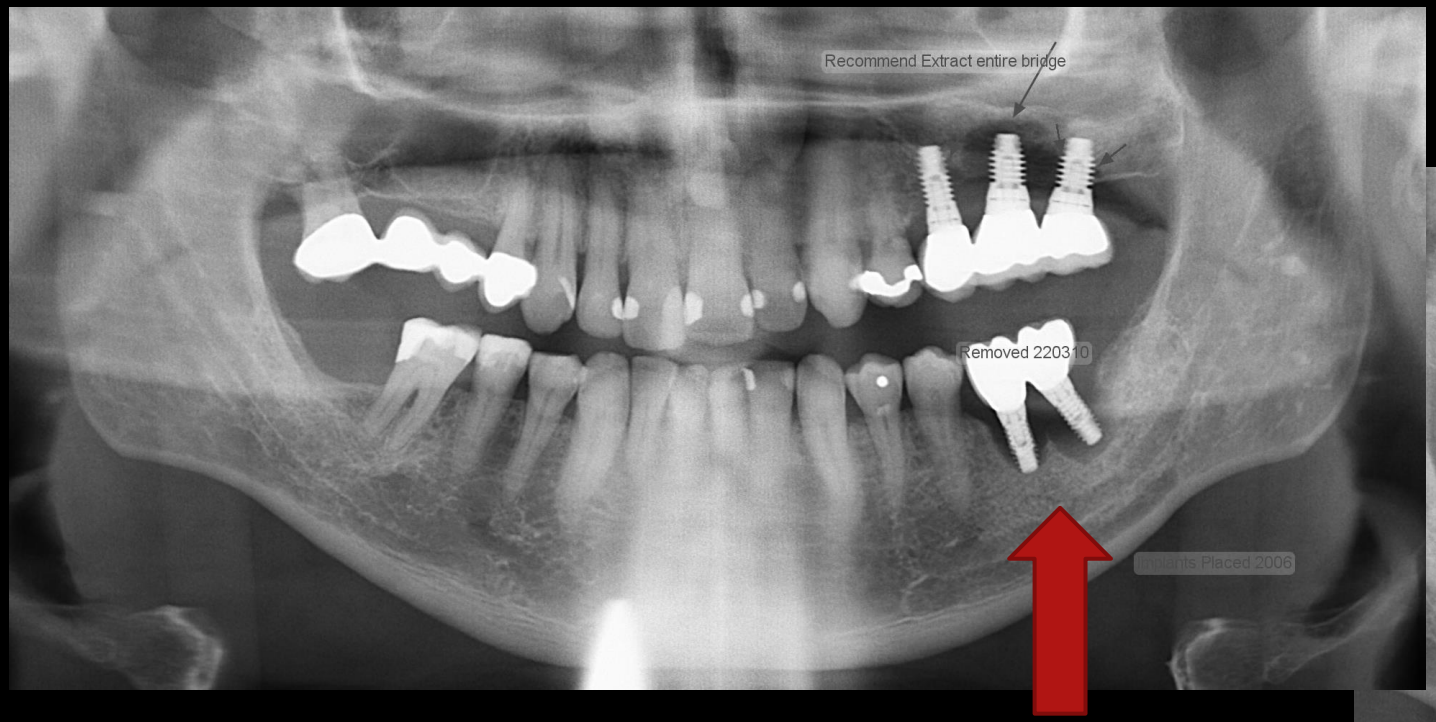
From Dr. Murray Arlin's Cases

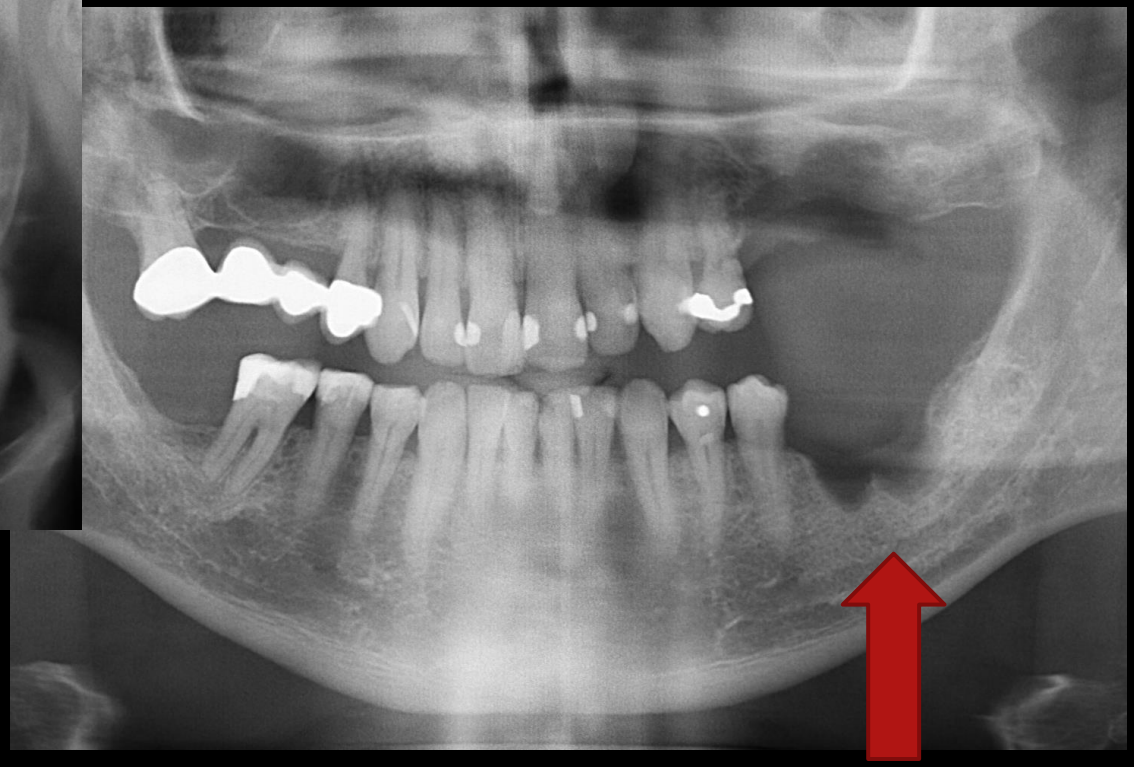
All these diseases originate Microscopically



Their extensive damage is easy to see

Peri-implant Disease originates Microscopically





Its extensive damage is easy to see

Some Like Arguing for an Acceptable Amount of Implant-Abutment Misfit

10 µ (Branemark 1985), 150 µ (King et al 2002)

BUT … Bacteria can colonize a 1 µ gap (Herman et al 2001)

Adverse consequences include:

Peri-implantitis (O'Mahoney et al 2003)

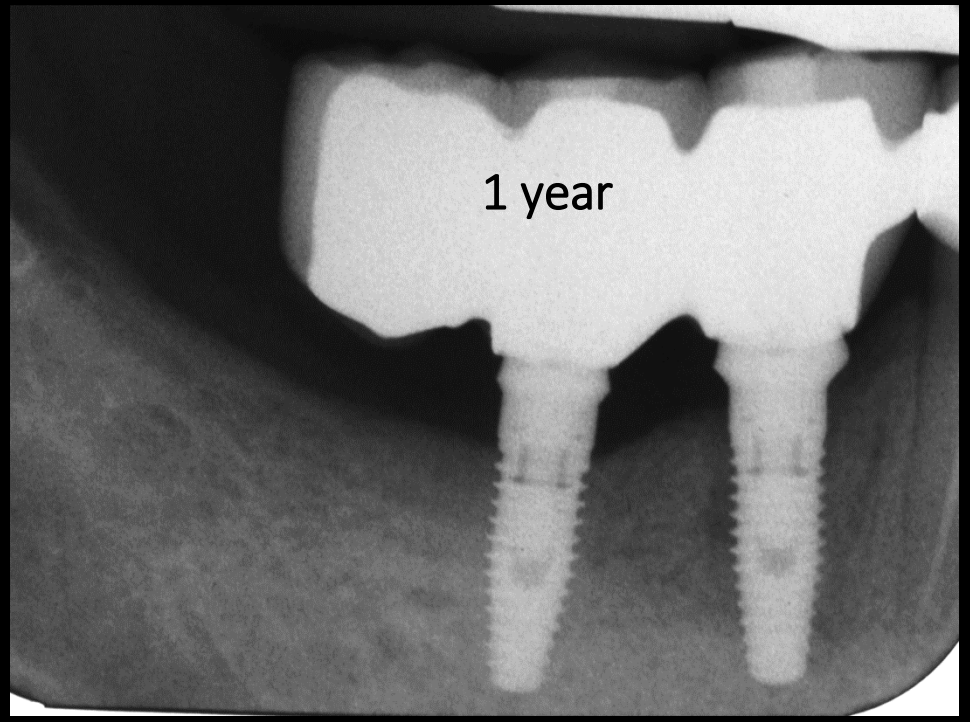
Screw loosening / fracture (Steinebrunner et al 2008)

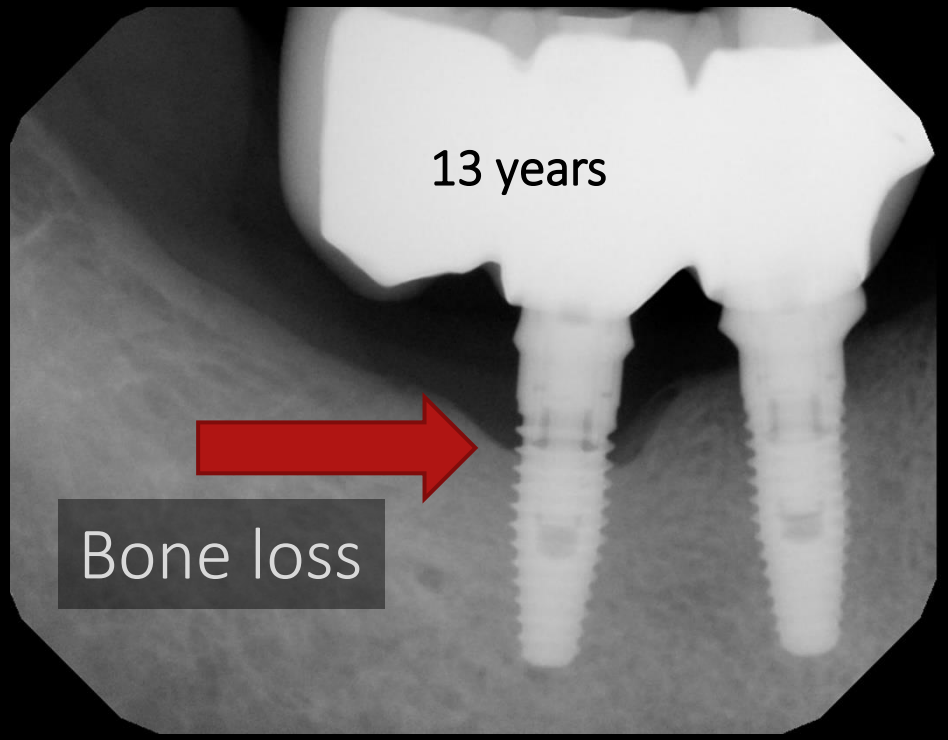
Wouldn't Patients expect Connections be Optimized in the Mouth to be predictable according to Health Canada & FDA Test results?

Are Preventable Misfits Really Acceptable?

Unseated Prosthesis/Open Margins

Is there also Subgingival Cement?





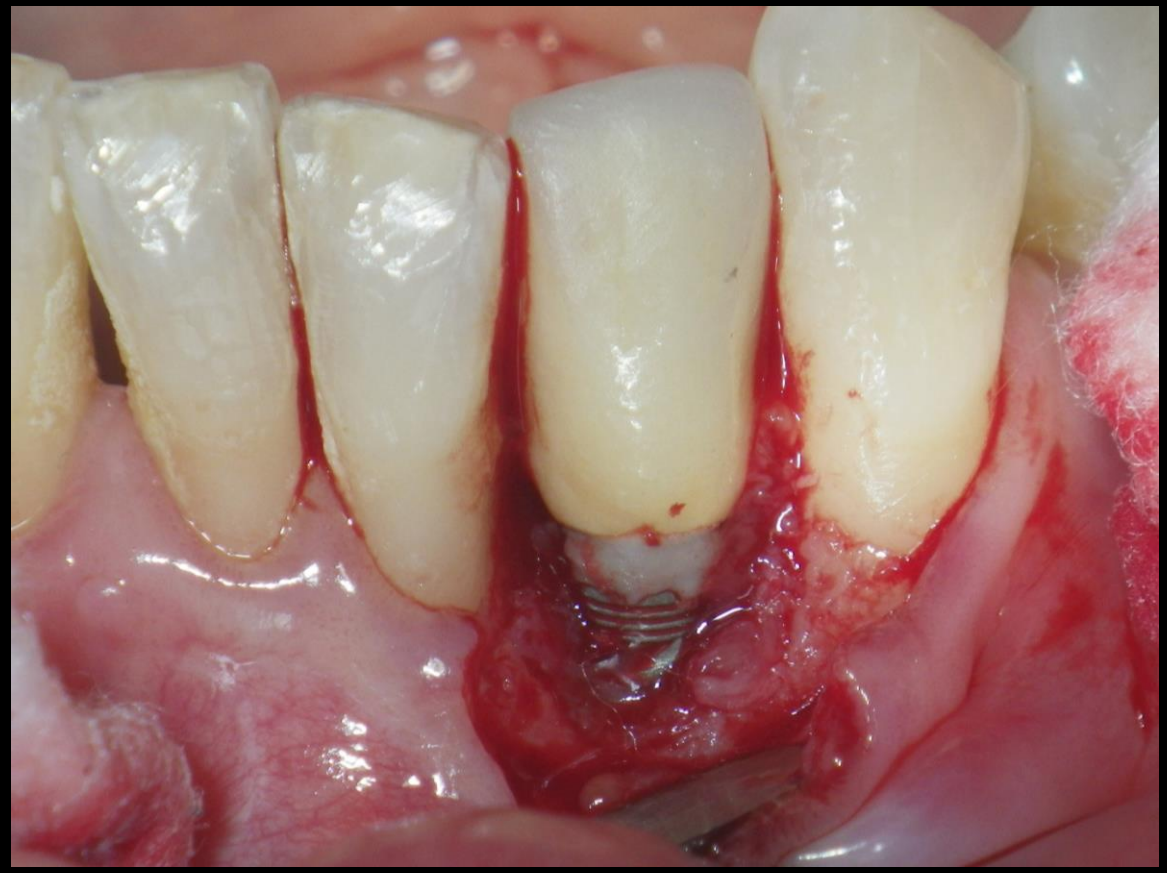
What causes these problems?

Why has the peri-implant bone resorbed?

Can this be prevented?

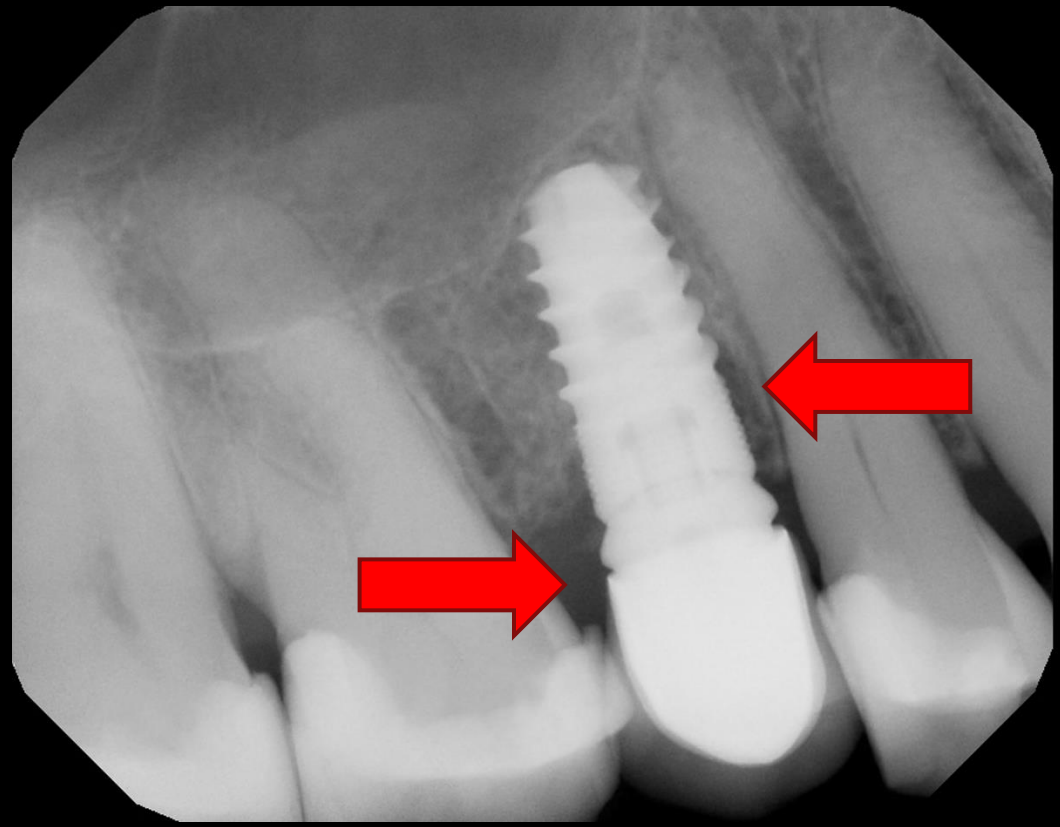
Residual Subgingival Cement can be difficult to see on x-ray images

The Damage is easy to see



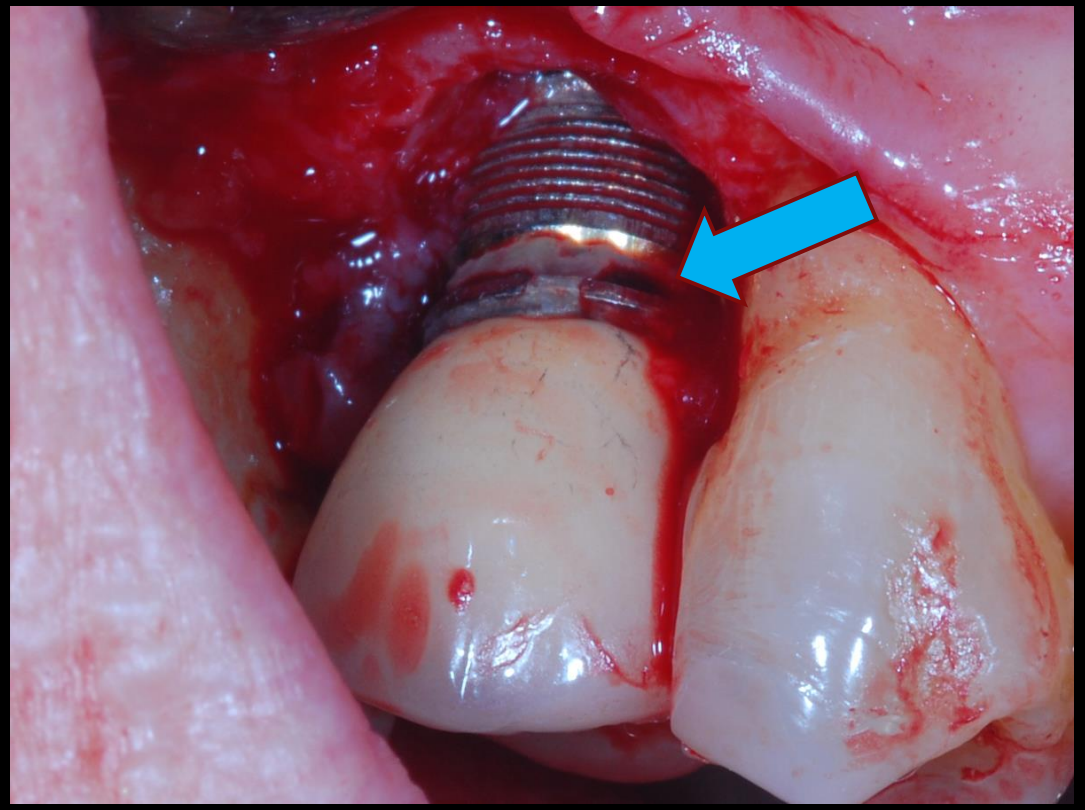
Why is this type of problem still so prevalent?

Open margin, subgingival cement & bone destruction



Why is this still such a common problem?

Open margin, subgingival cement & tissue destruction



To prevent problems, we need to know their root causes!

NO Predictable Treatment For Peri-Implantitis

78% of their sample Screwed-in Prosthetics

Primary Prevention of peri-implantitis: Managing peri-implant mucositis
Jepsen S et al. J Clin Periodontol 2015;42 (Suppl. 16) S152

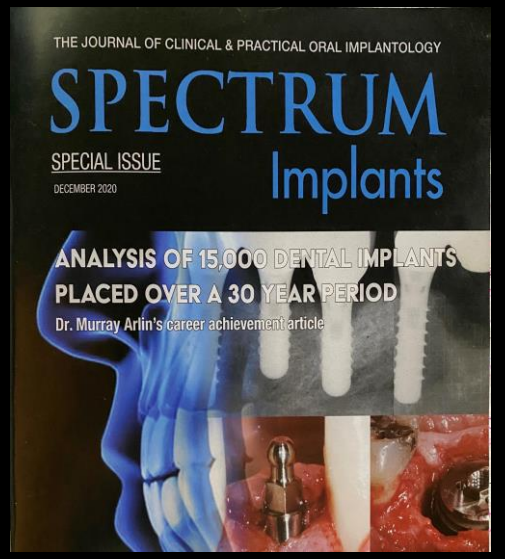
Prevention is Key!

Why didn't Dr. Arlin's Implant Survival Rate improve over 30 years?

5 % failures by 2 years &
8 % by 10 years

1999 Group ~ 2019 Group

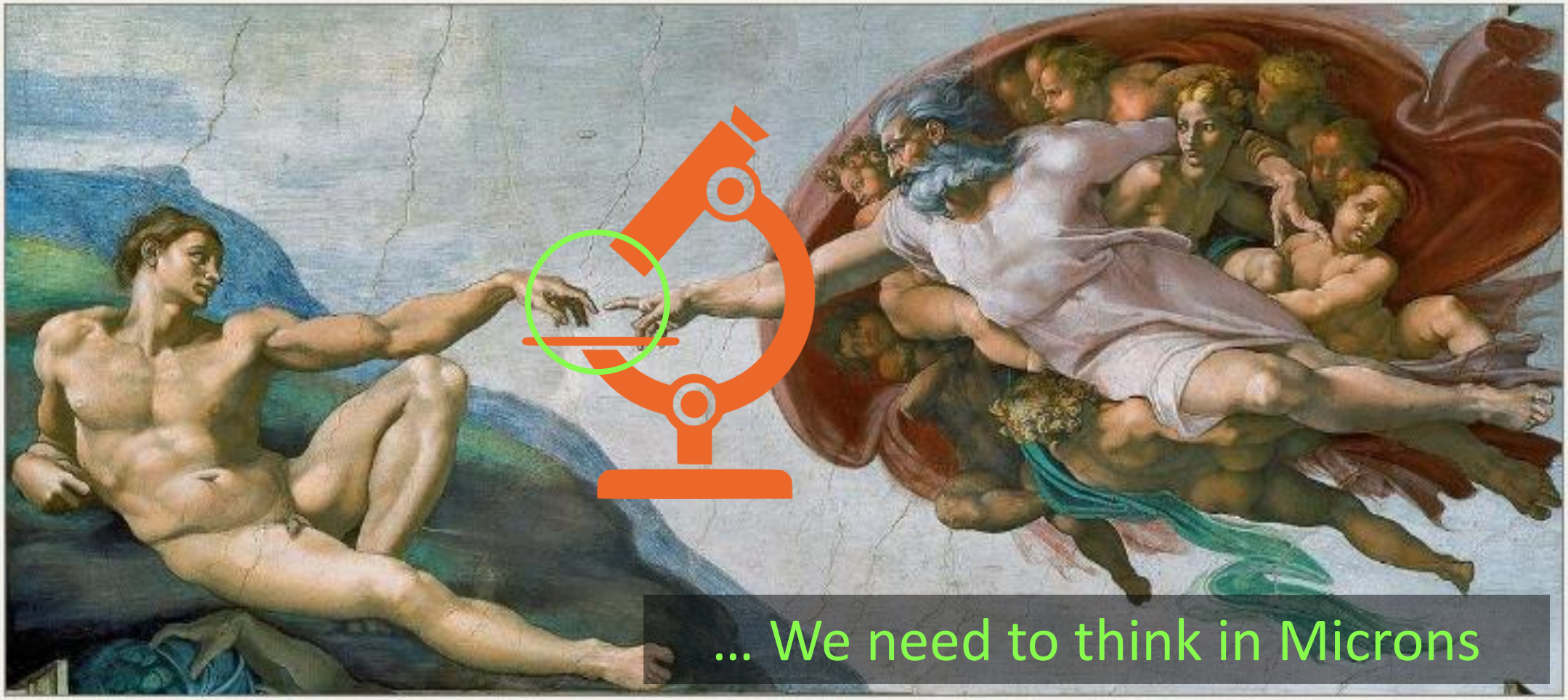
Are we still missing something important?



What Frustrates the Dentist's Efforts to do a better job?
What are the Flaws in our current installation systems?
Who suffers the complications most?

When Patients Suffer, Dentists Suffer TOO!

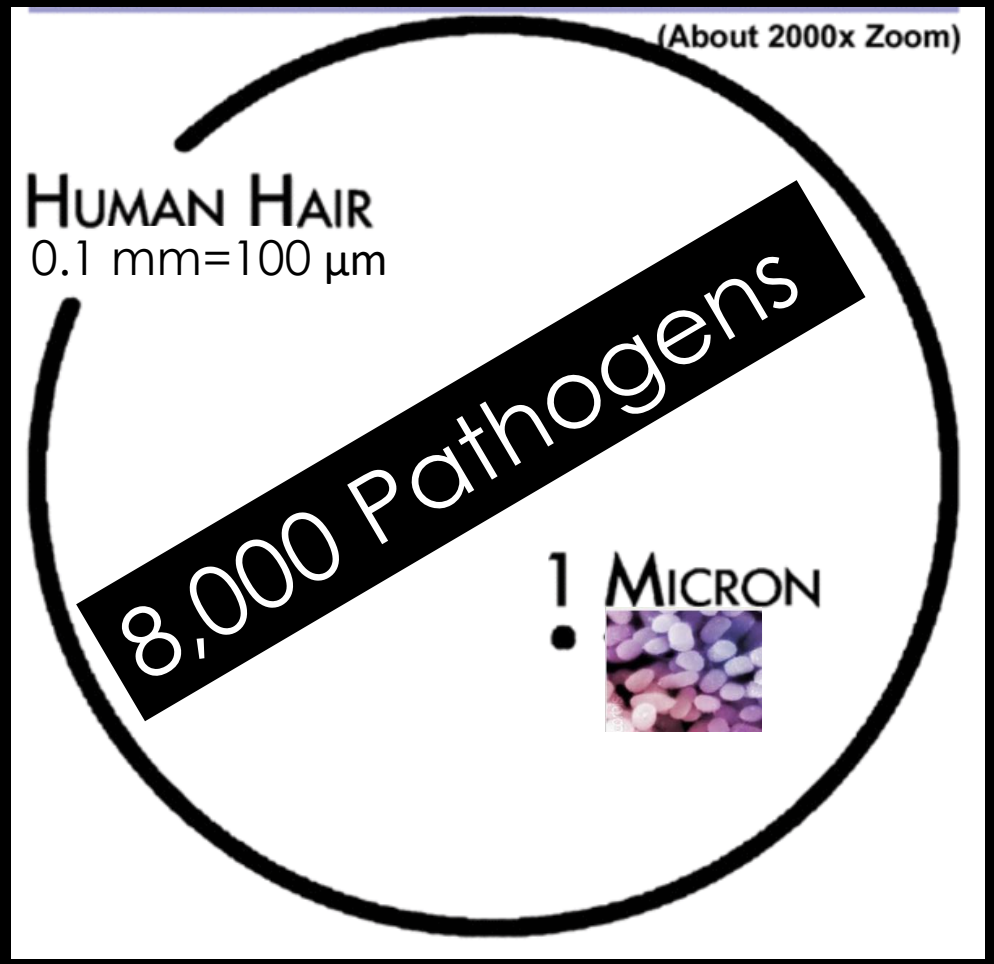
To reduce complications .....



Courtesy of www.Michelangelo.org

… because even Microscopic Mechanical problems predispose our patients to diseases caused by Microbes

Microscopic

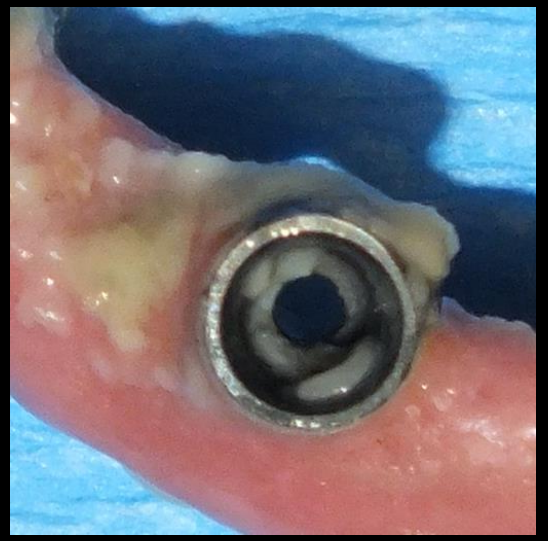


8 Million/mm

32 mm perimeter

A Billion Pathogens

In Microbiology SIZE MATTERS!



Size of Inoculum

Host Resistance ⟷ Pathogen Virility

Disease

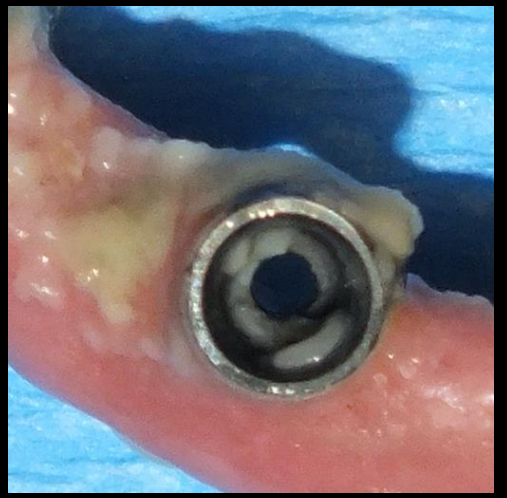
too many

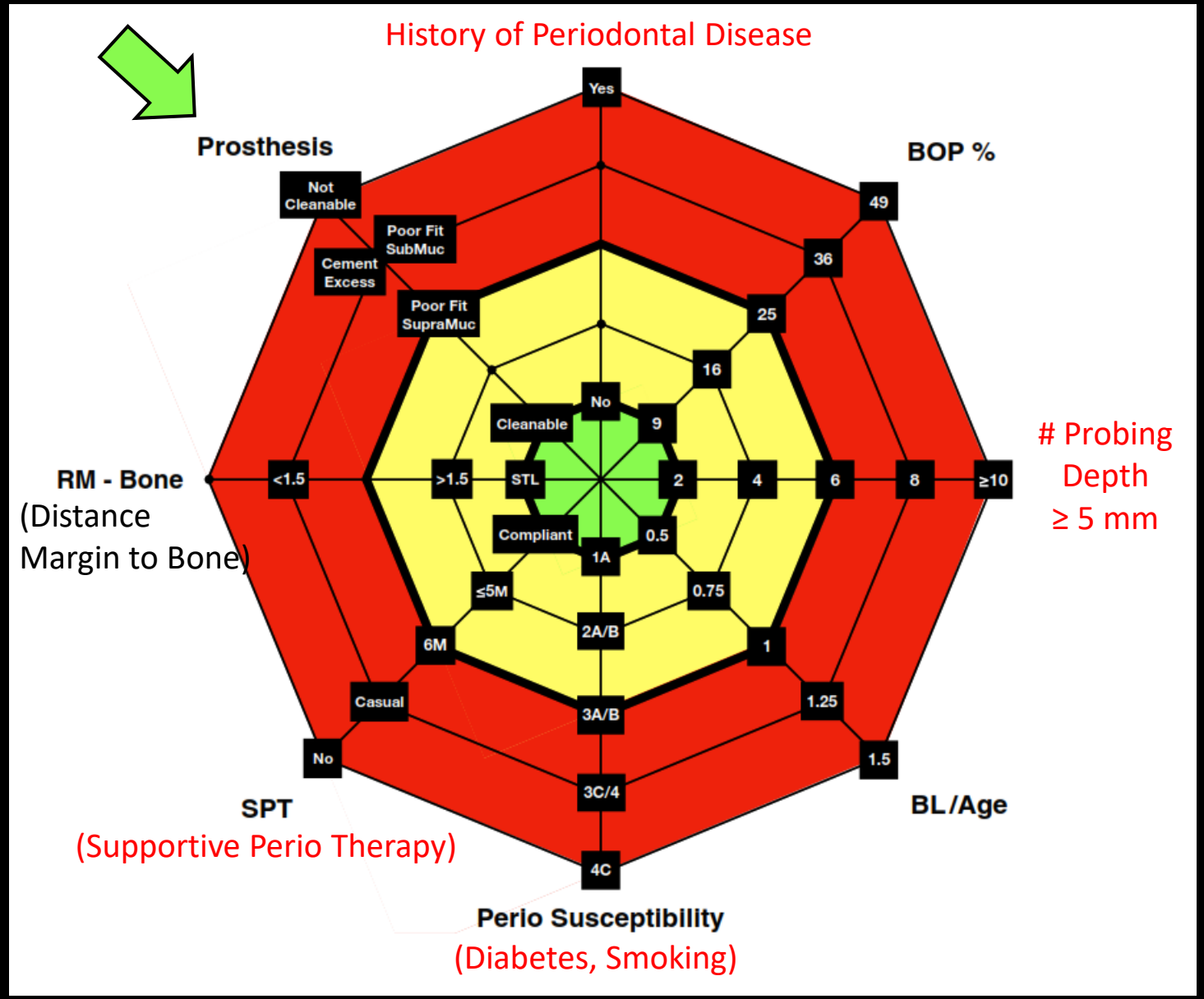
too weak

too strong

Phagocytosis

Too many
to eat &
Too difficult
to clean

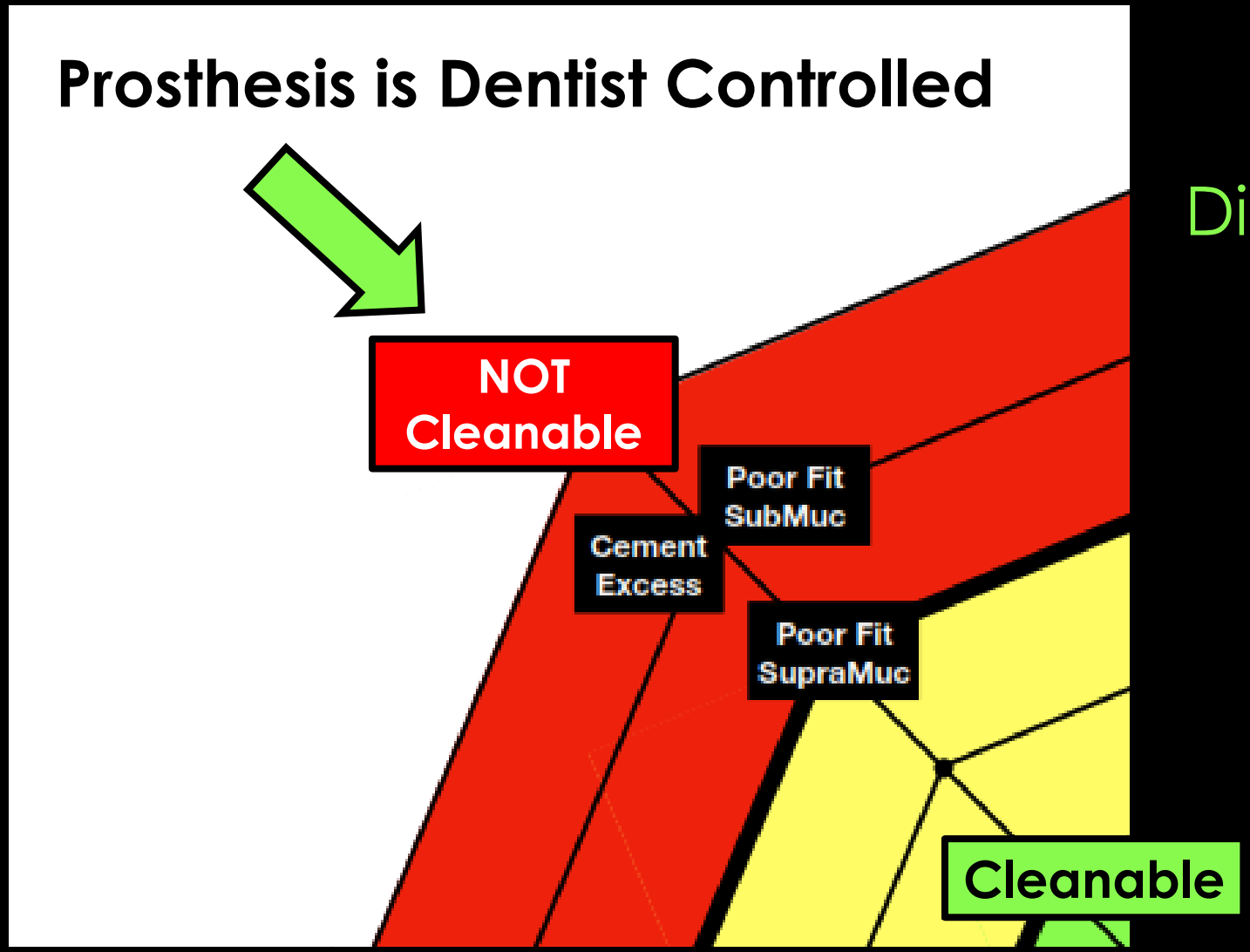




Peri-implant Disease Risk Assessment

Where do Dentists need to Focus their Attention?

Heitz-Mayfield LJA, Heitz F, Lang NP.
Implant Disease Risk Assessment IDRA - a tool for preventing peri-implant disease. Clin Oral Impl Res. **2020**;31:397-403.



Peri-implant Disease Prevention by Reducing these known Risk Factors for Disease

Heitz-Mayfield LJA, Heitz F, Lang NP.
Implant Disease Risk Assessment IDRA - a tool for preventing peri-implant disease. Clin Oral Impl Res. **2020**;31:397-403.

Part 2 of 4

Identifying the Root Causes of Mechanical Risk Factors for Peri-Implant Disease inherent to current Prosthesis Installation Systems

Slides 30-50

What causes Treatment Complications?

Let me tell you about the
Root Causes
of
Mechanical Problems
that expose
Our Patients to Risk Factors for
Peri-implant disease

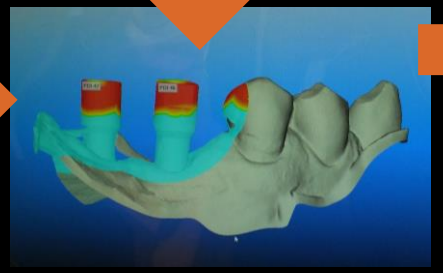
Knowledge is the
Foundation of Prevention

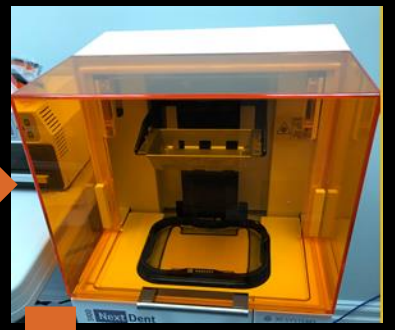
What are the ROOT causes of these Mechanical Problems …

- Loose and tight contacts
- Misfit implant parts (joint instability, implant & screw breakage, spaces for oral pathogens to breed and attack adjacent tissues)
- Hyper-occlusion
- Poor prosthesis margins (open, overhanging & overextended margins & subgingival cement)

… that predispose patients to Peri-implant Disease?

Indirect Prosthesis Manufacture has many finicky steps & poor tissue management tools





Lab Makes the Prosthesis Fit a Dental Model

BUT

Dental Model ≠ Mouth

in Dimensions, Composition nor Dynamic Behavior in Living Tissues

Implant Manufacturing is BIG Business

Digital vs Reality
Tolerances

Henrik Andersen

PhD

Elos Medtech
@ElosMedtech

ELOS MEDTECH SIGNS GLOBAL DISTRIBUTION AGREEMENT WITH NOBEL BIOCARE

Elos Medtech and Nobel Biocare have been business partners over 25 years and we are now expanding the collaboration within the growing market of digital dentistry 🦷

elosdental.com/in-focus/elos-...

Nobel Biocare™

ELOS MEDTECH

Andersen, Henrik. PhD. Influences Affecting Print. 2021 Webinar: https://www.dropbox.com/s/3t1jqlgzp6owwdx/influences%20affecting%20print%20%281%29.mp4?dl=0

Prosthesis Dimensional Error is the sum of all the errors inherent in the making of a prosthesis (Errors are 3-D)

Passive fit of a dental restoration is influenced by the following tolerance stack up:

- Position tolerance of Scan Body in implant. +/-5 µm
- Tolerance of Scan Body. +/-8 µm
- Scanning tolerance. +/-15 µm
- Print tolerance of 3D printer. +/-75 µm
- Position tolerance of Model analog in 3D printed model. +/-25 µm
- Tolerance of Model Analog. +/-10 µm
- Position tolerance of Hybrid base in Model analog. +/- 5 µm
- Milling and sintering tolerance of ZrO_2 bridge. +/-15 µm
- Hybrid base on implant. +/- 5 µm

PDE ±163 µm

This is from an in vitro study & error terminology is 2-D

Andersen, Henrik. PhD. Influences Affecting Print. 2021 Webinar: https://www.dropbox.com/s/3t1jqlgzp6owwdx/influences%20affecting%20print%20%281%29.mp4?dl=0

Industry can produce connecting parts with

Verified Tolerances ± 5 µm

DENTISTS need to learn to exploit this amazing technology …

… BUT educators & clinicians are still stuck
with ancient designs & protocols cannot work

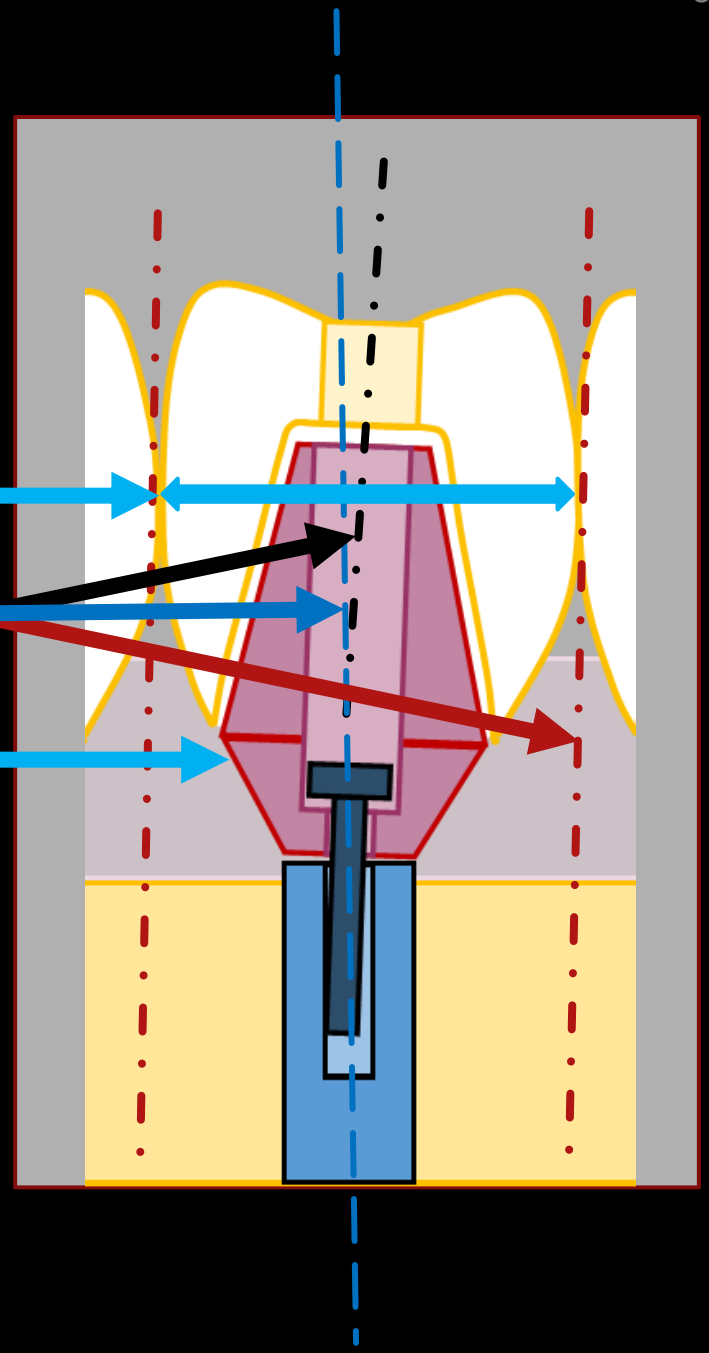
Are crowns and bridges accurate and precise?

Dentists usually
need to adjust
Contacts, Fit & Occlusion
on installation day

Do you really think dentists can adjust at ± 5 µm with these tools?

The ROOT causes of Mechanical Complications

1. Prosthesis Dimensional Error
2. Incongruent Paths of Insertion
3. Tissue Effect-Resistance to Displacement

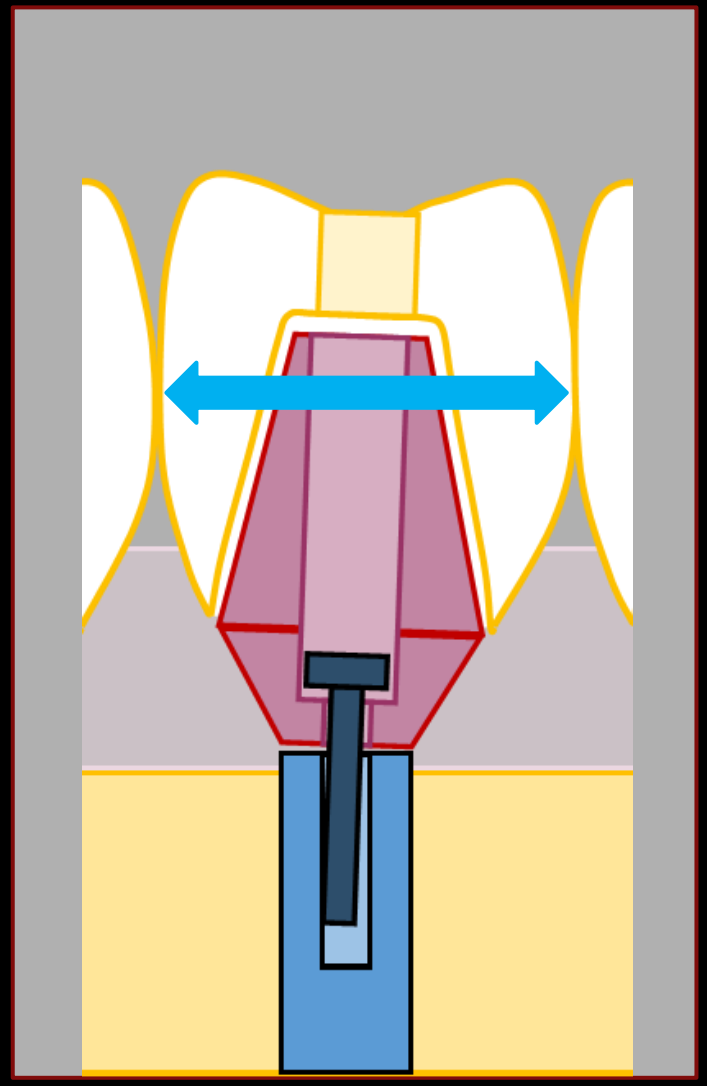


These Predispose patients to Biological Problems

1. Prosthesis Dimensional Error (PDE)

PDE is the culmination of all the 3-D errors involved in the construction of a prosthesis.

Prosthetic systems that are to be installed by the Screw-in System are simply not designed to safely manage expected PDE within the potential tolerances of their embedded connecting parts



Svoboda ELA. New Dental Terminology for Exposing and Mitigating the Root Causes of Installation Related Treatment Complications. Aug 2021: www.ReverseMargin.com, pg 1-13.

Svoboda ELA. Fixed Prosthesis Installation: An Aviation Analogy Considering 3-D Position, Yaw, Pitch and Roll. Nov 2021, www.ReverseMargin.com, pg 1-6.

PDE & the Screw-in System of Installation

PDE ±150 µ

Tolerance ±5µ

Flawed Concept: Let's embed abutments into a prosthesis (±150 µ) on a dental model & hope to make those abutment connectors (±5µ) fit into/onto implants (±5µ) fixated in the mouth

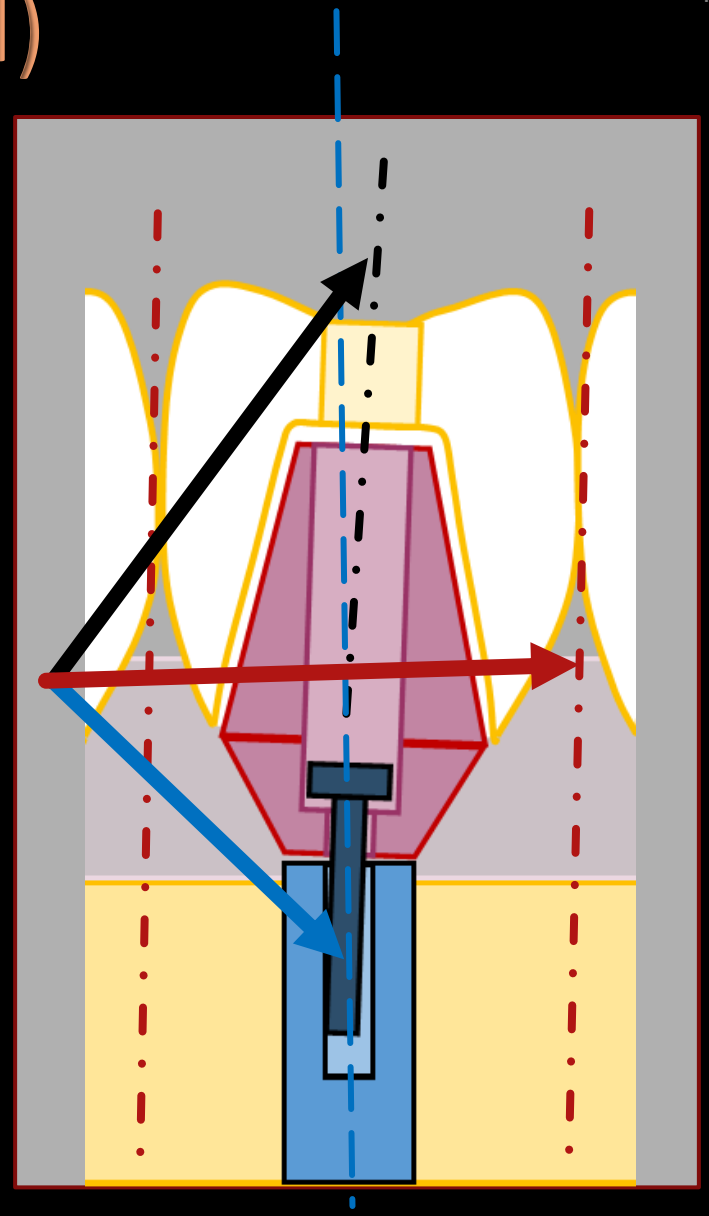
How can this system be expected to work properly?
How can dentists prevent misaligned/misfit joints?

Andersen, Henrik. PhD. Influences Affecting Print. 2021 Webinar: (In vitro)
https://www.dropbox.com/s/3t1jqlgzp6owwdx/influences%20affecting%20print%20%281%29.mp4?dl=0

2. Incongruent Paths of Insertion (ICPOI)

A Screw-in Prosthesis has a specific path of insertion (POI) determined by their embedded abutment(s), adjacent teeth and fixated implant(s)
It is highly unlikely that all these POIs will be congruent at ±5 µm and that it is possible to optimize the fit of the embedded abutments!

An abutment without a prosthesis attached will have its POI determined by the position and orientation of its complimentary implant.
It is possible to make the position and POI of each abutment congruent with its complimentary implant and to optimize its fit

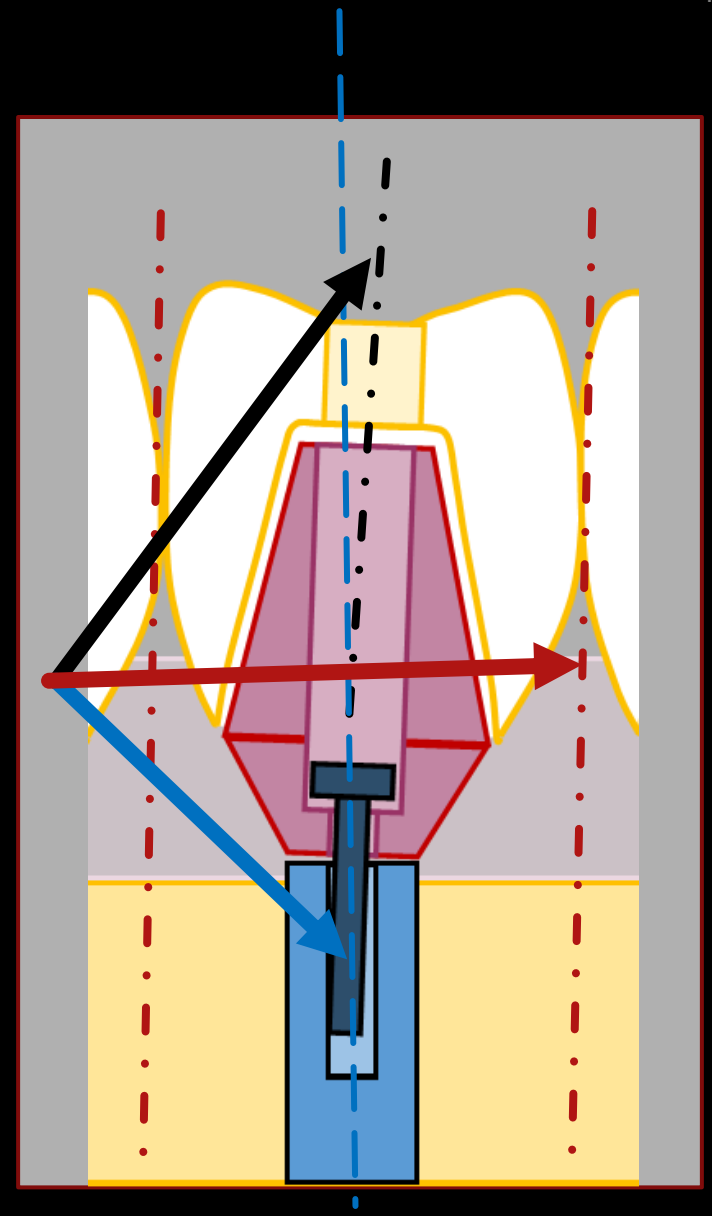


“Easy Retrievability by screw removal requires congruency of connectors or tolerance to expected error ”

Congruency is almost impossible to achieve among the many elements involved in the making and installation of a Screw-in prosthesis.

Retrievability without congruency requires Manufacturers to create “sloppy fits” to help dentists “fake the precision fit of their components”.

These sloppy fits and misfit parts create space and joint instability that exposes the patient to infection and peri-implant disease

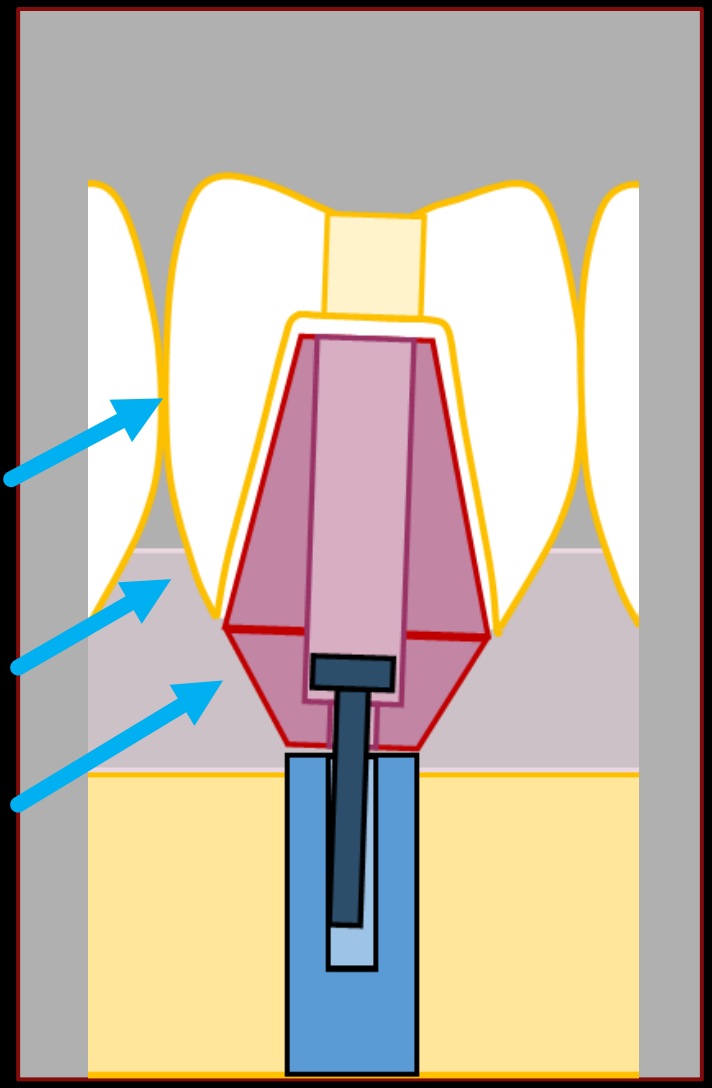


Easy Retrievability can be very expensive for the Patient!

3. Tissue Effects

Resistance to Displacement Effects (RTDE)
can impede the proper seating of the abutment and prosthesis by tissue entrapment and/or displacement, and can thus cause misfit connections

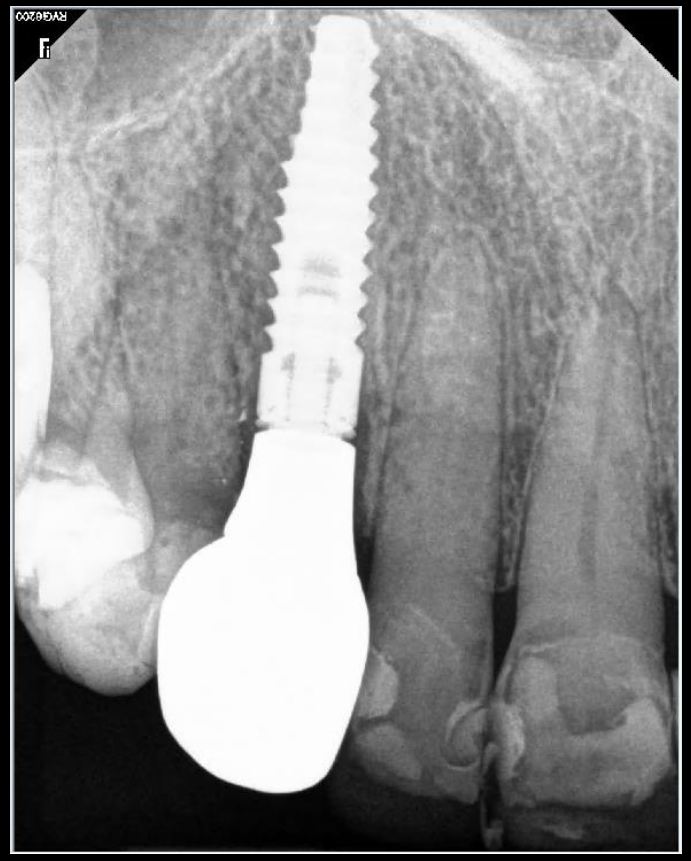
Gingival Effects (GE)
are a major cause of excess cement in the subgingival environment



Svoboda ELA. New Dental Terminology for Exposing and Mitigating the Root Causes of Installation Related Treatment Complications. Aug 2021: www.ReverseMargin.com, pg 1-13.

These Root causes of Mechanical Problems can act individually or together to cause …

1. PDE (Tight contact(s)?)
2. ICPOI (Tight contact(s)?)
3. RTDE (Tissue resistance?)

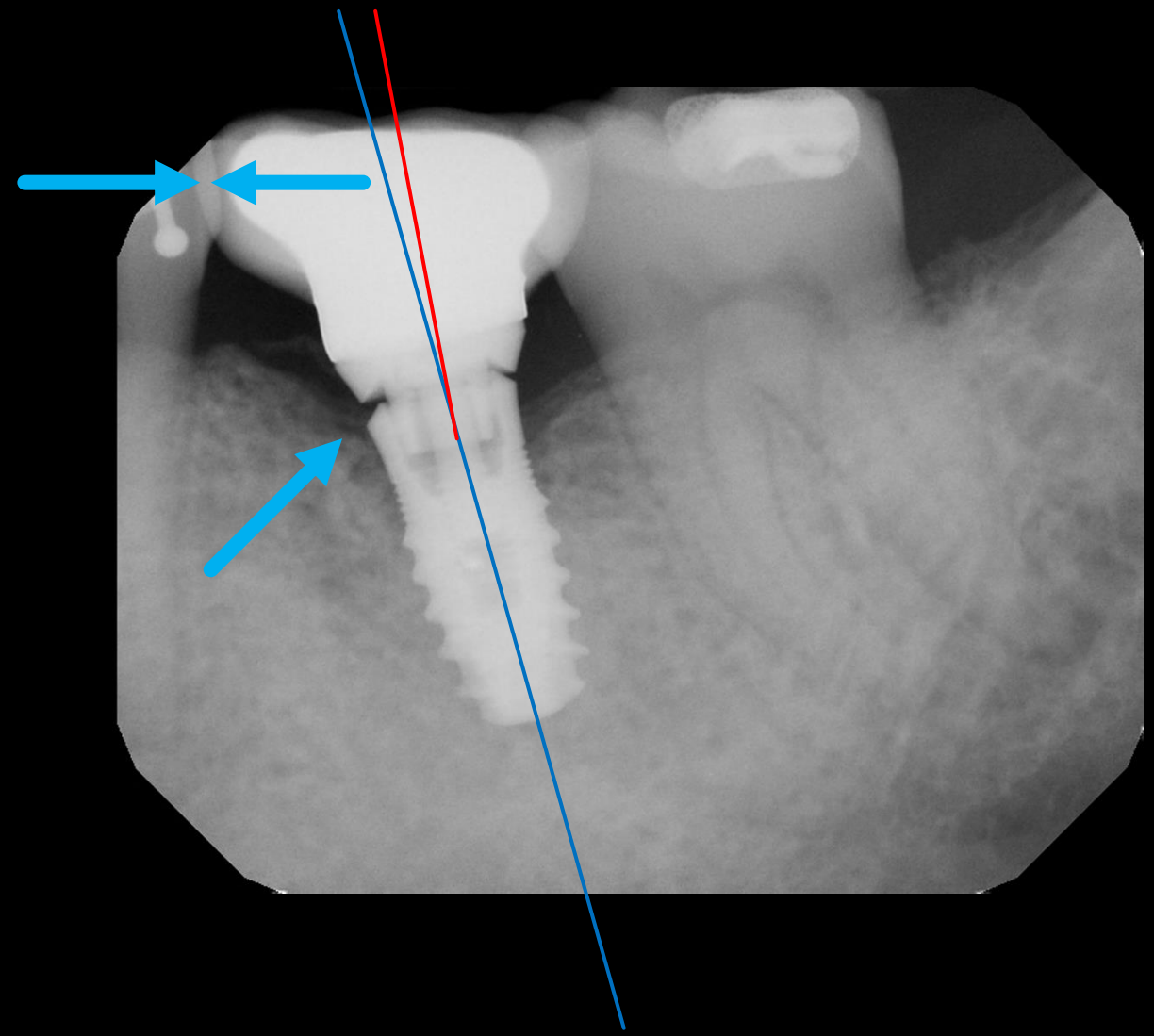


… separation of the Zirconia abutment shape from its Titanium base

Carl Misch: 35 Ncm torque is enough to draw 2 boxcars together on a level track

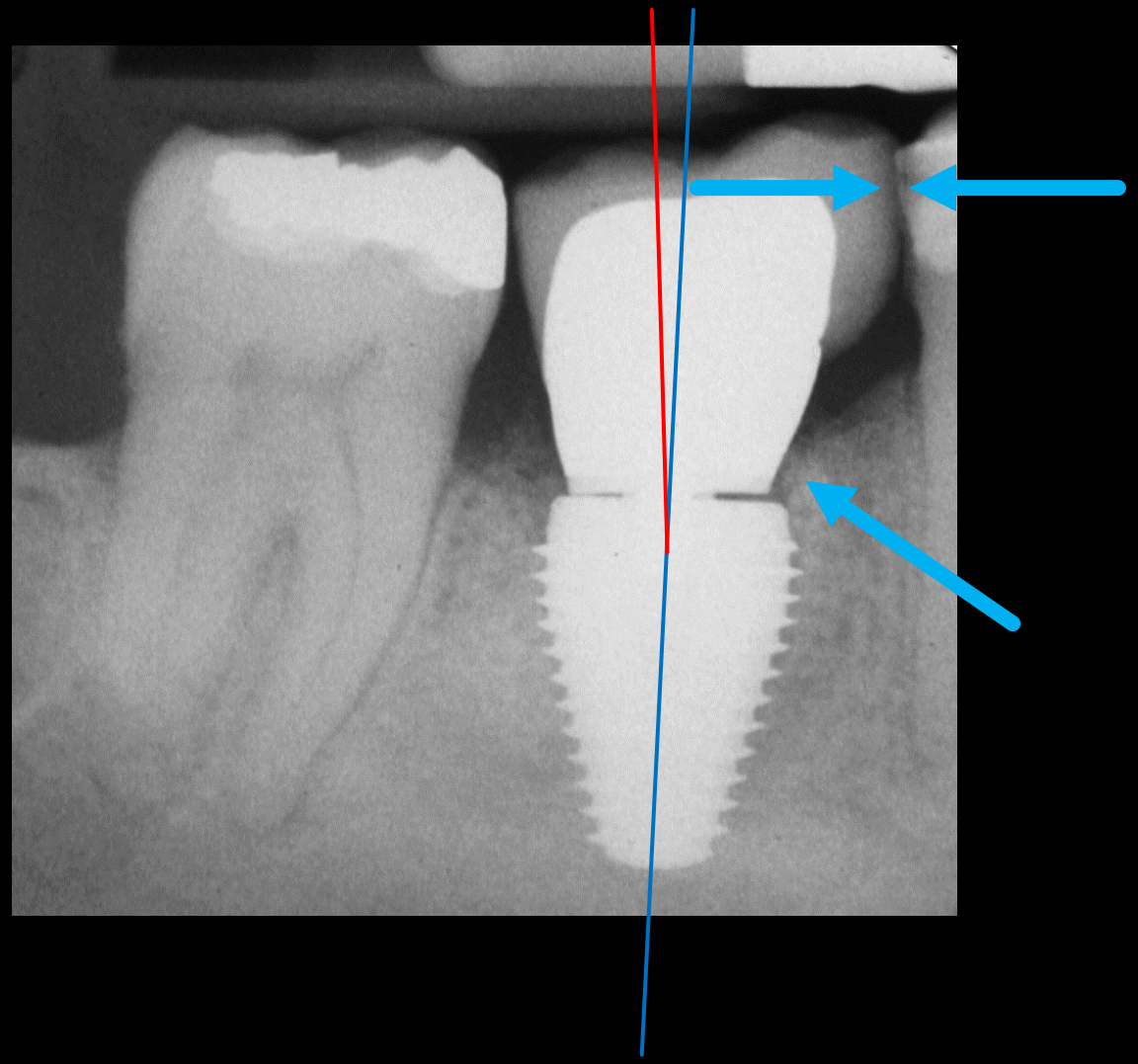
These Misfits are Macroscopic & Easy to See

1. PDE (Tight Mesial contact?)
2. ICPOI (Tight Mesial contact?)
3. RTDE (Mesial Tissue entrapment?, Tight Mesial contact?)

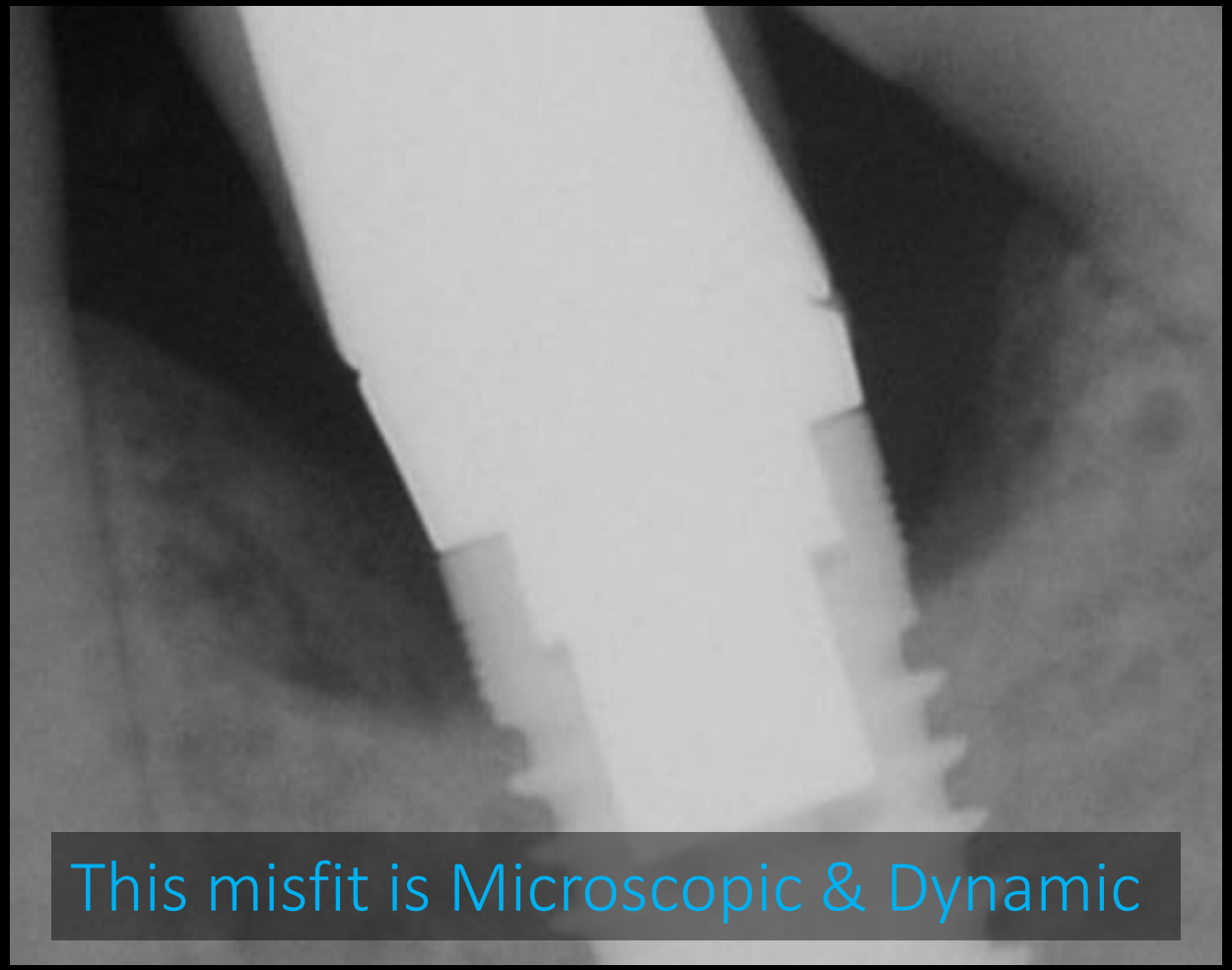


These Misfits are Macroscopic & Easy to See

1. PDE (Tight Mesial contact?)
2. ICPOI (Tight Mesial contact?)
3. RTDE (Mesial Tissue entrapment/resistance to displacement?)

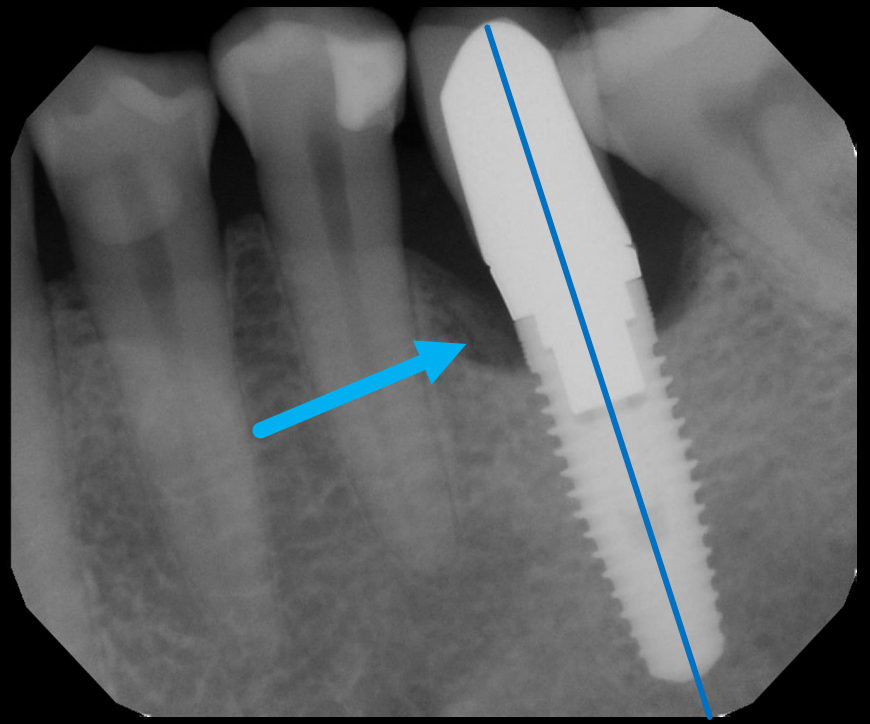


Implant-abutment misfit is NOT easy to see



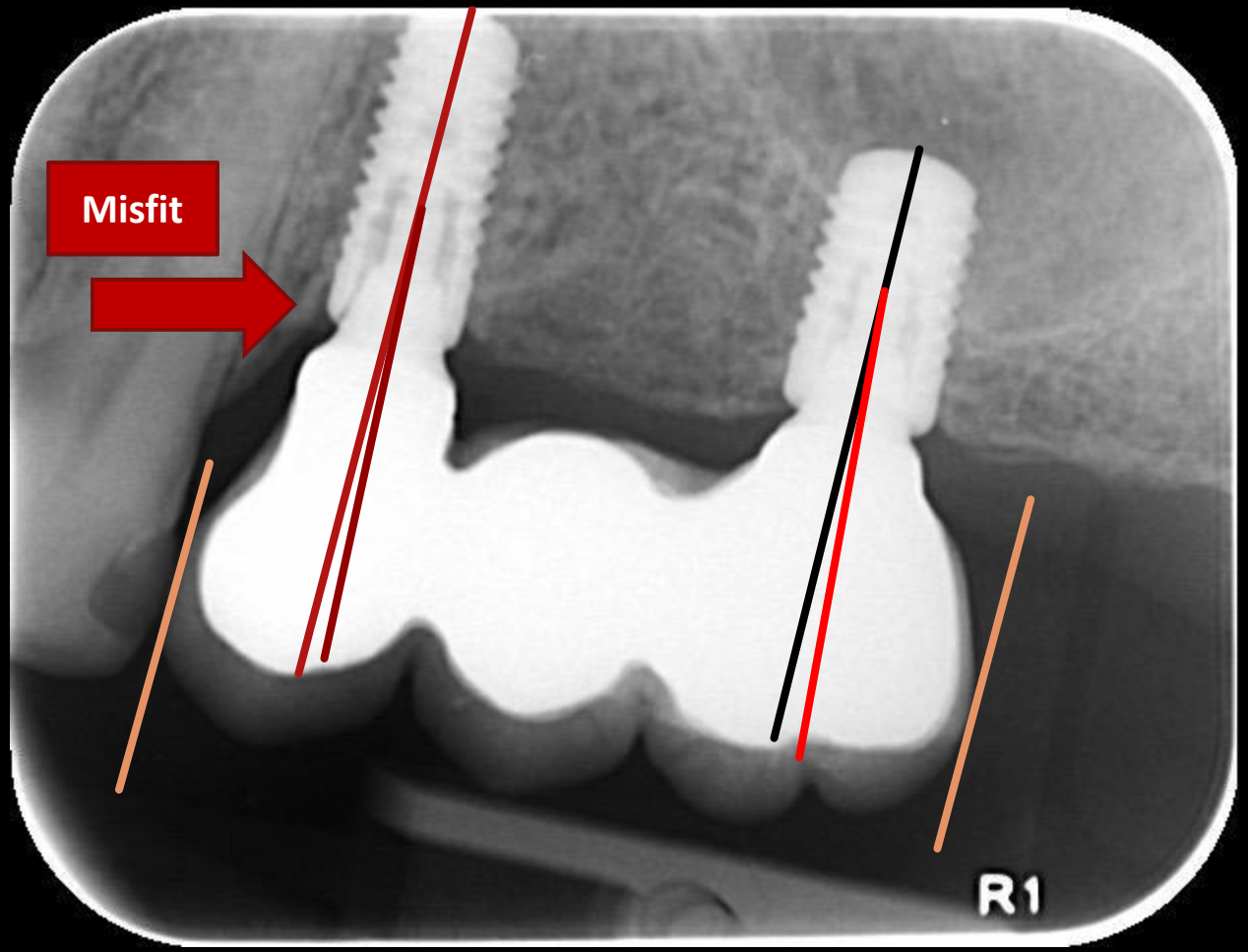
"Tooth moves when I push on it"

Mobile Abutment-Crown Complex
Pockets > 9mm



The damage is easy to see

Current Screw-in Technique is Fatally Flawed!

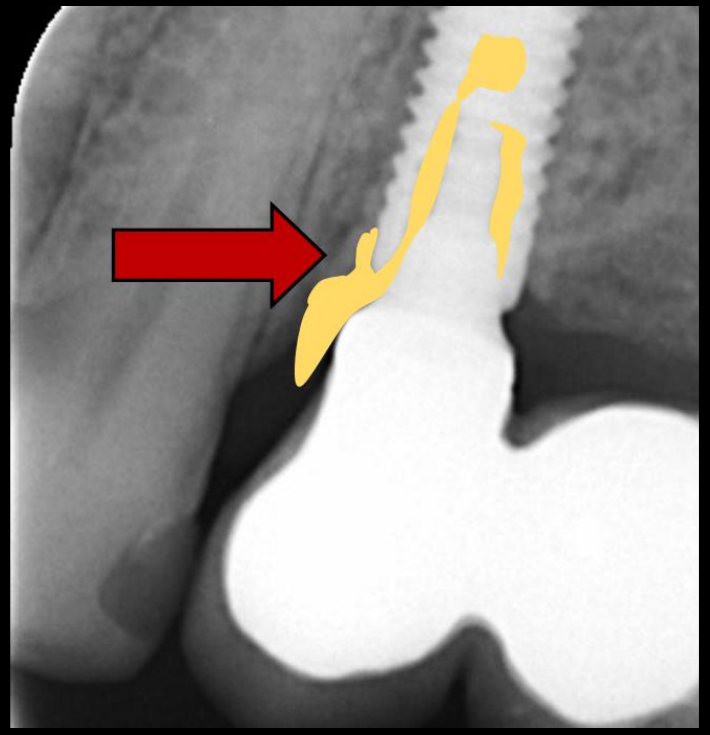


Can Dentists Optimize the Implant- Abutment joints with Multiple Units?

NOT this Way!

PDE, ICPOI & RTDE make it impossible to prevent misfits

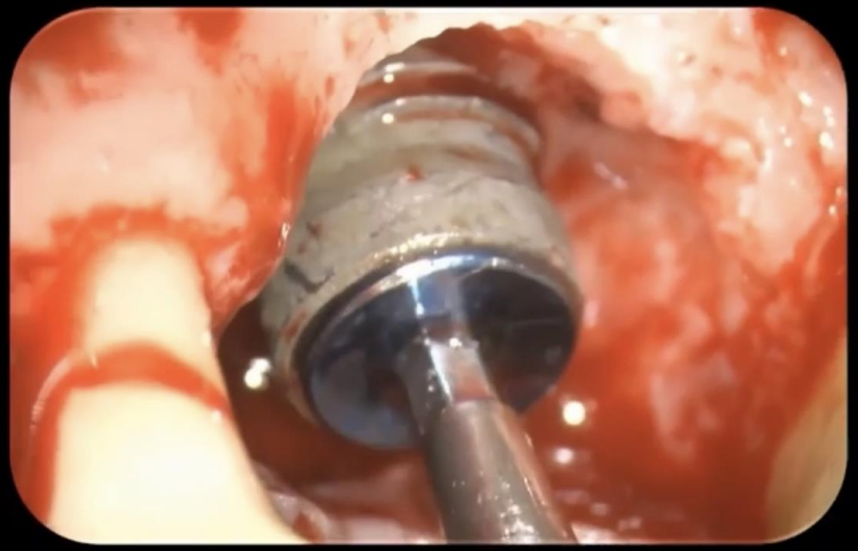
Current Screw-in installation technique

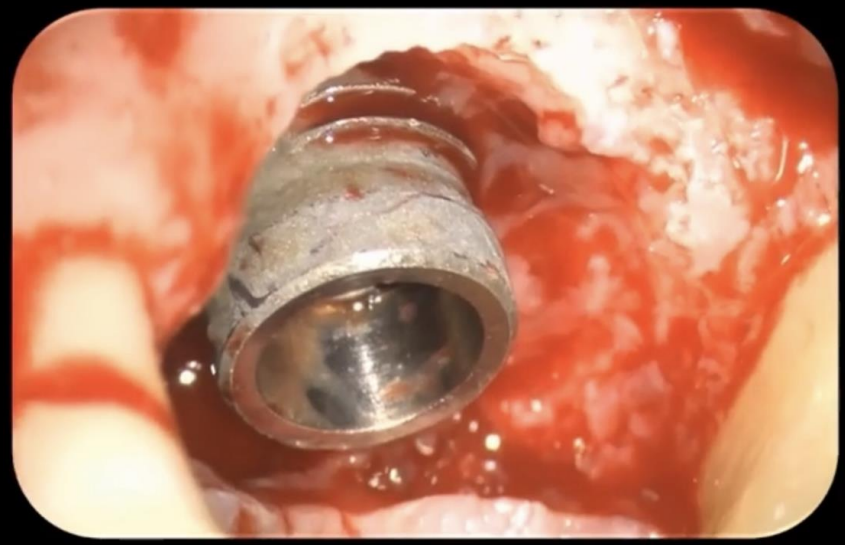


Misfit joints are
NOT
optimally stable
& are
reservoirs for
oral pathogens

Pumping pathogens with every BITE

Dr. Markus Schlee: “How should we handle this infection?”





decontamination? implantoplasty? augmentation? re-osseointegration? apical reposition?

“A Brilliant Invention: Electrolytic cleaning with Galvosurg”

BUT: How can we Prevent
Contamination & Recontamination
of the Peri-implant environment?

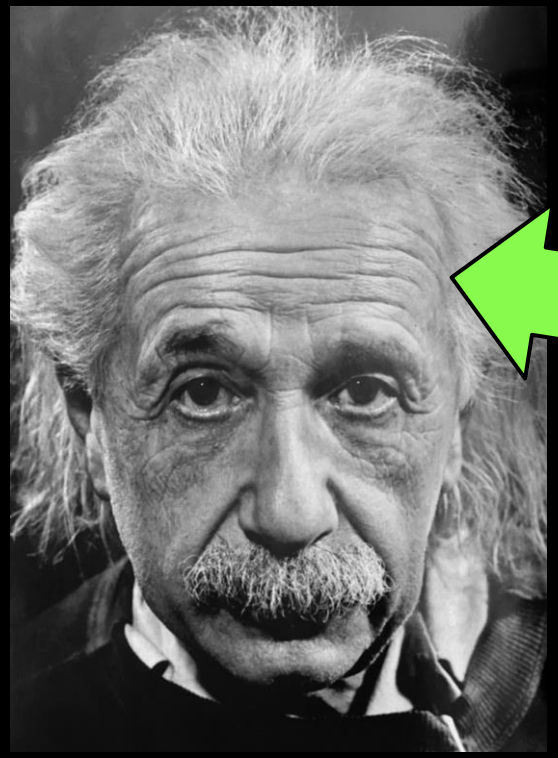
Part 3 of 4

Preventing Peri-Implant Disease and its Dire Consequences

Slides 51- 83

If Dentists cannot usually see MISFITS (microscopic)

How can they connect parts optimally at the microscopic level?



Knowing the
Root Causes of a Problem,
Having a Desire to Improve
& Using Logic
Allows us to achieve results
beyond our sight

Dentists can

Make the peri-implant environment cleanable
Optimize the fit of implant parts
& Prevent subgingival cement

to Reduce Risk of Peri-implant Disease & make treatment better

Let’s learn how to do this routinely!

Single Screw-in Crown Challenge – With Contacts

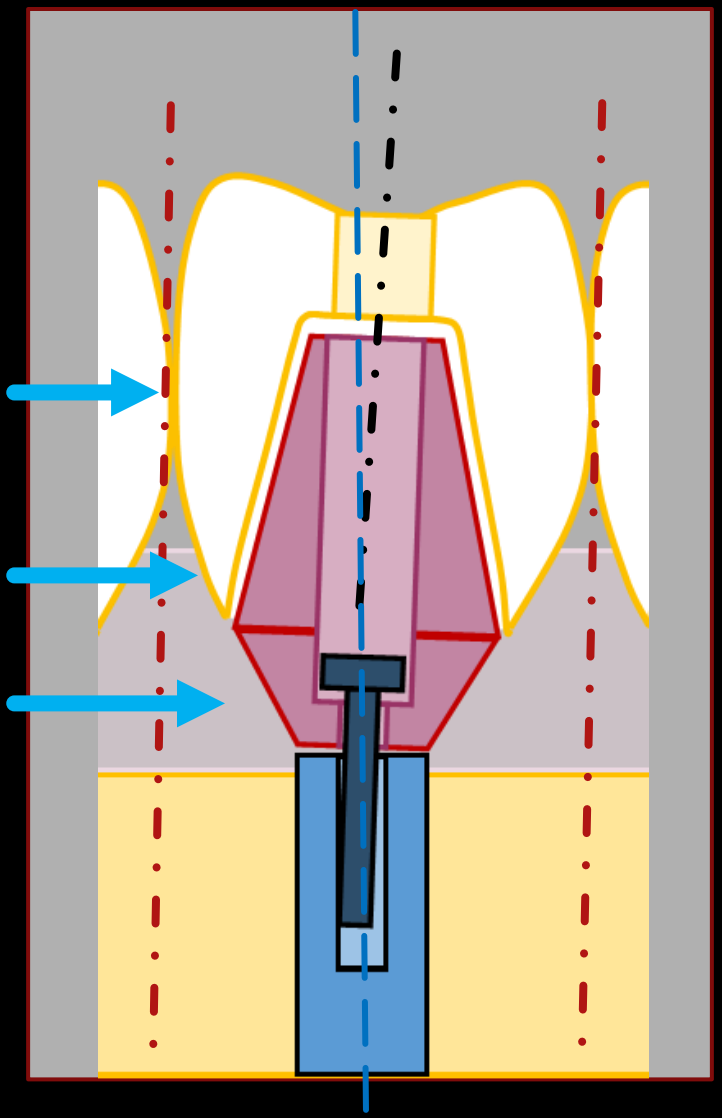
After tightening the abutment screw & adjusting contacts
"The crown just snaps into place"

Should the dentist be **HAPPY** ?????

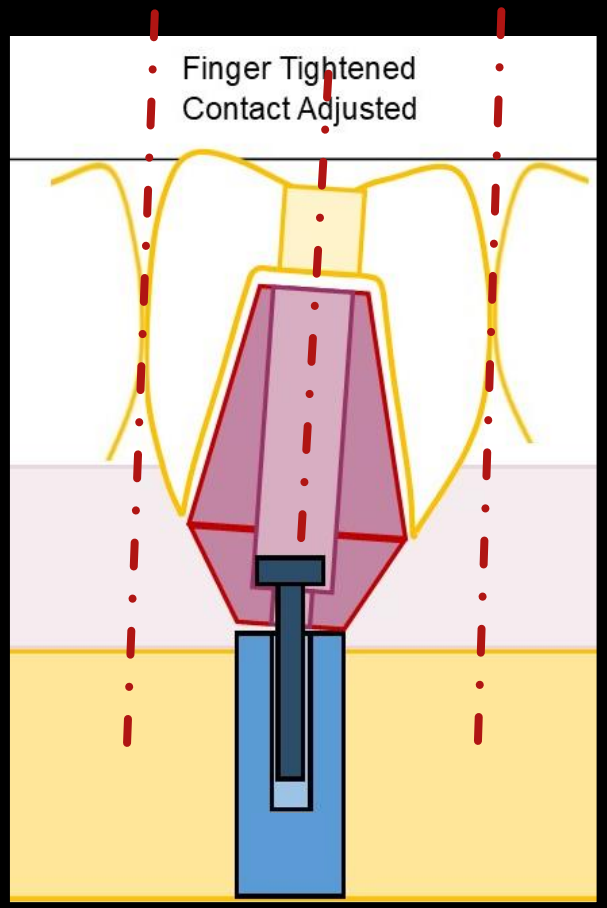
Danger! Misfit Joint Likely!

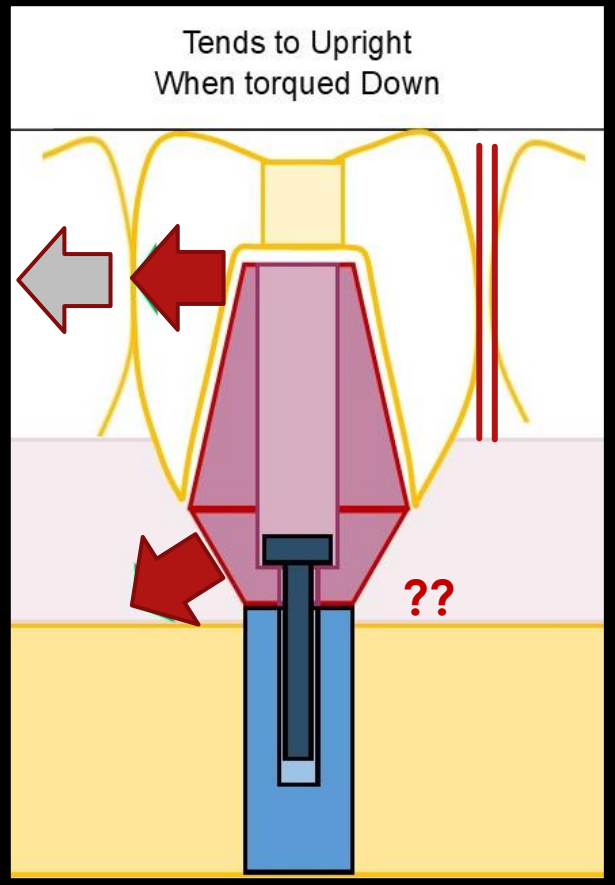
Contacts may have forced
the abutment-crown complex
into a path of insertion
other than that
required for an optimized
implant-abutment connection (ICPOI)

Contacts with gingiva, bone, dentition
are difficult to manage &
fit is very difficult assess
(PDE & RTDE)



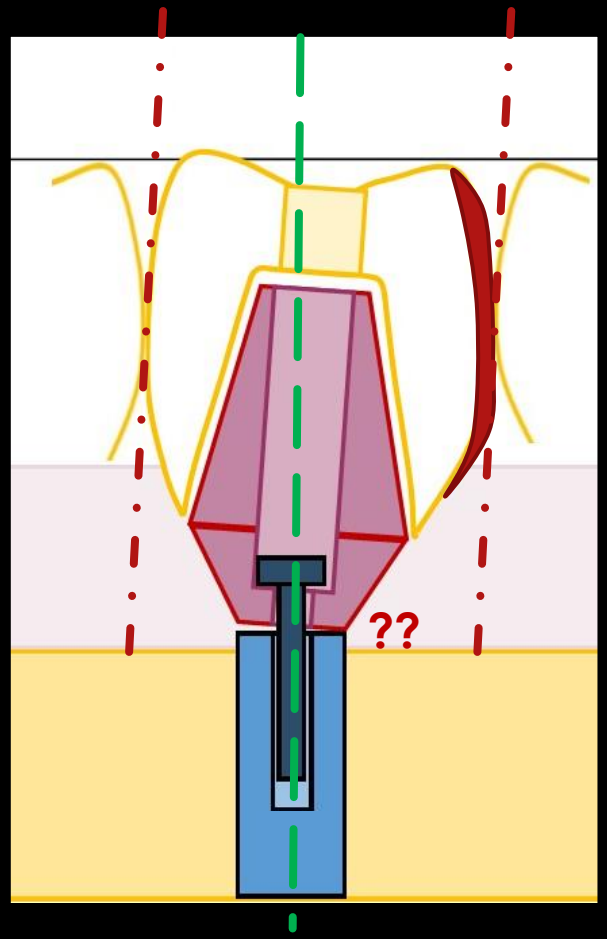
Final torquing of abutment screw may upright the abutment-crown complex somewhat …





… causing a tight & open contact & possible implant-abutment misfit

Open Contact – Transport to Lab



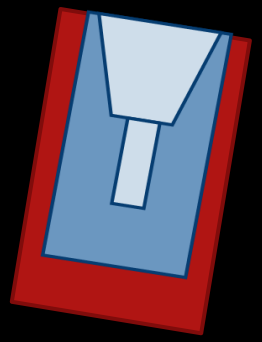
Lab technician - Put in oven to disassemble, add porcelain to contact (overbuild), reassemble on the inaccurate model & transport back to Dentist

Dentist reappoints patient, adjusts contacts to seat the crown complex & screws it into place … & hopes for the best

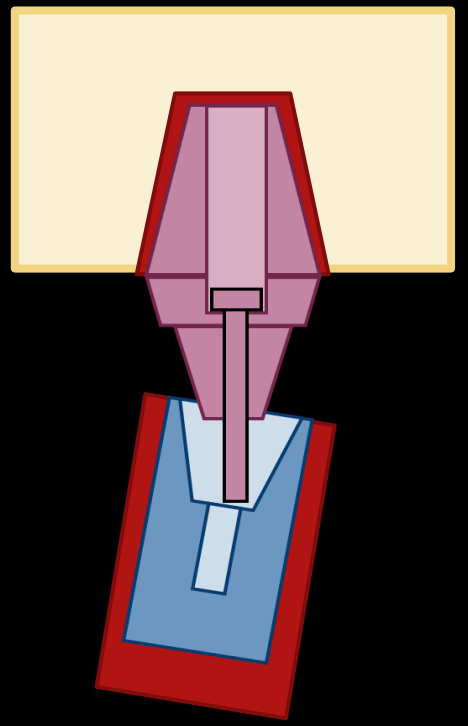
Screw-in technique – the PROBLEM

FIT determines joint stability & its ability to exclude oral pathogens

Implant
Fixed in Jaw
(cannot move
& never congruent with other implants)



Abutment
Fixed in Prosthesis
(cannot move relative to Prosthesis)

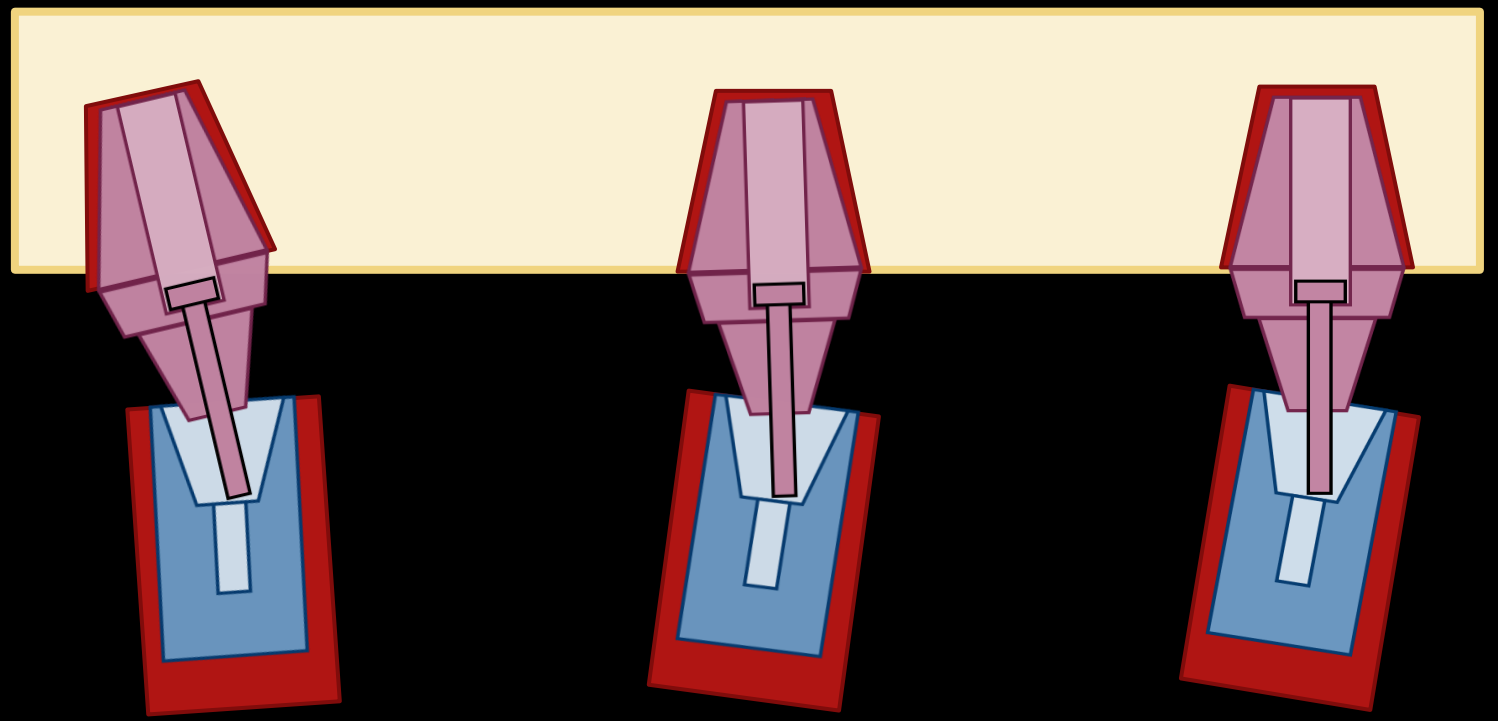


Svoboda, ELA. Fixed Prosthesis Installation: An Aviation Analogy Considering 3-D Position, Yaw, Pitch and Roll. www.ReverseMargin.com; 2021:1-6.

Screw-in Technique – the PROBLEM

FIT effected by 3-D location, angulation & rotation of embedded abutments

Implants and abutments are Fixed in Place & cannot adjust themselves during installation – Misfits Guaranteed because of PDE, ICPOI & RTDE!

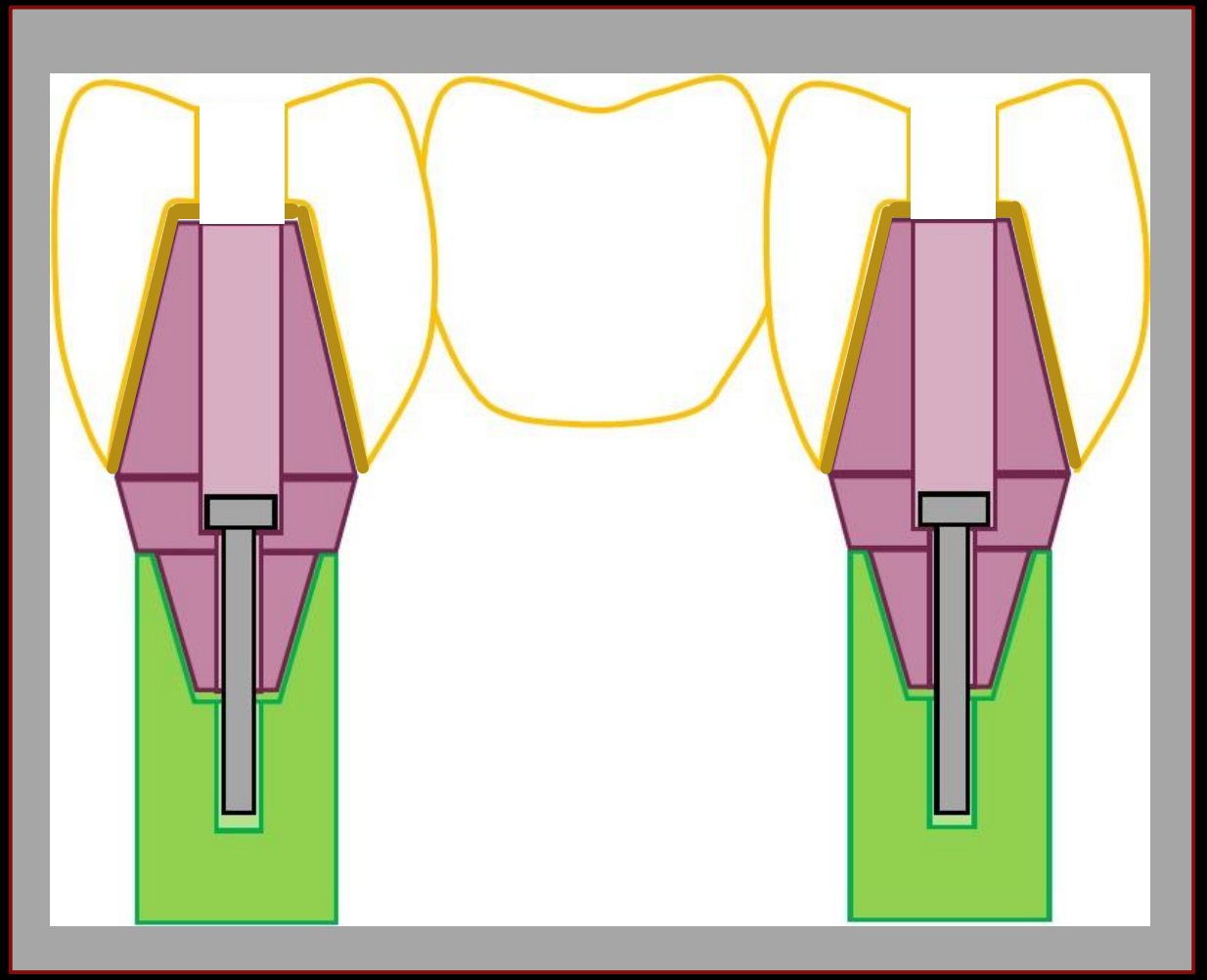


Svoboda, ELA. Fixed Prosthesis Installation: An Aviation Analogy Considering 3-D Position, Yaw, Pitch and Roll. www.ReverseMargin.com; 2021:1-6.

Model ± 150 µm

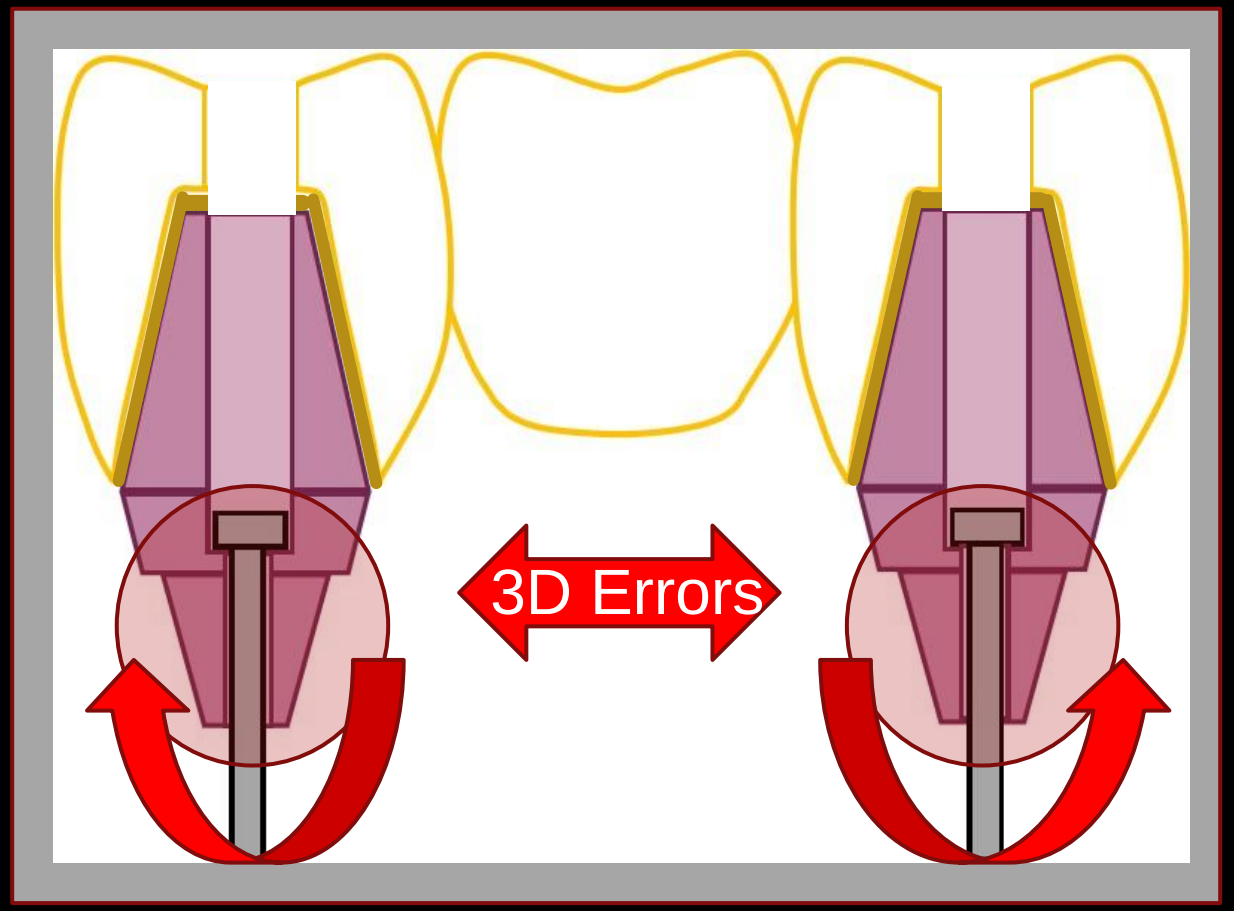
Screw-in System
3-unit bridge

The Lab
Joins the
Prosthesis
to its
Abutments
to fit the
Model



Connectors ± 5µm (30X more accurate) than Model

Prosthesis constrains the abutments



Malpositioned connectors Not Free to self-adjust

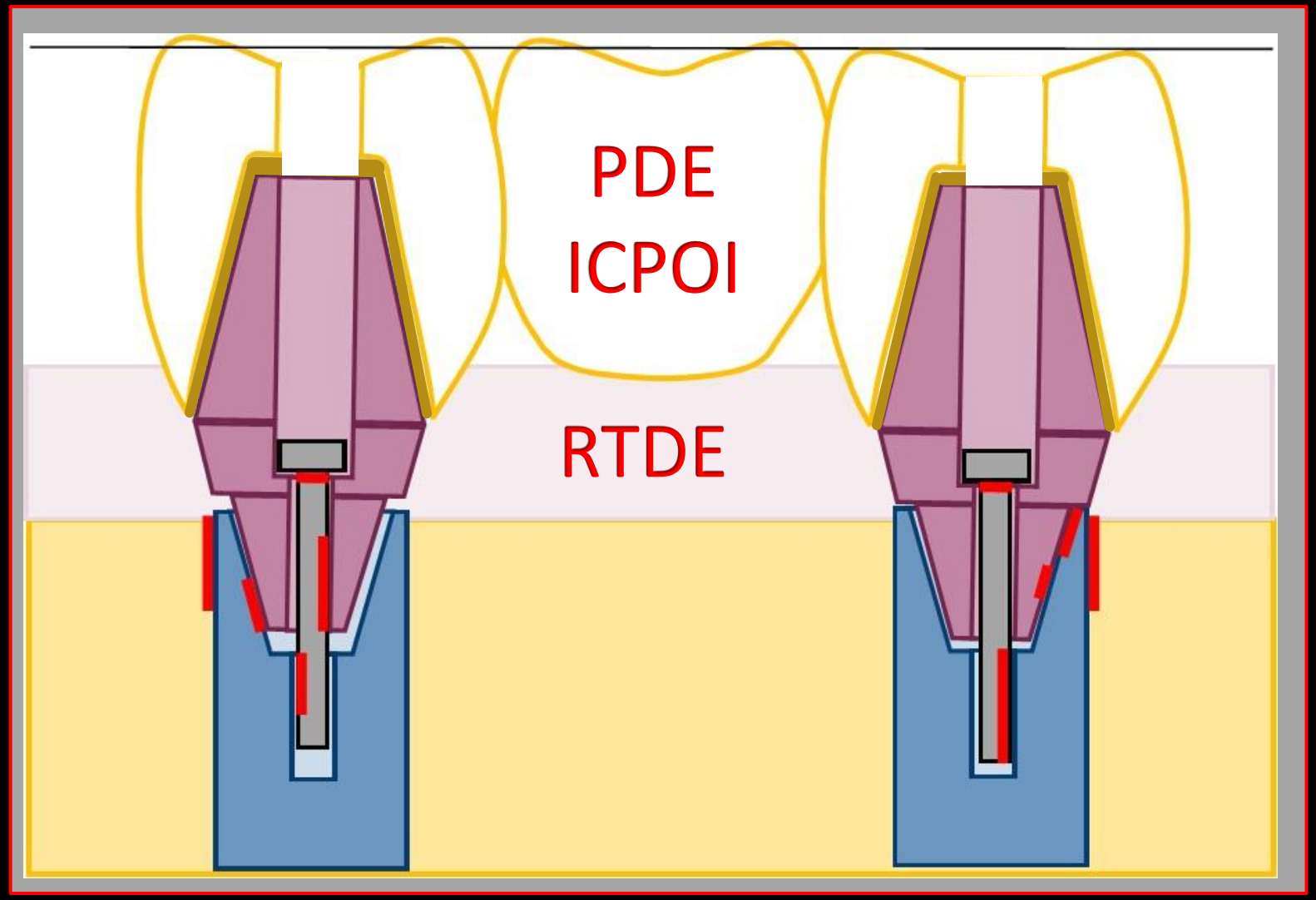
Multiple Units – Misfits Guaranteed!

Mechanical Problems

- Tight & Open Contacts
- Misfit of Components
- Deformation of Parts
- Broken Retaining Screws
- Broken/Splayed implants
- Unstable Joints
  - Micropump (Zipprich,YouTube 1,2)

Biological Problems

- Stress on Bone
- Invasion of Voids by Oral Pathogens



AO – DocMatter: Discussion Site November 22, 2022
Experiencing more fractures than reported?

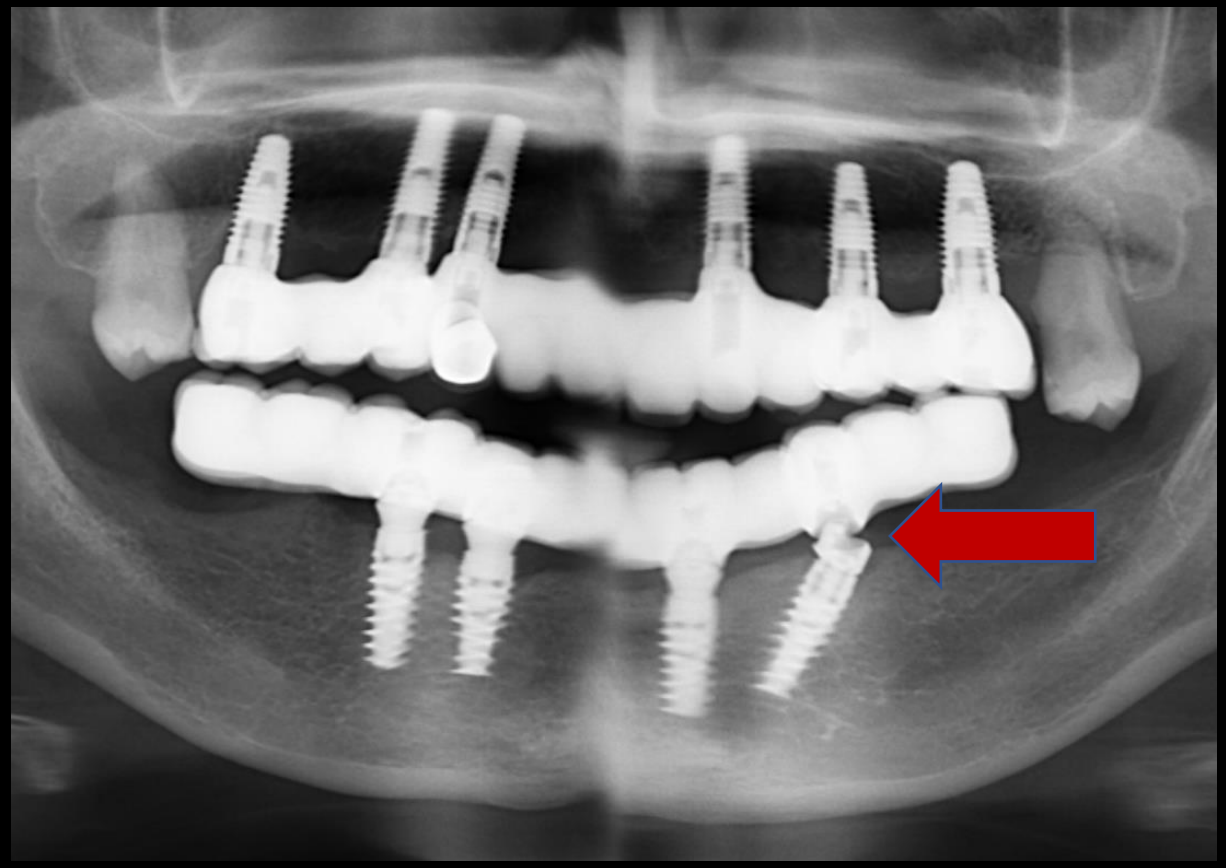
"In response to Rapid Bone Loss around implants from one visit to the next. More recently, I've been removing the prosthesis and checking the internal conical connection and found a surprising number of fractured implants."

Bernard Longbottom – Periodontist

Conical and other connectors are not designed to be connected to implants in a misfit manner. They work best when installed Optimally. This is almost impossible with the Screw-in System of Prosthesis installation. So, fractured implants and peri-implantitis should be no surprise.

Emil L A Svoboda PhD, DDS

Bigger the Screwed-in Prosthesis



The Bigger
Misfits
Guaranteed

(misfits are usually microscopic)

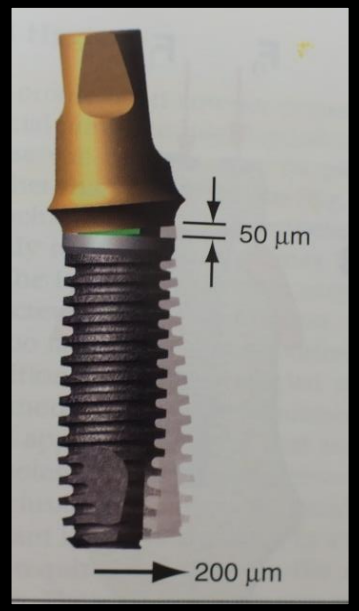
The Dreaded Macrogap

1. Inaccurate impressions/models
2. Tight contacts
3. Tissue interferences
4. Cheaper inaccurate parts
5. Use of engaging abutments
6. Trying to re-insert an abutment that has been previously misfit

"When bacteria colonize a Macrogap, implant failure can result due to biologic failure such as peri-implantitis. (4)
In addition, misfit can lead to mechanical failure of the implant system because of factors such as screw fracture and/or implant fracture. (5)"

Top factors leading to dental implant abutment/implant fixture misfit: The dreaded microgap.
Scott Froum, Perio-Implant Advisory, Feb 6, 2017. Clinical Associate Professor – Periodontist NYU

*Passive Fit could not be achieved with Screwed-in Prosthetics!



Misch CE. Dental Implant Prosthetics, Elsevier Mosby, 2015; 2nd Edit: Ch 28:724-752

Including the Expensive "Master Cast Technique"

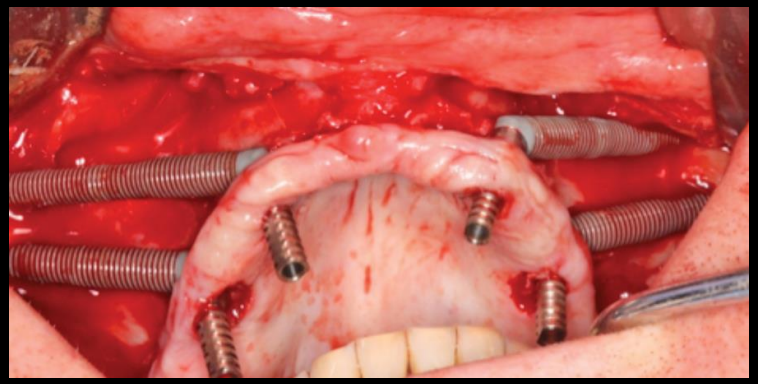
*Passive Fit in Screw Retained Multi-unit Implant Prosthesis Understanding and Achieving: A Review of the Literature. MM Buzaya, NB Yunus. J Indian Prosthodont Soc. 2014, Mar;14(1):16-23

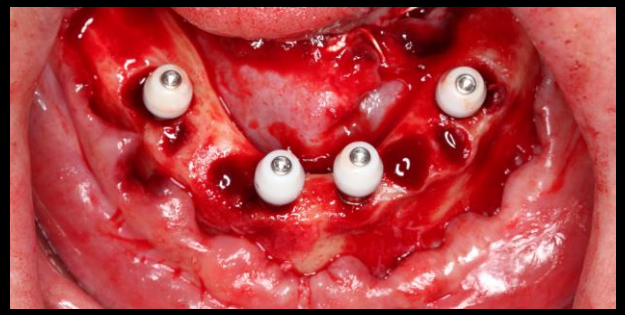
Comparison of the Accuracy of Different Transfer Impression Techniques for Osseointegrated Implants. Zen BM et al. JOI Vol 41 No 6 2015: 662-667.

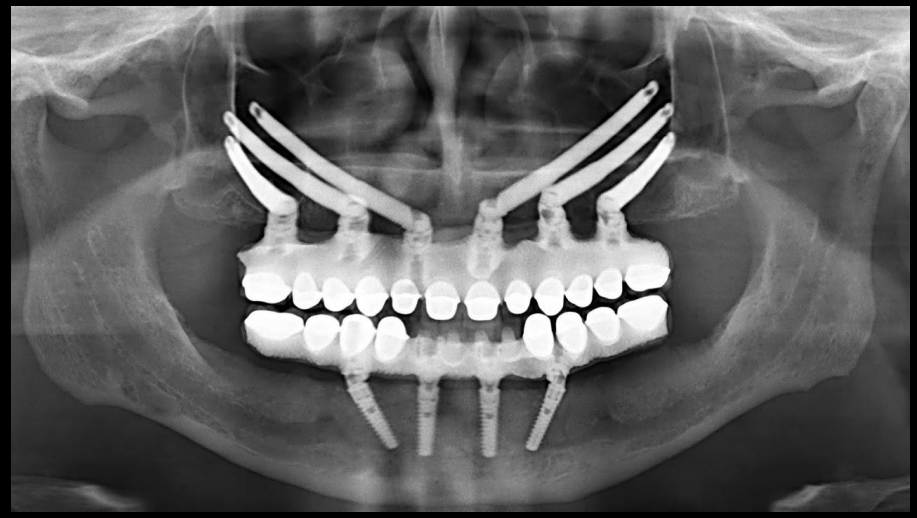
Tissue -integrated prostheses. Branemark PI, Zarb GA, Albrektsson T. Chicago: Quintessence; 1985. p. 253

Comparing the accuracy of master models based on digital intra-oral scanners with conventional plaster casts. C Vogtlin et al. Physics in Medicine. June 2016. Volume 1, 20–26

Shouldn’t we optimize fit of parts & provide access to care







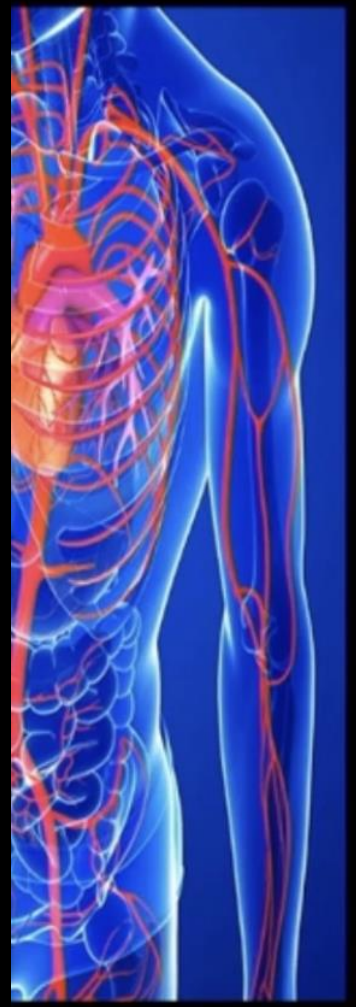
… before increasing risk & liability?

Patients with 4 or more implants retaining a prosthesis
15X rate of Peri-implantitis

Effectiveness of Implant Therapy Analyzed in a Swedish Population: Prevalence of Peri-implantitis.
Derks et al. J Dental Research, **2016** Vol 95(1):43-49
(588 patients with 2,277 implants)

From Dr. Markus Schlee at FOR.org

THE IMPACT OF PERIMPLANTITIS ON SYSTEMIC CONDITIONS



PERIIMPLANTITS

- increases number of white blood cells in a dog model
- increases proinflammatory cytokines
- has systemic impact
- is associated to squamous cell carcinoma

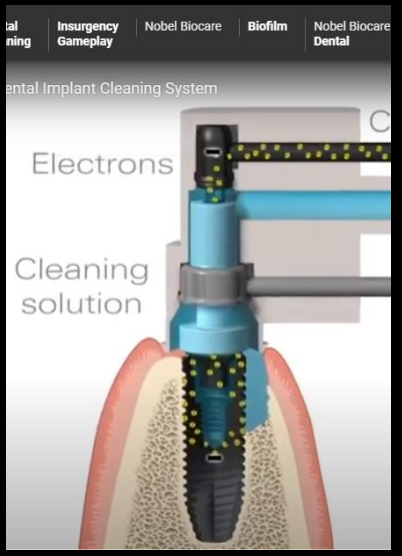
Chaushu L, Tal H, Sculean A, Fernández-Tomé B, Chaushu G. *Peri-implant disease affects systemic complete blood count values-an experimental in vivo study. Clin Oral Investig. 2020 Dec; 24(12):4531-4539.*
Carcuac O, Berglundh T. *Composition of human peri-implantitis and periodontitis lesions. J Dent Res. 2014 Nov; 93(11):1083-8.*
Jeelani S, et al. *Squamous cell carcinoma and dental implants: A systematic review of case reports. Dental Science, 2015, 7, (6) 378-380*

From Dr. Markus Schlee at FOR.org

RESULTS IN TREATMENT OF PERIIMPLANTITIS – SYSTEMATIC REVIEWS

CONCLUSIONS

- No reliable evidence suggesting a superior treatment modality
- Therapy + regular supportive therapy improve clinical parameter and allow implant survival in the majority of cases
- Longer follow up points out a relapse of peri-implantitis in up to 100% of the cases



Amazing tool!

Roccuzzo M, Layton DM, Roccuzzo A, Heitz-Mayfield LJ. Clinical outcomes of peri-implantitis treatment and supportive care: A systematic review. Clin Oral Implants Res. 2018 Oct;29 Suppl 16:331-350
Heitz-Mayfield LJ, Mombelli A. The therapy of peri-implantitis: a systematic review. Int J Oral Maxillofac Implants. 2014;29 Suppl:325-45.
Esposito M, Grusovin MG, Worthington HV. Treatment of peri-implantitis: what interventions are effective? A Cochrane systematic review. Eur J Oral Implantol. 2012;5 Suppl:S21-41

Infection and relapse of infection is what you should expect when a new or old prosthesis is installed in a way that exposes the patient to similar risk factors for peri-implant disease … like poor access to care, misfits, subgingival cement?

Screw-in Systems are in Vogue Again Today

A Specific
Prosthodontist:
“99% of the prosthetics
I install are screwed-in”

We must acknowledge problems to improve results

Misfits are Preventable!

Misfit implant parts and poor margins are the Standard of Care for implant prosthetics. Is anyone conflicted about this?

Emil LA Svoboda PhD, DDS

20 SPECTRUM Implants V11-N3 June/July 2020

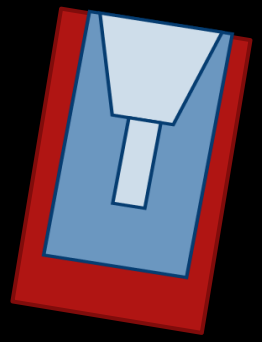
Free Download:
www.ReverseMargin.com

Fixing the All-on-X Screw-in System the Svoboda Way by separating the installation of implant parts from installation of the final prosthesis

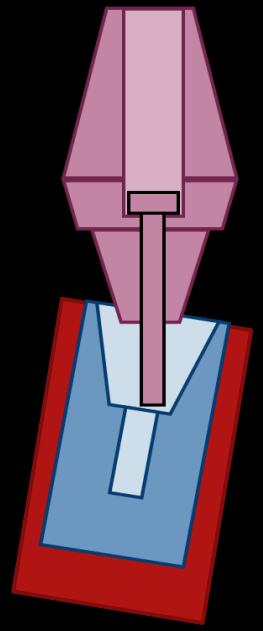
Svoboda ELA. All-on-X: A New Standard of Care. **2020**, www.ReverseMargin.com

The Solution: **Optimizing FIT** is Important (±5 microns)

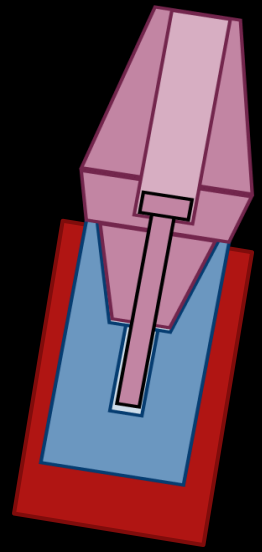
Implant
Fixed in Jaw
cannot move



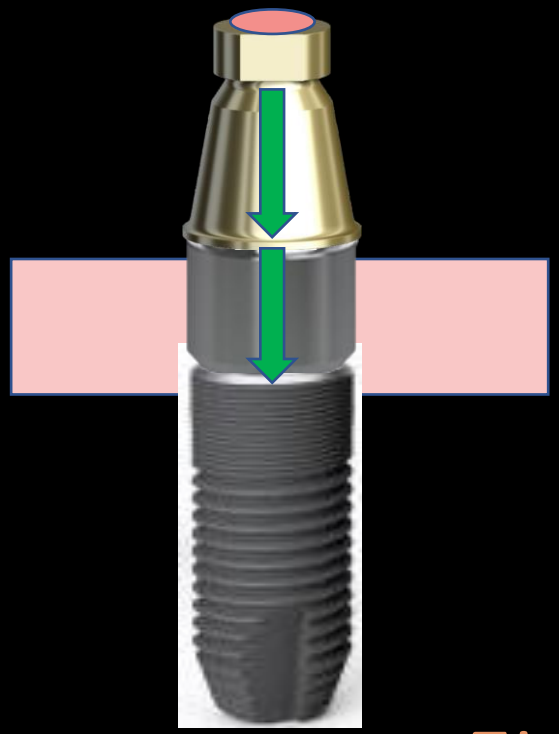
Abutment
free to move



Abutment
Moves to Optimize Fit
Step 1 of 2



Svoboda, ELA. Fixed Prosthesis Installation: An Aviation Analogy Considering 3-D Position, Yaw, Pitch and Roll. www.ReverseMargin.com; 2021:1-6.

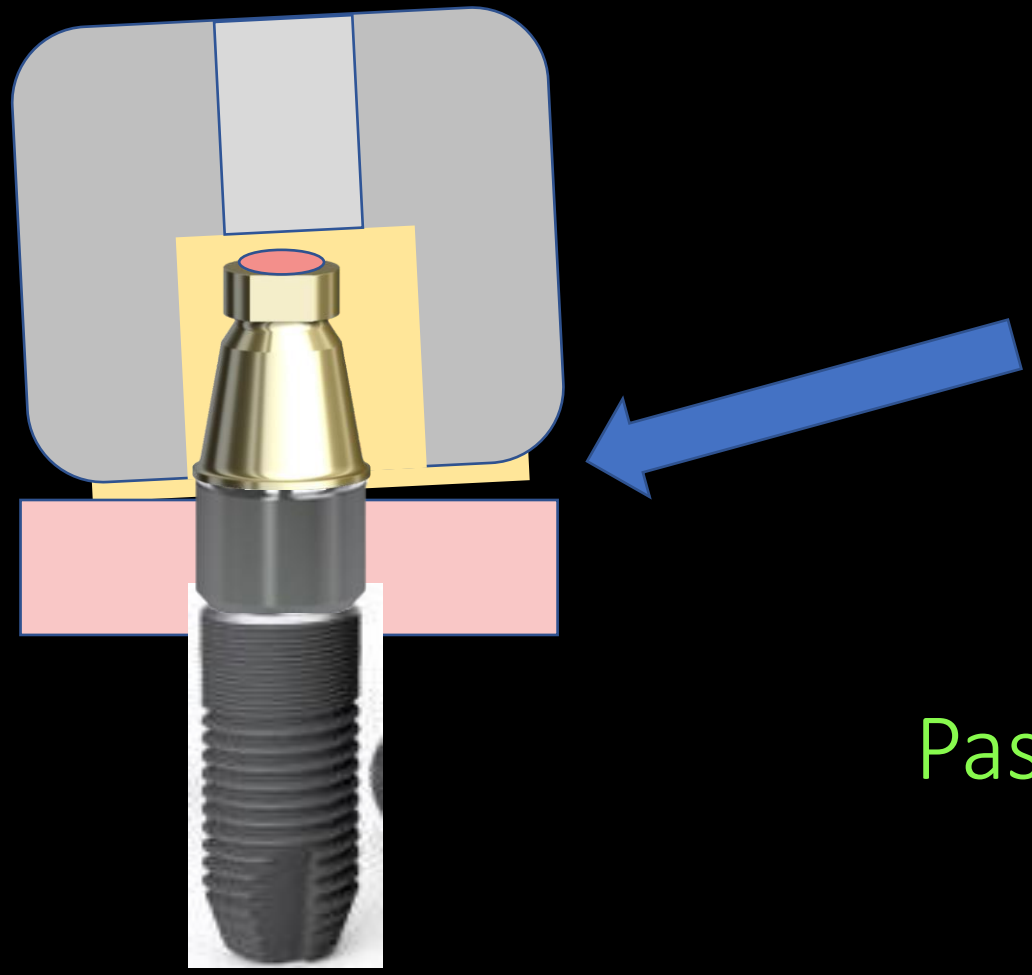


Dentist
assembles all
implant components
in the mouth
&
plugs the
screw access hole with
Teflon

PDE
ICPOI
RTDE

Fit of these parts are now optimized

Cement space between prosthetic-connector and prosthesis safely tolerates expected PDE

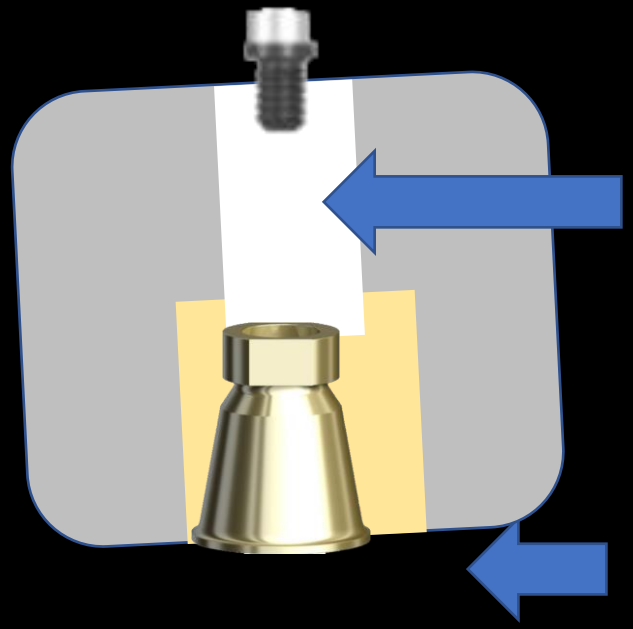


Excess cement extrudes from offset joint

PDE ✓
ICPOI ✓
RTDE ✓

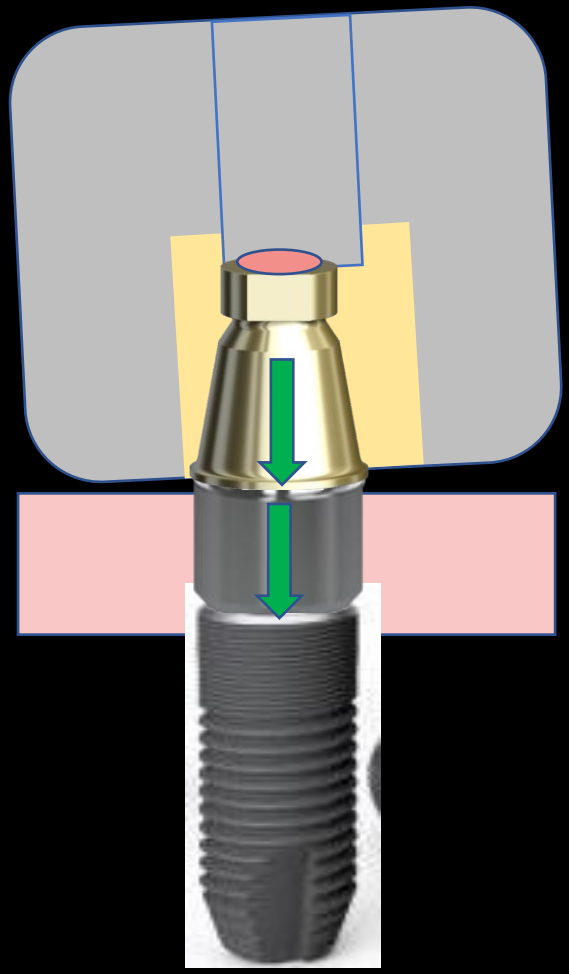
Passive fit of the prosthesis is accomplished

Prosthesis is unscrewed from the mouth with the prosthetic-connector(s) attached



Connectors-Prosthesis Complex is unscrewed from multi-unit abutment(s)

Tissue surface of the prosthesis is refined



Today

dentists can consistently

optimize

the fit of parts

& deliver a

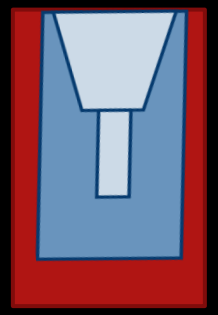
passive fitting prosthesis

The Svoboda Way

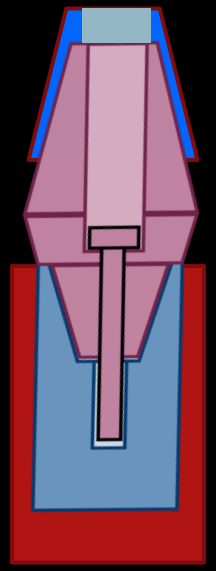
WOW!

The All-on-X Svoboda Way Review

Implant
Fixed in Jaw
(cannot move)

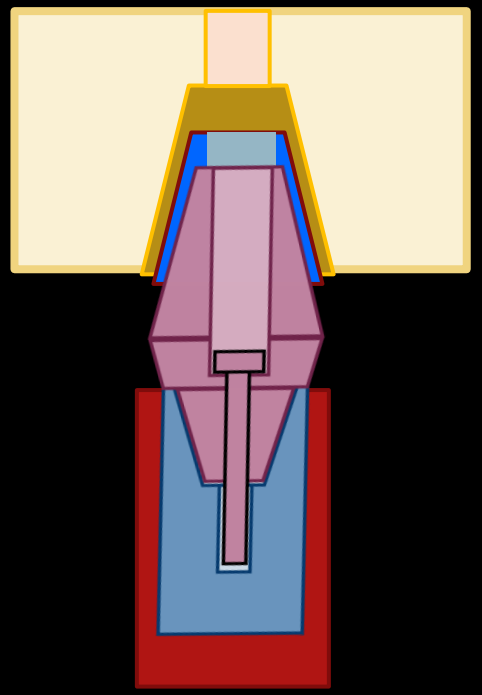


Screw-in parts
(No Prosthesis)



Parts Optimized

Cement pickup of Connector
with Prosthesis, refine & reinstall



Prosthesis Passive

PDE ✓
ICPOI ✓
RTDE ✓

Svoboda, ELA. Fixed Prosthesis Installation: An Aviation Analogy Considering 3-D Position, Yaw, Pitch and Roll. www.ReverseMargin.com; 2021:1-6.

The Svoboda Way Hybrid

Is it cleanable?

Do parts fit optimally?

Have we prevented subgingival cement?

YES, YES, & YES

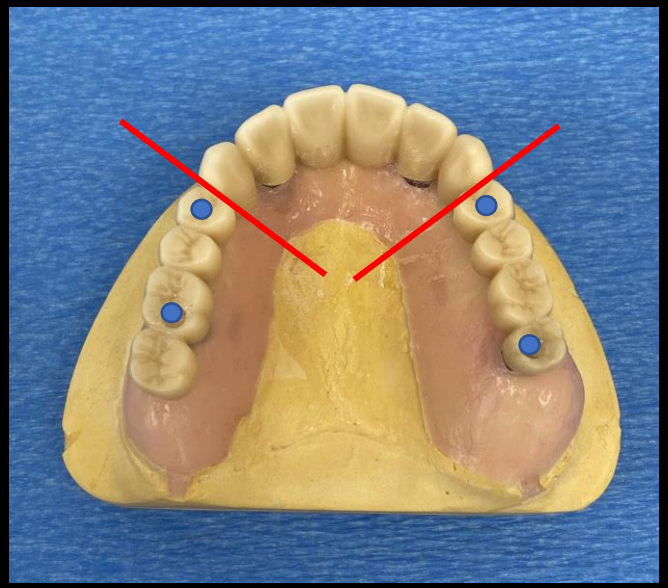
Prosthesis is

Retrievable, Fit is Passive

and

Segmented to reduce impact of implant failure

Narrow Profile

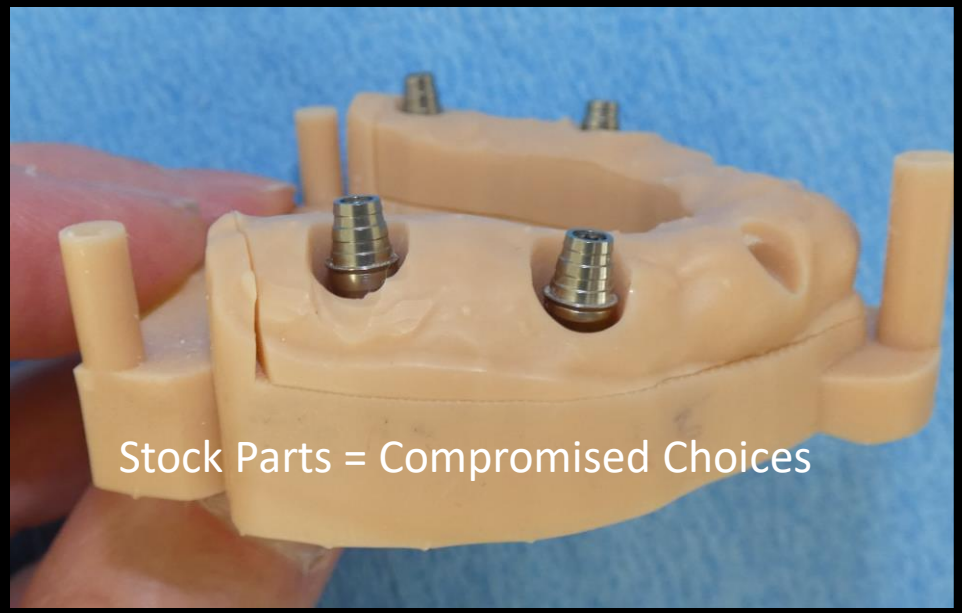


What Advantages can Cemented Connections Provide (that Non-Cemented Joints Cannot)

1) Cement can fill the space between parts and prevent the movement of oral pathogens into that space and the large spaces inside the bodies of implants & abutments. Oral pathogens can breed in great numbers in any spaces they have access to and chronically reinfect the peri-implant tissues.
2) Cement can fixate parts to one-another and prevent their movement that can cause the redistribution of oral pathogens and their toxic byproducts into the peri-implant environment to perpetuate disease.
3) Cement space filled with cement can be used to safely tolerate expected Prosthesis Dimensional Error (PDE) and Incongruent Paths of Insertion (ICPOI) and can mitigate the Tissue Effects (TE) by separating the installation of implant parts from the prosthesis. This can enable the dentist to optimize the fit of all implant parts and achieve a passive fitting prosthesis. This prevents several known risk factors for mechanical complications and the dreaded peri-implant disease.

Yet another
BIG PROBLEM
remains
with this “all-on” type of
Screw-in System

All-on-X relies on a limited selection of **Stock Parts**
Current CAD/CAM Technology can make "Site Specific Custom Abutments"



Custom Parts offer better control of emergence profile, screw access position, margin design & material choice

CAD/CAM Custom Parts = Better Control
Easy Segmentation = Reduced Impact of Implant Complications

Part 4 of 4

Understanding Why the KEY to Better Prosthetic Treatment includes a Safer Intra-Oral Cementation Step

Slides 85 - 131

Cement-in Systems

can consistently optimize implant-abutment connections

PDE

ICPOI ✓

RTDE ✓

… because abutments are installed without the prosthesis attached

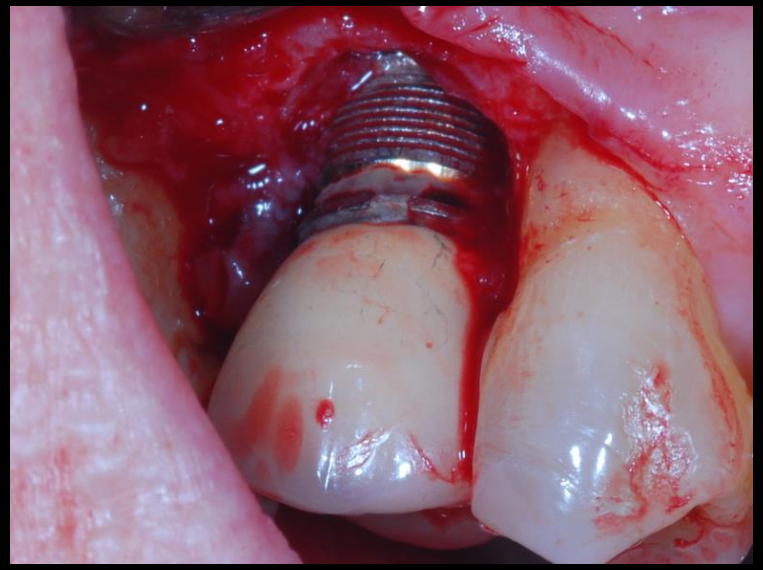
“Why do we (at ELOS MEDTECH) recommend cementation in the mouth?”

“Cementation in the mouth actually uses the patient as reference, so you cancel out all the parts of the tolerance chain … and by doing the cementation in the patient you will actually have the perfect passive fit”

They don’t seem have a system for safer intra-oral cementation

Andersen, Henrik. PhD. Influences Affecting Print. 2021 Webinar: https://www.dropbox.com/s/3t1jqlgzp6owwdx/influences%20affecting%20print%20%281%29.mp4?dl=0

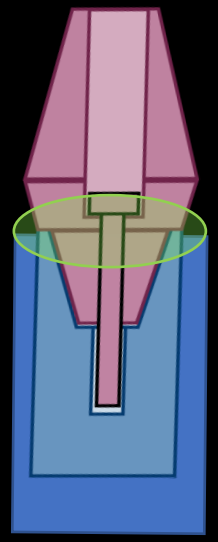
Open Margin & Residual Subgingival Cement



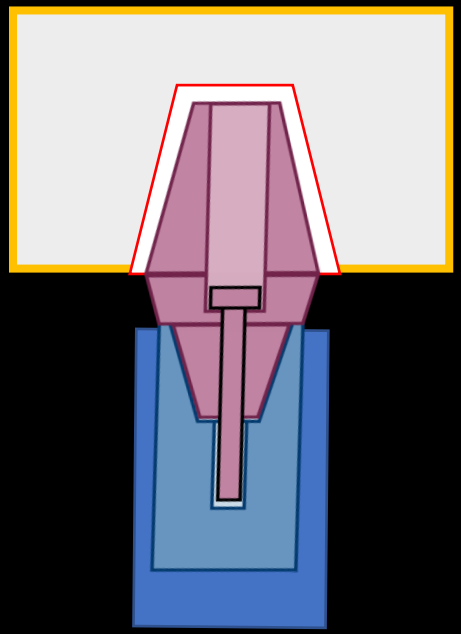
Do you think you are able to prevent these problems without mitigating the Tissue Effects … RTDE & GE?

Cement-in protocol has Two Steps

Abutment Installation
Step 1
Fit Optimized &
Fixed in Place

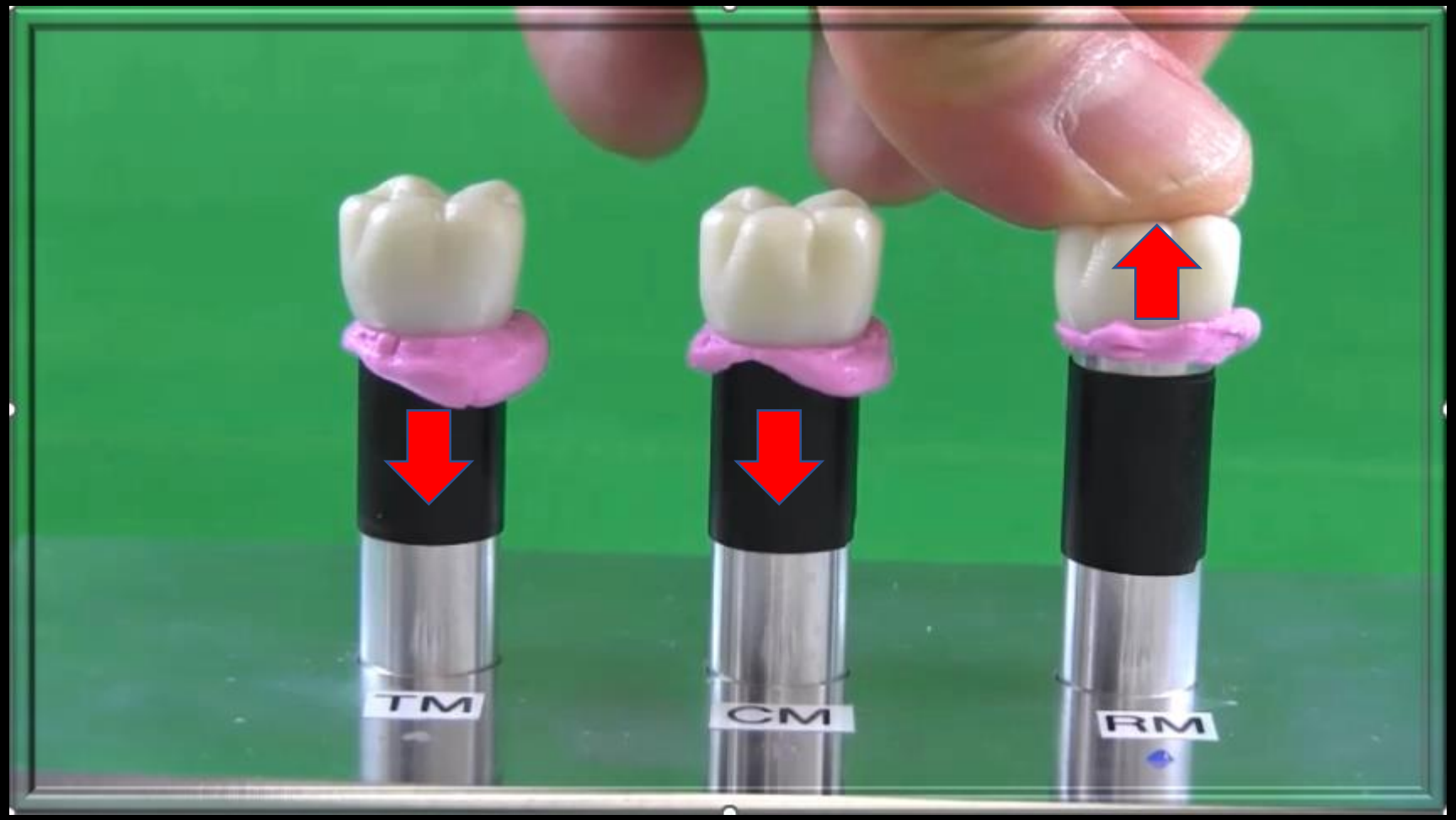


Prosthesis Installation
Step 2 – Intraoral Cementation
Can we prevent Subgingival Cement
& Open Margins?



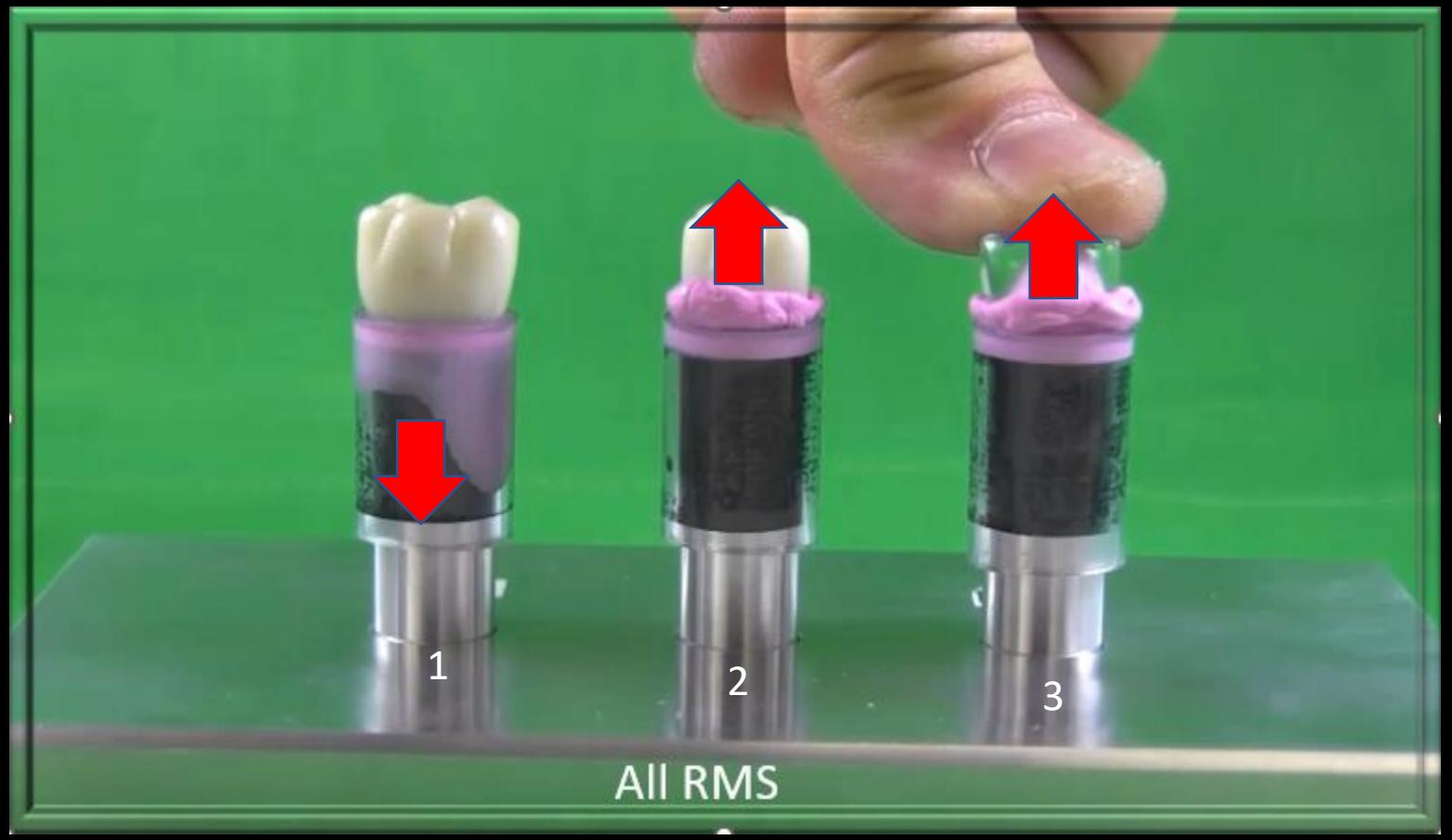
Svoboda, ELA. Fixed Prosthesis Installation: An Aviation Analogy Considering 3-D Position, Yaw, Pitch and Roll. www.ReverseMargin.com; 2021:1-6.

Effect of Margin Design on Cement Flow Direction



During crown cementation the Tapered (TM) & Chamfer Margin (CM) shapes direct cement towards the tissues. The Reverse Margin (RM) shape redirects cement away from tissues. This video is available for view at www.ReverseMargin.com

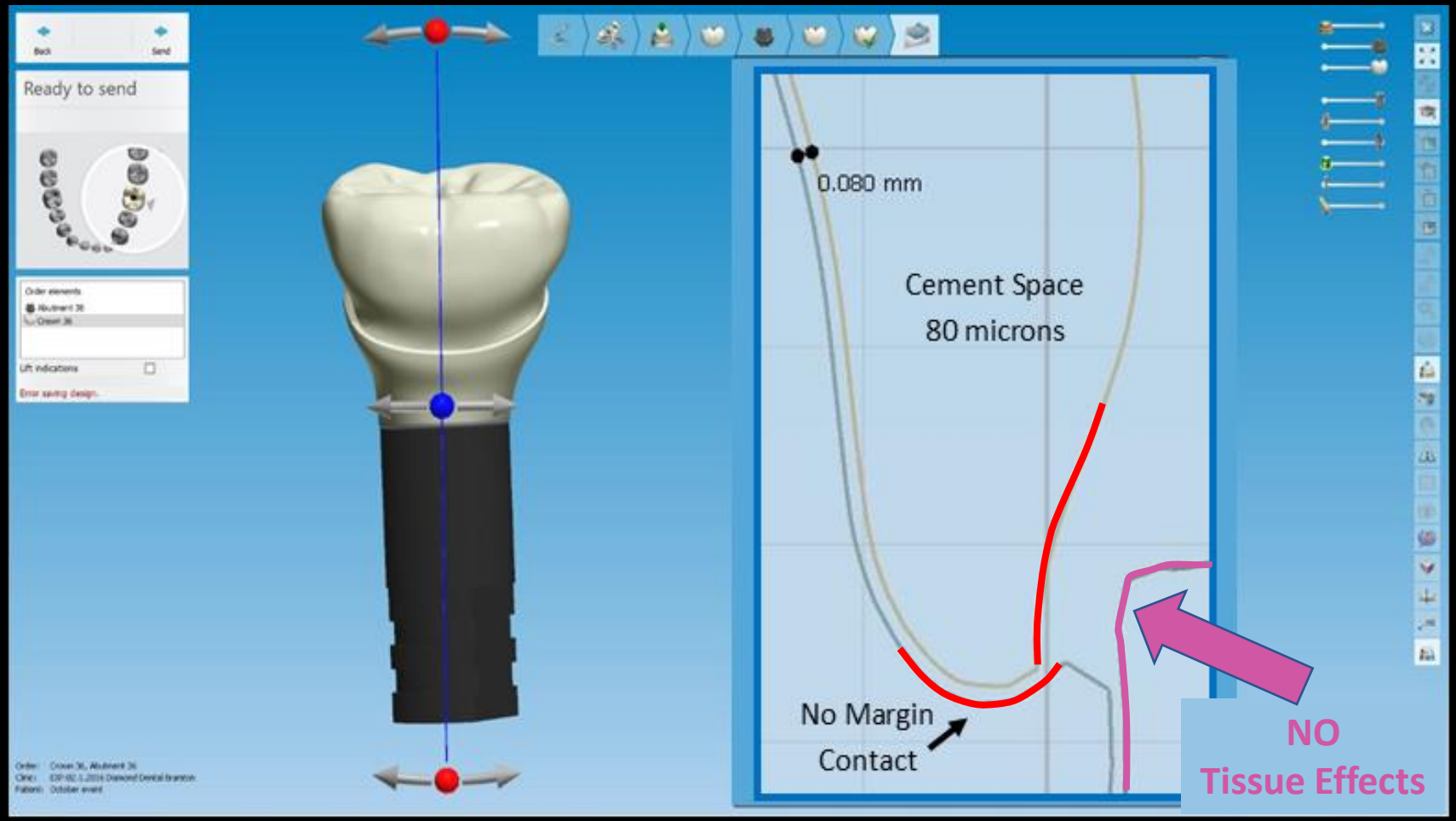
Overcoming the Gingival Effects (GE) & RTDE by RMS Design



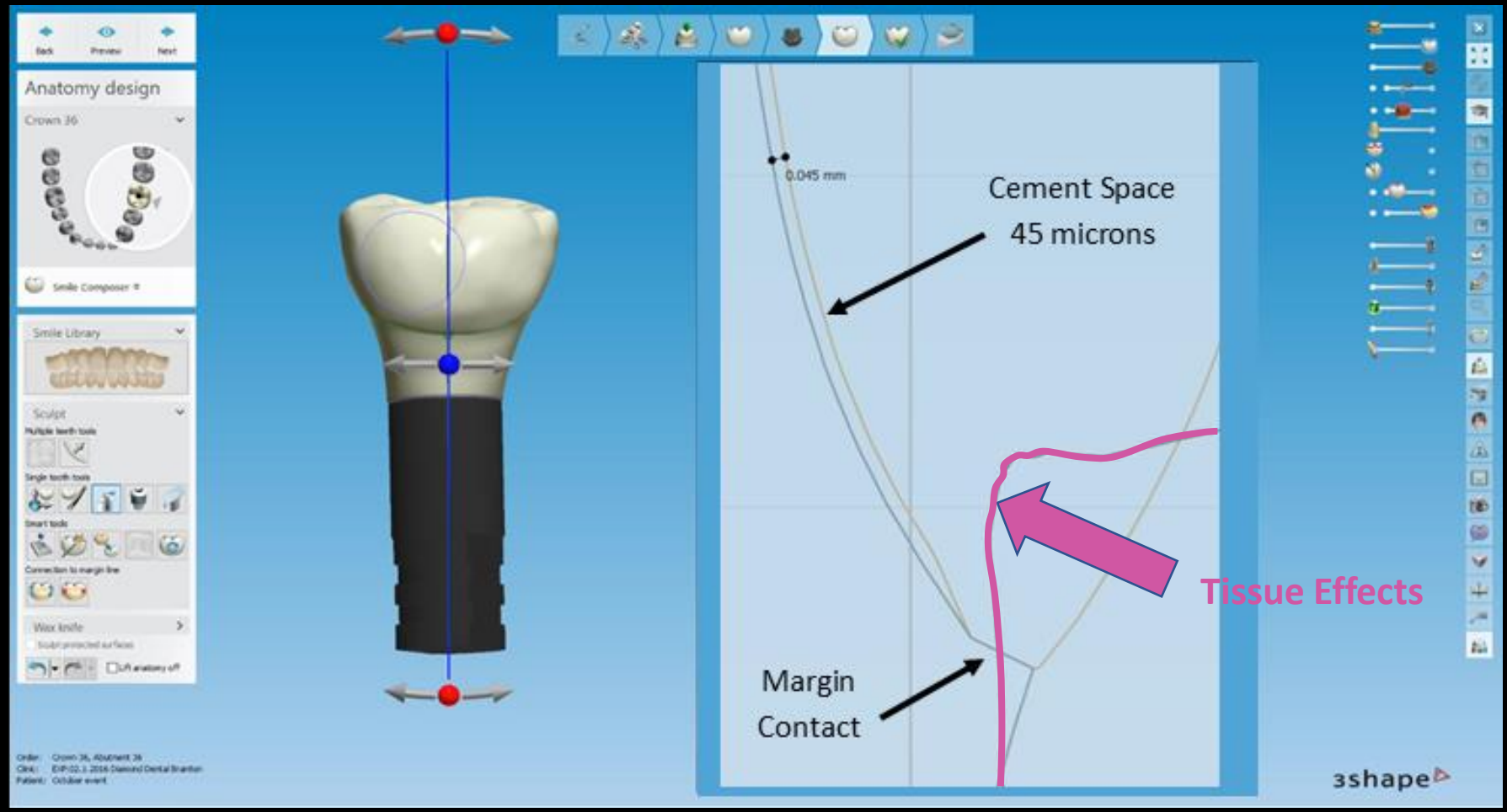
During RMS crown cementation the full contour crown (1) contacts the simulated gingiva prior to being seated. This stimulates the GE and causes much subgingival cement. RTDE by gingiva also resists seating of the crown and causes dentists to exert maximum pressure to seat a crown and prevent open margins. Red arrows show direction of cement flow

RMS crown 2 is narrow and does not touch gingiva, and crown 3 is only narrow in its subgingival position. Both provide space for the redirected cement to exit the subgingival space. View video at www.ReverseMargin.com.

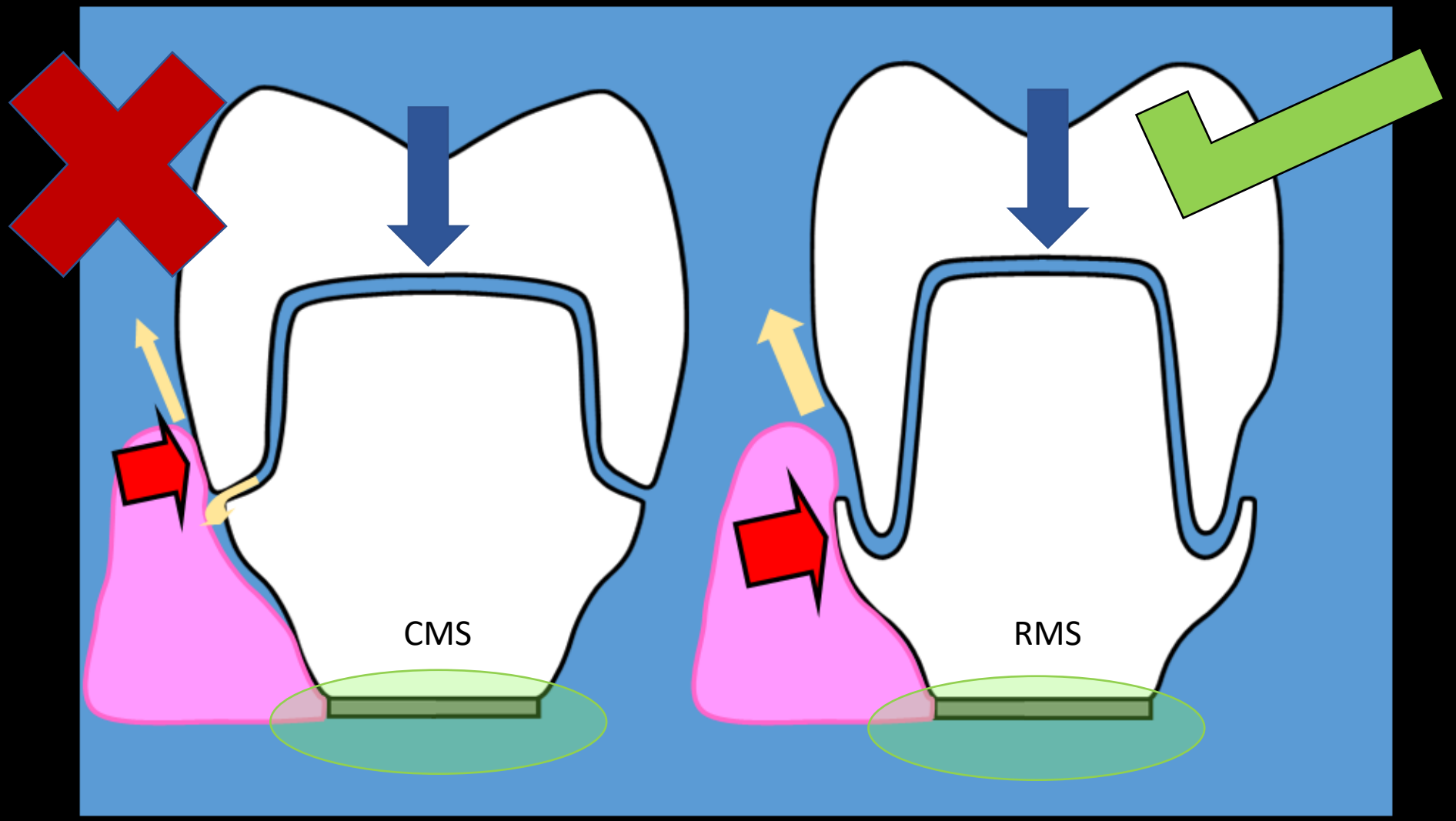
RMS Design Mitigates Both Tissue Effects … Crown does not interact with Gingiva



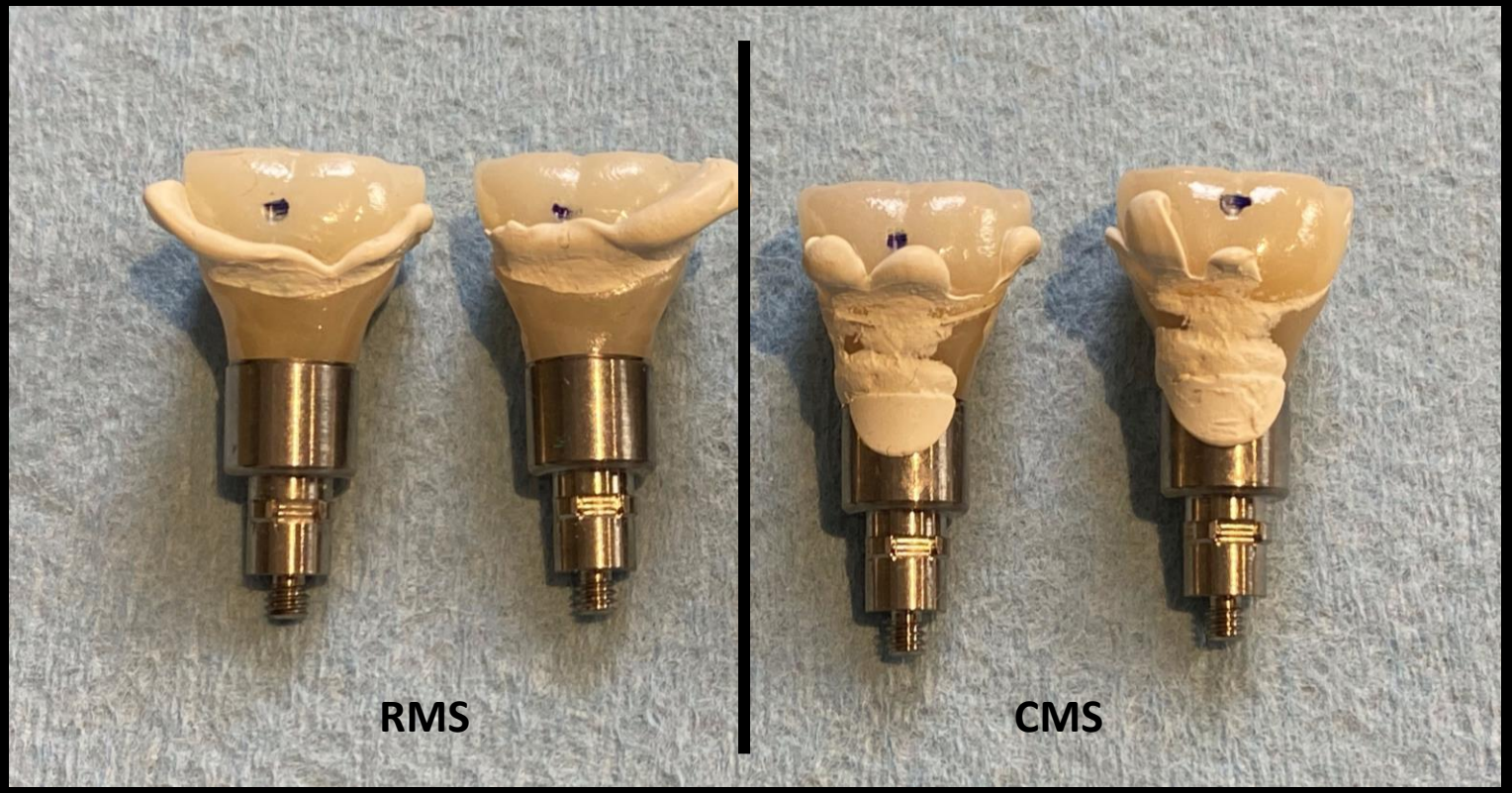
CMS Design Stimulates Both Tissue Effects … Crown Wider than Abutment & Interacts with Gingiva



RMS Mitigates both GE & RTDE



What's better …. RMS or CMS????



What about even lower pressures and open margins?

We now know how the RMS Mitigates the Tissue Effects while the CMS does not.

Resistance to Displacement (RTDE)
& the Gingival Effects (GE)

Svoboda ELA. New Dental Implant Terminology for Exposing and Mitigating the Root Causes of Installation-Related Treatment Complications. www.ReverseMargin.com. Jan 29, 2021: 1-17.

Experiment: Comparing CMS to RMS

Experiment: Cement, Retrieve, Photograph, Measure

Effect of Margin Depth, Installation Pressure & Abutment-Prosthesis Design on Submarginal Cement and Open Margins

100 Models & Crowns
5 Pressure Groups
10 CMS & RMS/Group
RMS vs CMS

Rely X Unicem 2 from 3M Espe

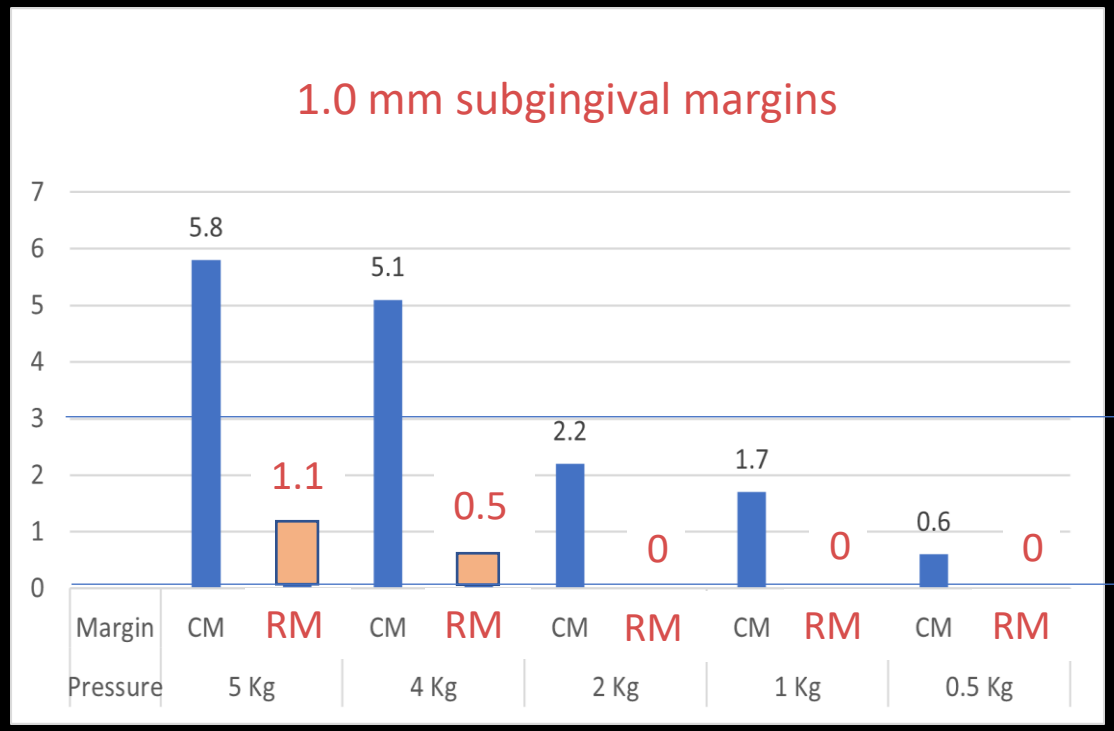
Svoboda ELA, Cheema D, Sharma A. Spectrum Implants March/April 2022: V13 N2: 50-64. Also at www.Reversemargin.com

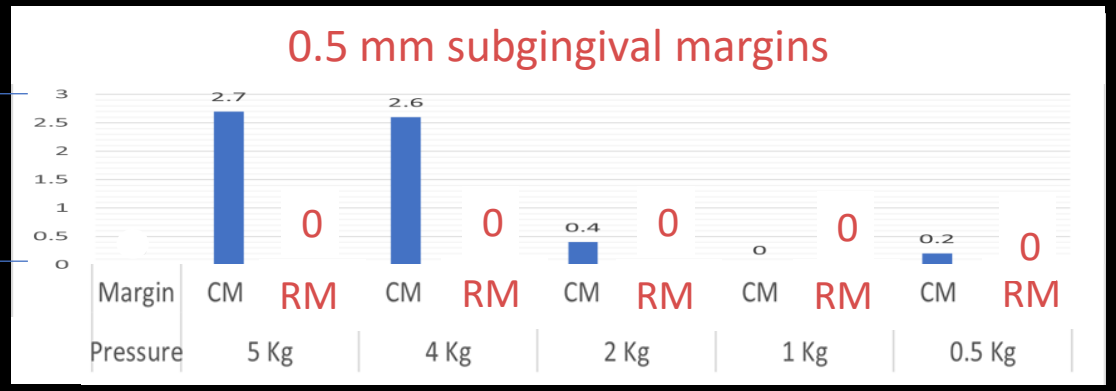
1) Effects Design and Pressure on Submarginal Cement when margins 0.5 to 1 mm below gingiva (GE)

		Totals	
Pressure	Margin	Average	Range
5 Kg	CM	4.1	0 - 10.8
	RM	0.4	0 - 11.6
4 Kg	CM	4.0	0 - 11.5
	RM	0.1	0 - 1.0
2 Kg	CM	2.1	0.1 - 4.2
	RM	0	0
1 Kg	CM	0.7	0 - 3.3
	RM	0	0
0.5 Kg	CM	0.7	0 - 3.8
	RM	0	0

- RMS better than CMS under all pressures
- Less submarginal cement with less pressure
- NO submarginal cement for RMS at 2Kg or less
- Results more erratic at 4 Kg or more

Average Submarginal Cement vs Pressure & Margin Depths





- RMS better than CMS at all pressures with NO submarginal cement at 2 Kg or less
- Results for RMS erratic at 4 -5 Kg pressure (this is the pressure taught at dental school)
- Shallower margins decreases submarginal cement
- Lower pressure decreases submarginal cement

2) Effects of System Design and Cement on Open Margins

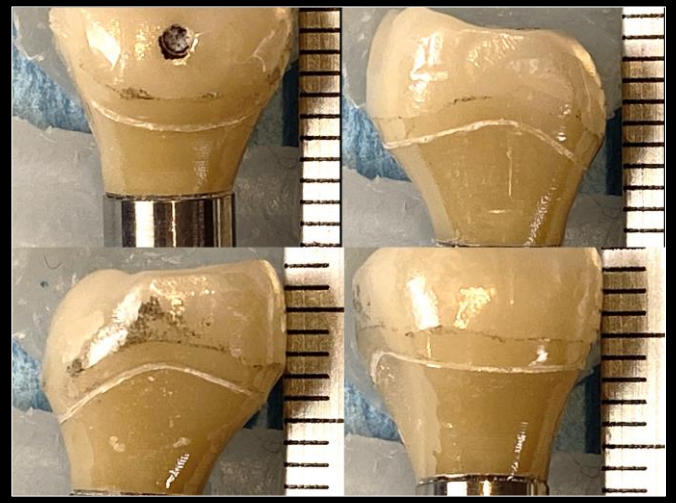
<u>Controls:</u> Are Open Margins caused by Mechanical Misfits or Cement?

<u>No Contacts:</u> Fits were Excellent With & Without Cement
<u>No Gingiva:</u> NO Open Margins were observed for both CMS & RMS

RMS had NO Open Margins

All CMS had Open Margins when 0.5 to 1 mm subgingival

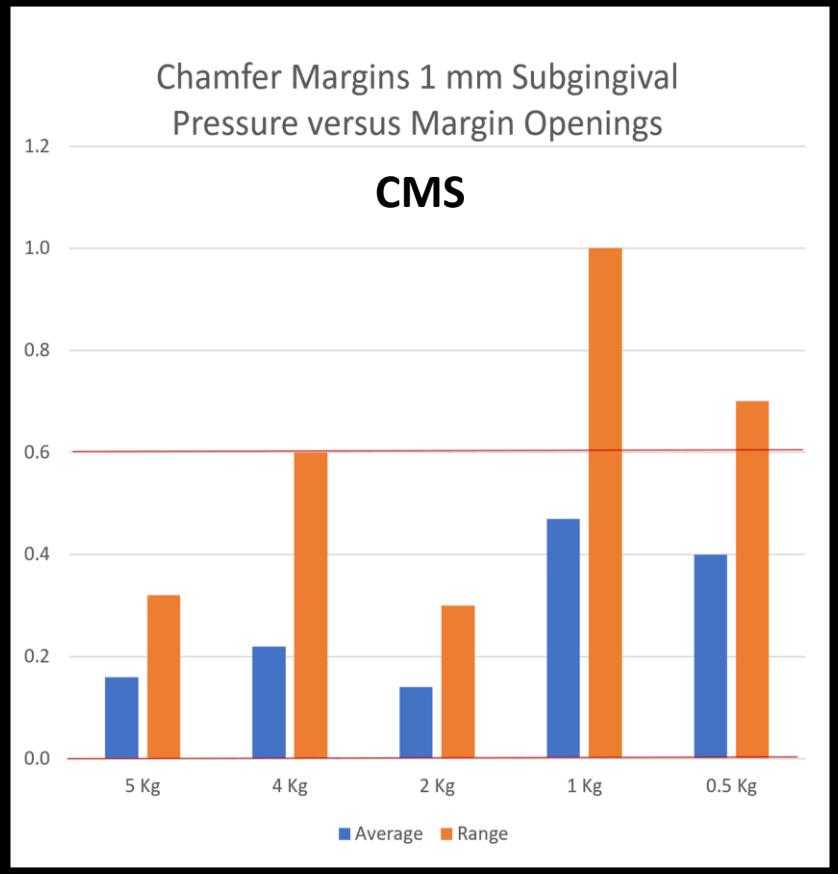
The Gingiva done it! (RTDE)



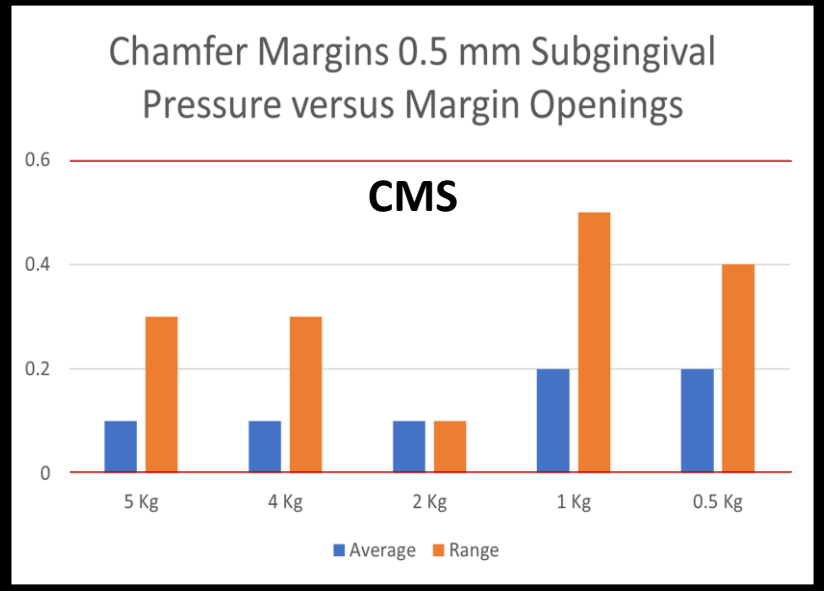
CM	Total	
Pressure	Average	Range
5 Kg	0.1	0-0.3
4 Kg	0.2	0-0.6
2 Kg	0.1	0-0.3
1 Kg	0.3	0-1.0
0.5 Kg	0.3	0-0.7

CMS Margin Openings Increased with Decreasing Installation Pressure

CMS Open Margins Increased with Decreasing Pressure and Increasing Margin Depths



RTDE



RMS crowns do not interact with gingiva and had No Open Margins

Conclusions:

1. The RMS consistently outperformed the CMS in preventing subgingival cement under all conditions.

2. The RMS eliminated both submarginal cement and open margins under low pressure crown installation conditions.

3. Open margins observed with the CMS were caused by resistance to displacement by adjacent Gingiva & they increased size with decreasing installation pressure. All of CMS had open margins.

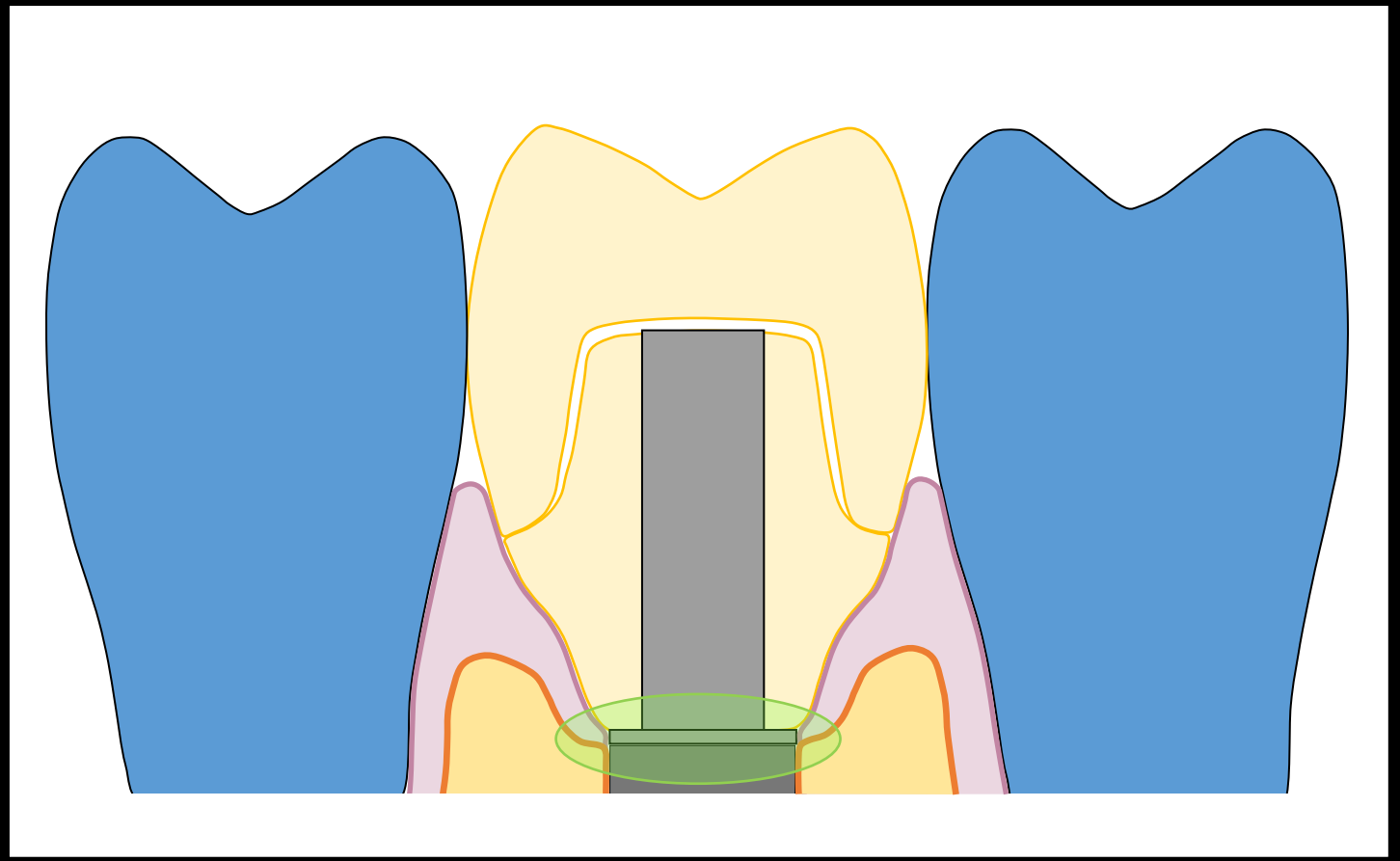
4. The results of these studies show how the Tissue Effects can contribute to complications, as described in Dr. Svoboda in his articles

We know HOW the RMS Mitigates the Tissue Effects

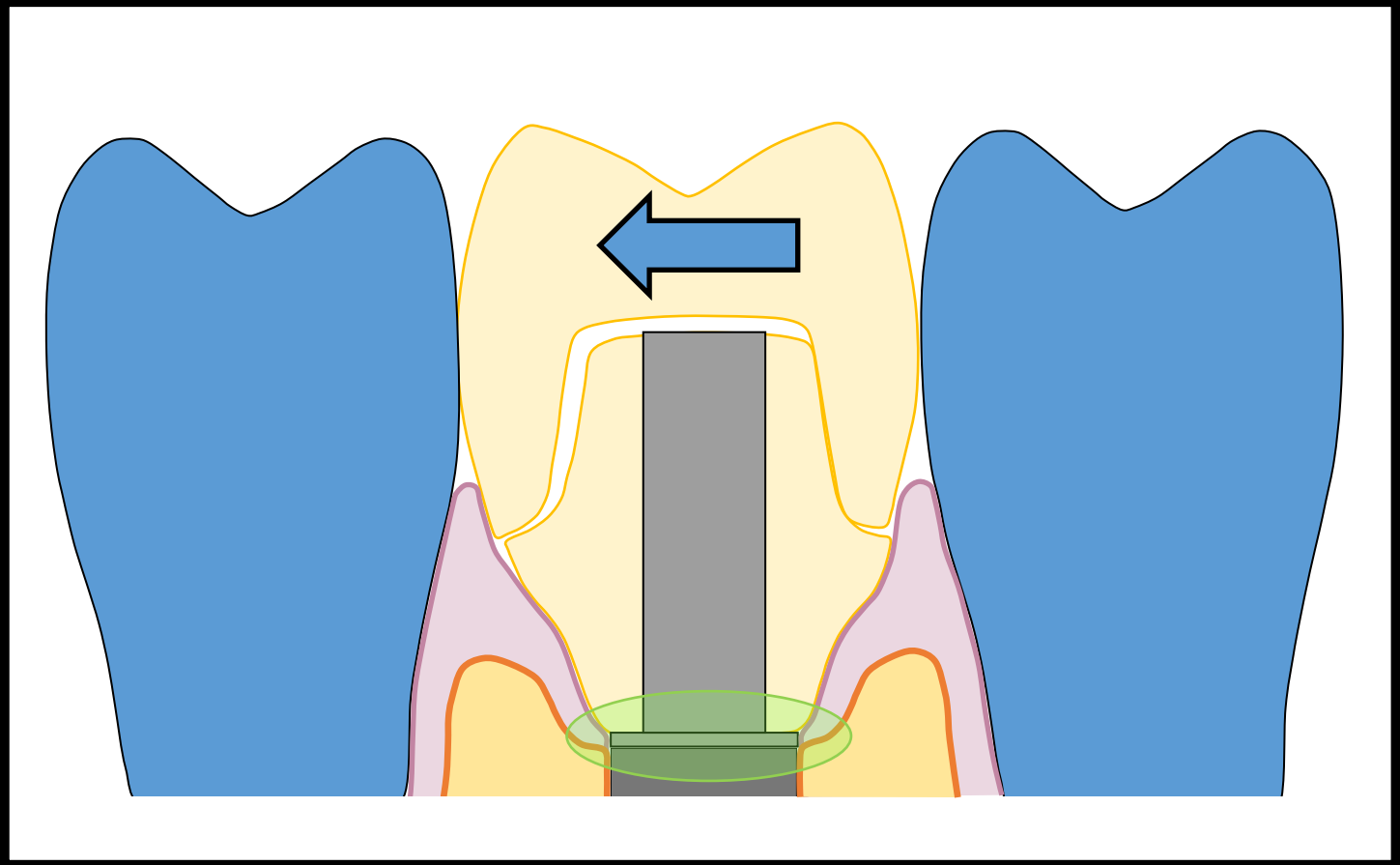
RTDE
GE

What about
Prosthesis Dimensional Error (PDE) &
Incongruent Paths of Insertion (ICPOI) ?

Can the CMS tolerate expected PDE &/or ICPOI?

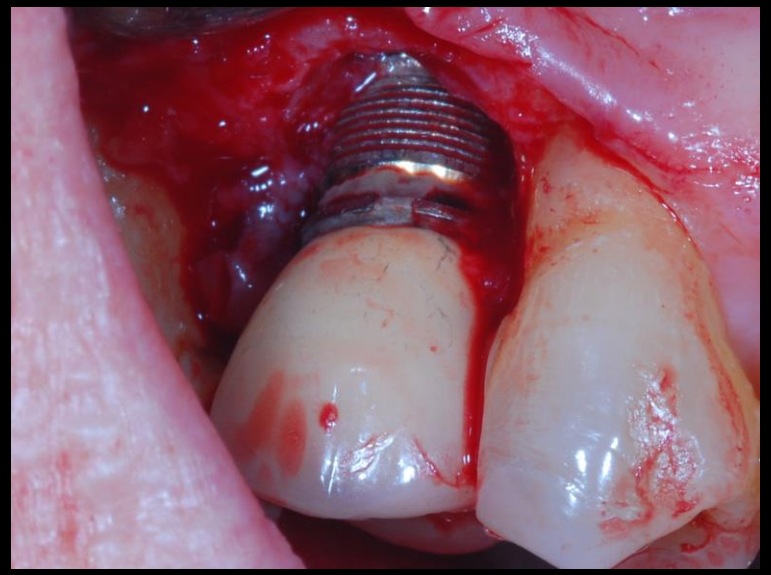


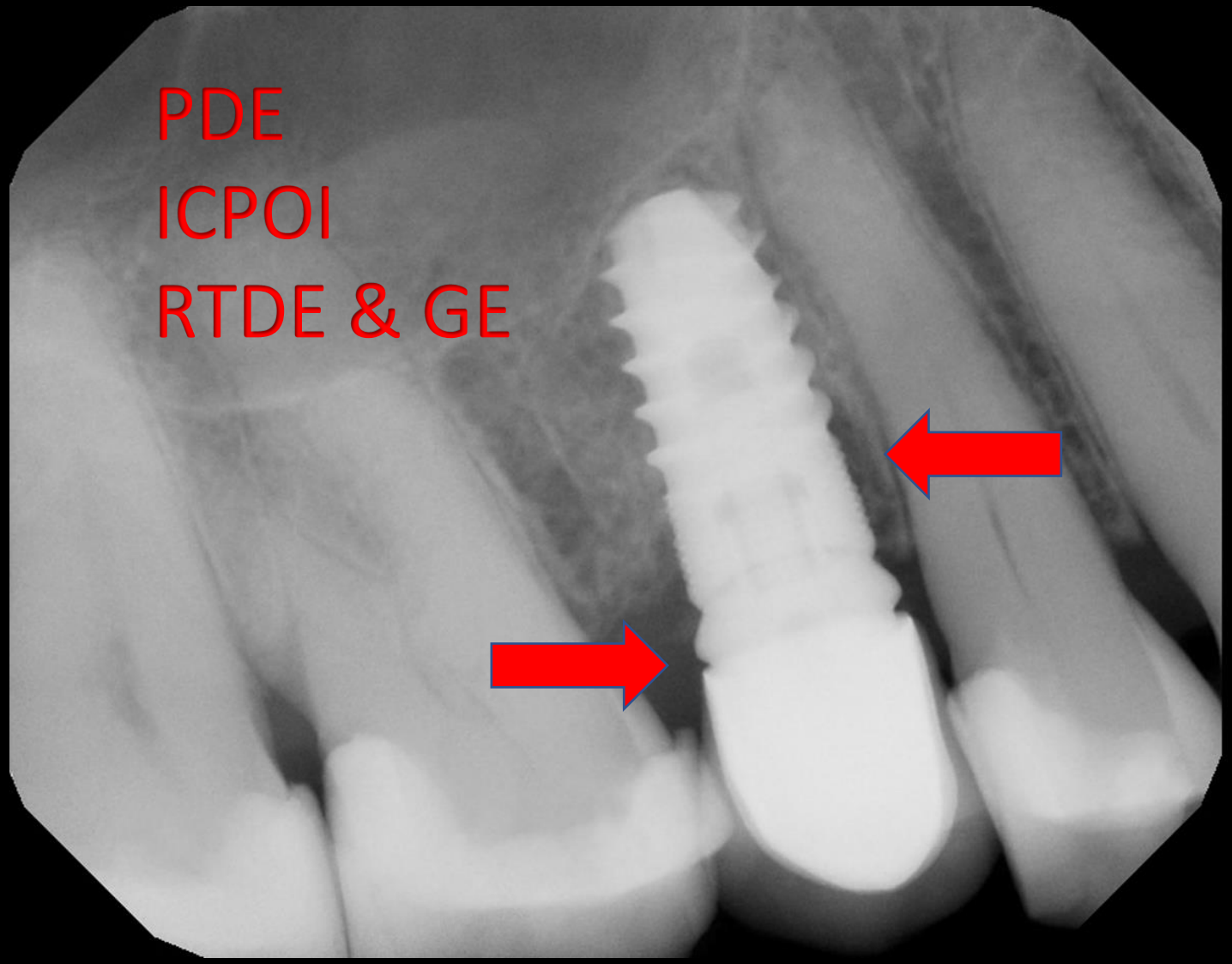
CMS margins are designed to touch and thus cannot safely tolerate expected PDE nor ICPOI



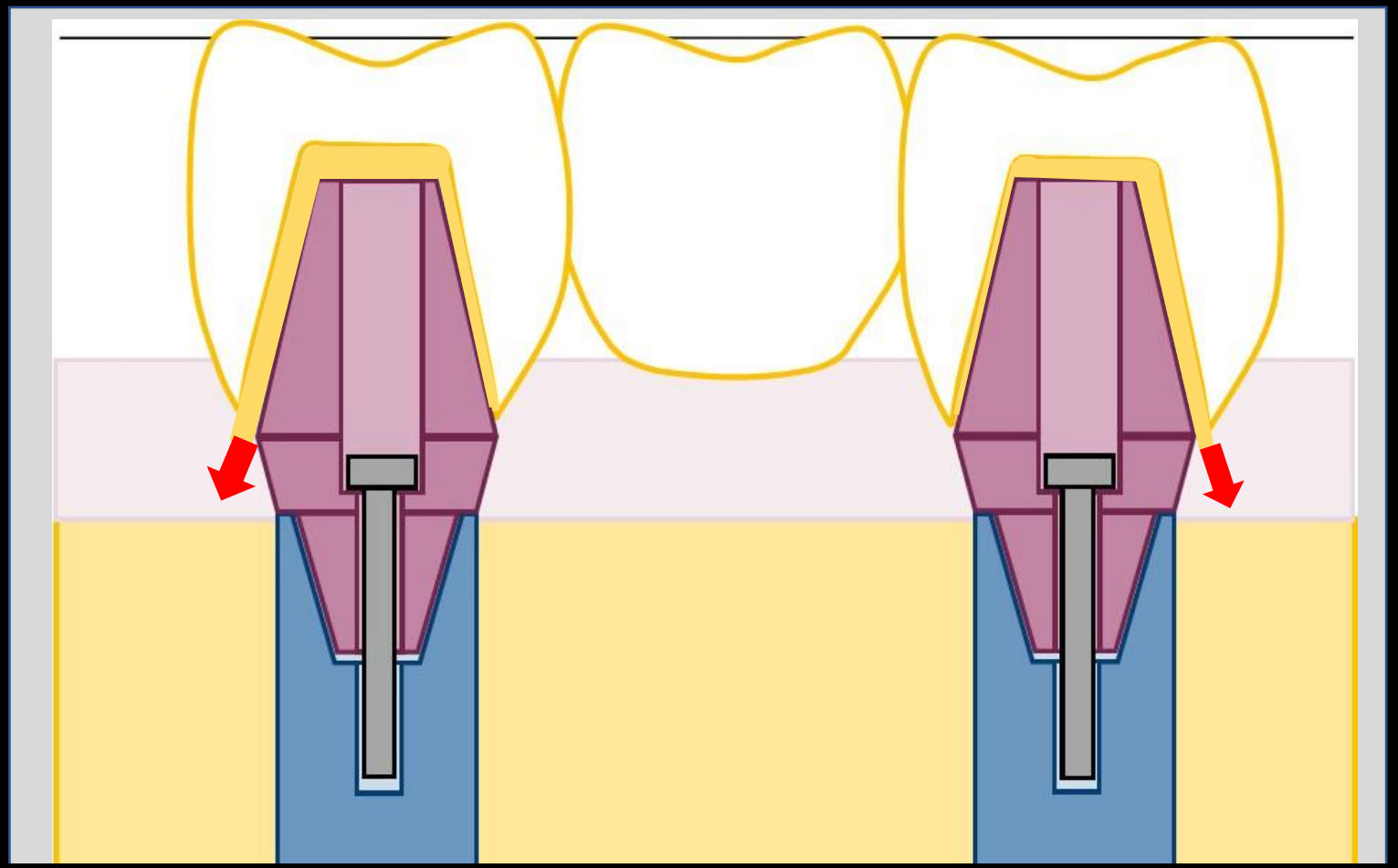
Without causing
open & overhanging
margins
& subgingival cement

Open Margin
Subgingival cement
Bone destruction





Chamfer Margins provide Zero tolerance to expected PDE & ICPOI

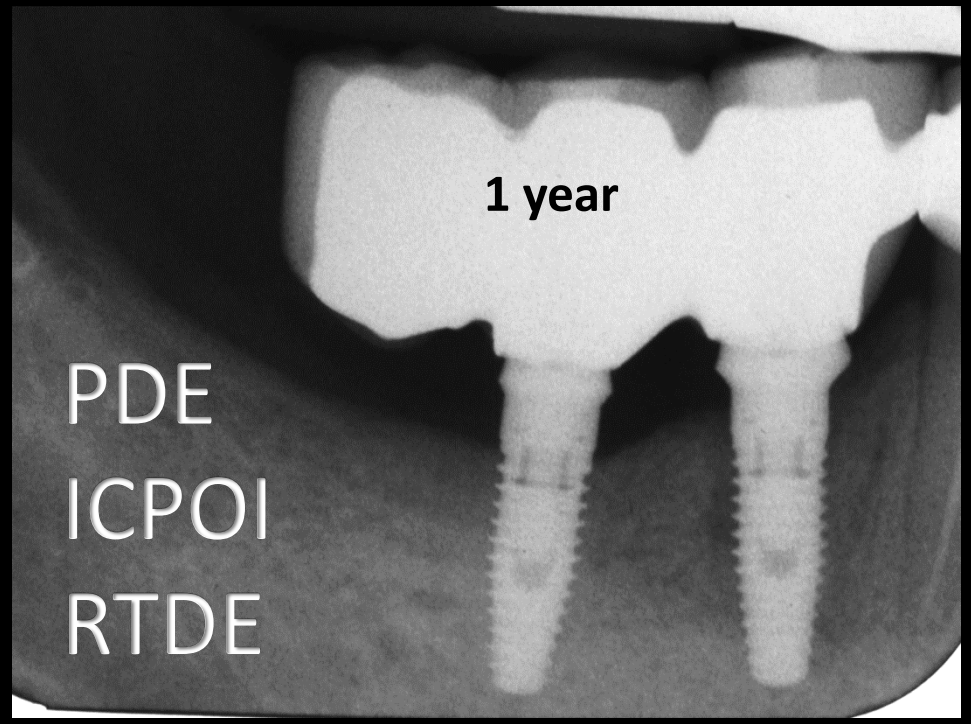


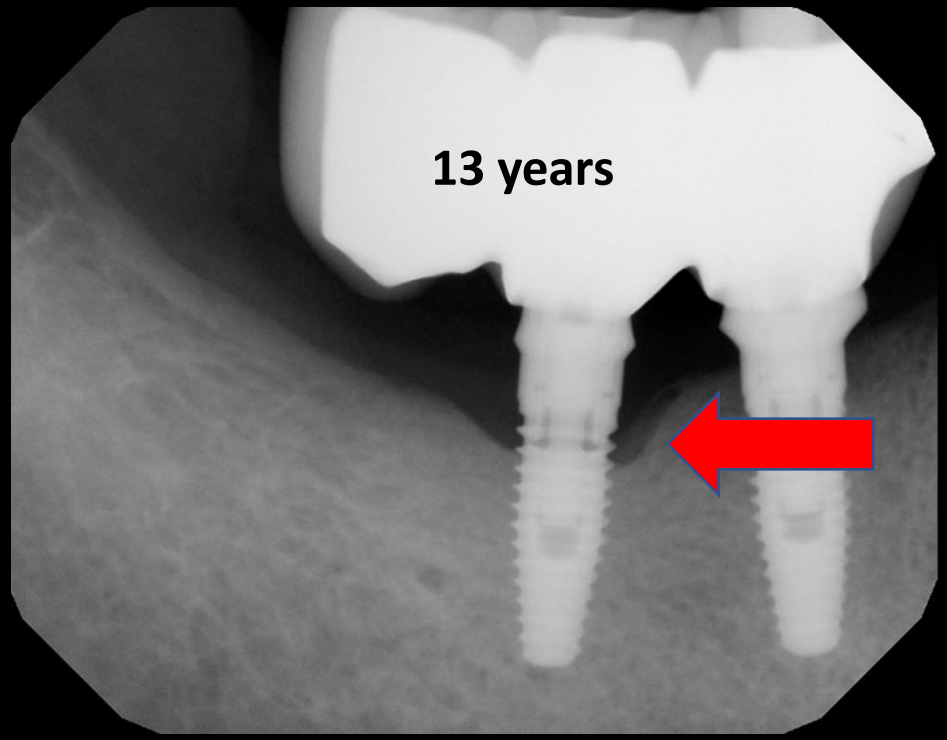
& stimulate Both TE: RTDE & GE

Result: Poor contacts, hyperocclusion, submarginal cement, & open, overhanging & overextended margins …. are common

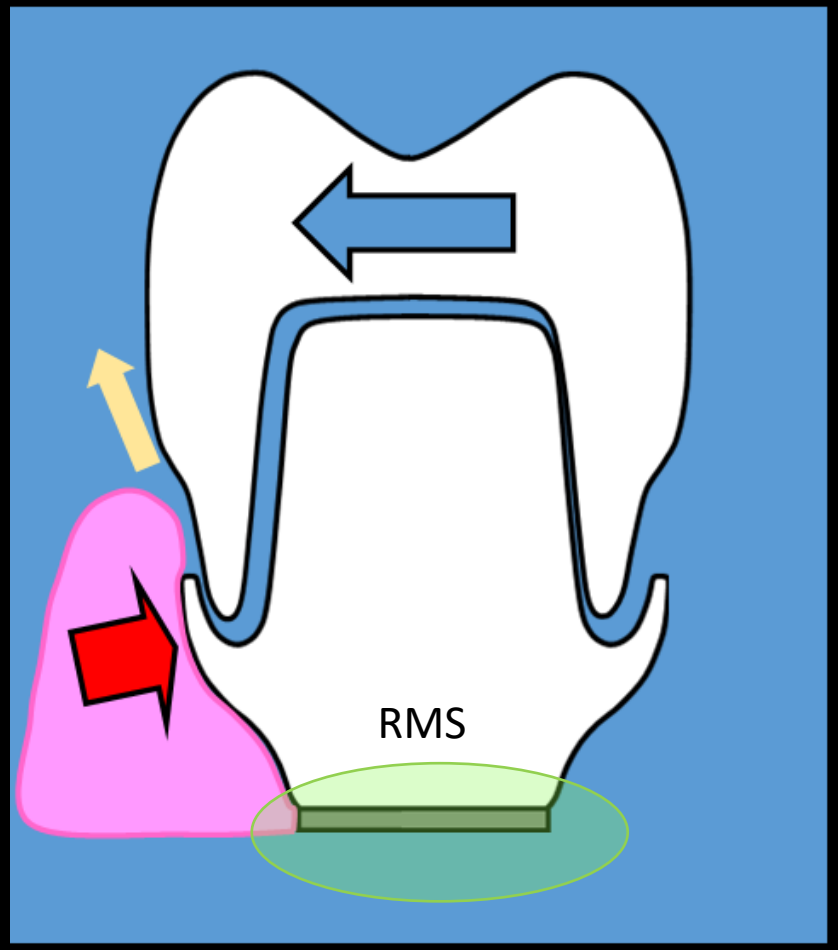
Unseated Prosthesis

Effect on Long-term Bone Loss?



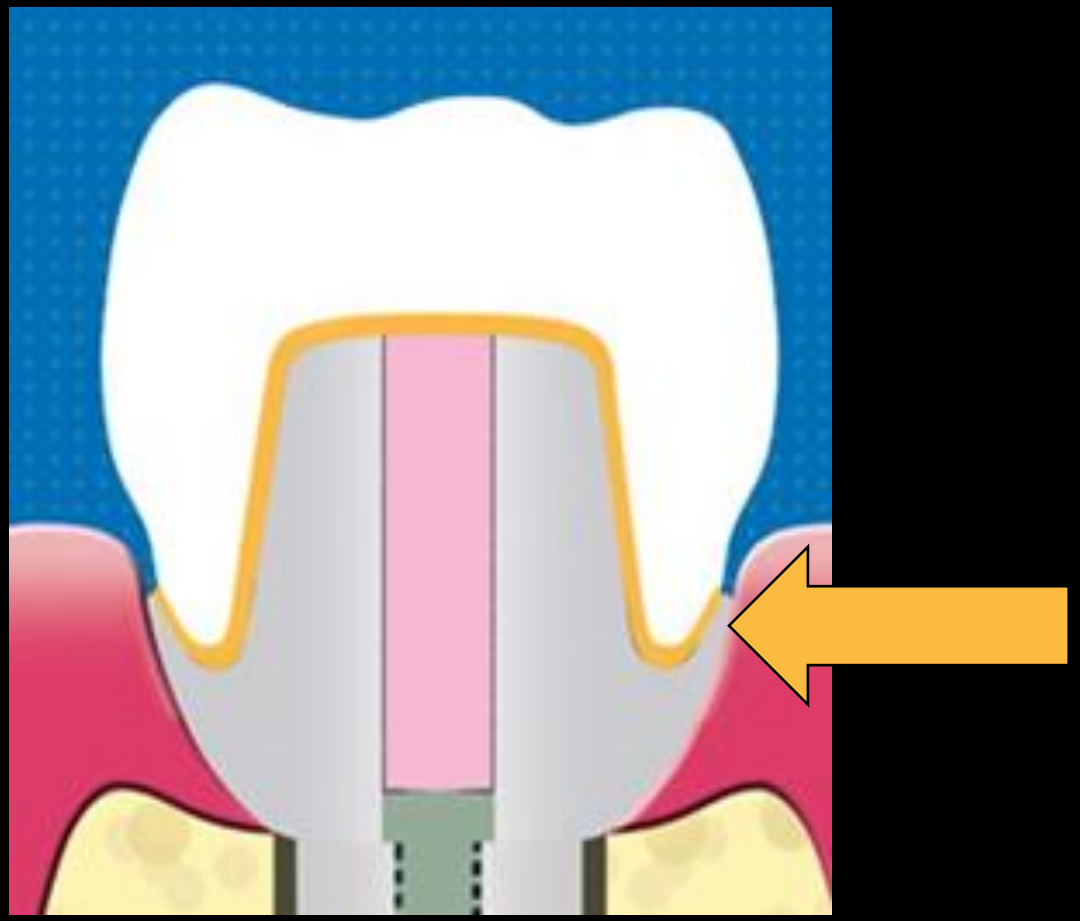


RMS margins are designed to safely tolerate expected PDE & ICPOI



This makes it
Easier for the Dentist
to adjust and install a
prosthesis
safely & calmly
with low pressure

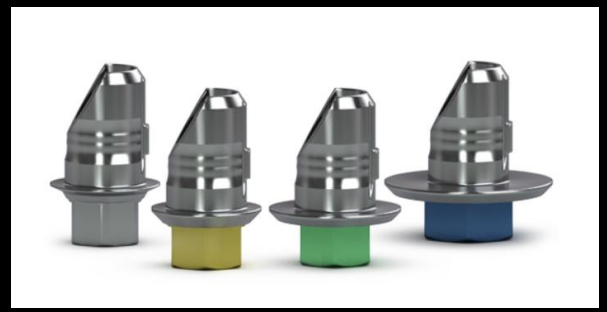
Reverse Margin System Tolerates PDE & ICPOI



Cement Space exists under & on both Sides of Prosthesis Margin

RMS can safely tolerate expected PDE & ICPOI and manage the TE

This helps dentists exploit the benefits of CAD/CAM



1

Healing Abutment (HA) Shapes the Trans-tissue Portal

Reduces the RTDE

Facilitates NEXT STEP

2 Installing the RMS Abutment

Its shape reverses cement flow away from tissues & pushes tissues away from the crown base

RMS Abutment eliminates RTDE & GE during crown installation

3

Installing the RMS Prosthesis

Crown shape safely tolerates expected PDE & ICPOI as margins are free to float within RMS abutment margin trough

RMS Prosthesis is self-centering & self –leveling,
Prevents submarginal cement & overhanging & open margins

Smoother the Treatment - Happier the Patient





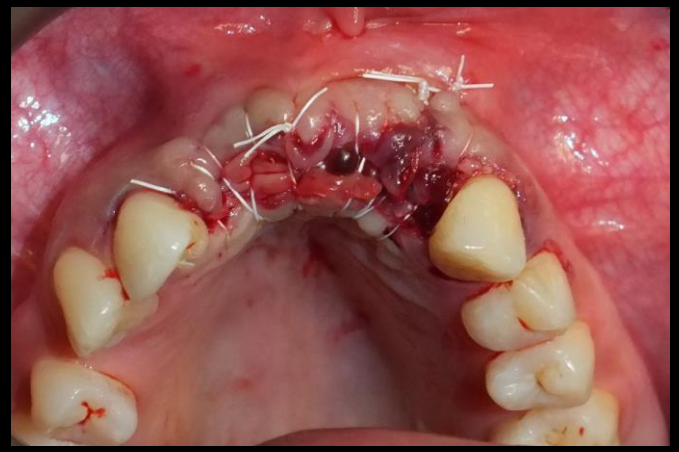




AF 19

RMS prosthetics are Easy Maintained

Another Happy Patient!



Their Happiness

is Good for Business

23 Years of Happiness is Great for Business

Good for the All because Complications are Expensive!

We threw out the baby with the bathwater

Safer intra-oral cementation is key to fixing both the screw-in & cement-in systems of installation

It is NOW possible for the Dentist to make

the Peri-implant Environment
Cleanable
Optimize the fit of implant parts &
Prevent subgingival cement
to Reduce Risk of Peri-implant Disease

Dentists need to do this for themselves & their patients

Reverse Margin™ System

Allows dentists to optimize the fit of implant parts in the mouth like in FDA tests

Makes installation simpler & safer

reduces dentist liability & is great for business

Dentists Can Now

Prevent Residual Subgingival Cement to reduce Peri-implant Disease by *60%

Wilson,T.G. The positive relationship between excess cement and peri-implant disease: a prospective clinical endoscopic study. J Periodontol 2009;80:1388.

“I have done over 2000 cases and this design has changed my life”
Dr. James Miller from Oregon

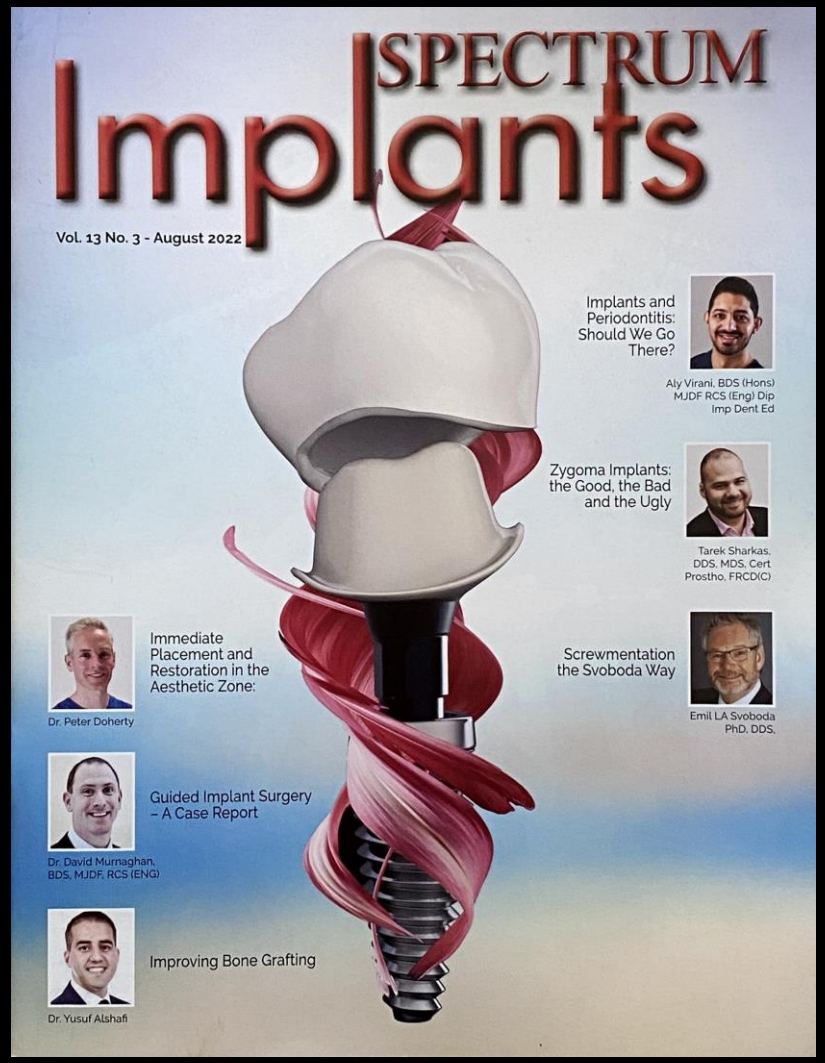
How does T. Mitchell's Screwmentation Differ from The Svoboda Way of Prosthesis Installation?

Mitchell describes a system of single crown installation that **fails to optimize** the implant-abutment (I-A) connection and requires the removal and reinstallation of the abutment-crown complex to remove expected subgingival cement.

The Svoboda Way optimizes the I-A connections for single and multiple unit restorations, prevents residual subgingival cement and open margins, and does not require prosthesis removal and reinstallation to remove excess cement.
This RMS is the safer, simpler and more efficient installation system.

Svoboda ELA. Screwmentation the Svoboda Way. Spectrum Implants Aug 2022,V13,N3:54-63.
www.ReverseMargin.com; June 2022;1-13.

Screwmentation the Svoboda Way



Available for free Download at www.ReverseMargin.com

Make that Healthier Choice

Choose the RM System

to Usher in

a

New GOLD

Standard of Care

Shaw Lab Group
Designs and Mills RMS Prosthetics for You

SHAW
Lab Group

Order Direct
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Safer Cementation with the RMS is the New Gold Standard for Fixed Prosthesis Installation

www.ReverseMargin.com

Questions - drsvoboda@rogers.com