Safer Intraoral Cementation Is the Gold Standard for Fixed Prostheses Installation

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Diplomate American Board of Oral Implantology / Implant Dentistry

May 27, 2022

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Spectrum Implants Journal Features: Implant Essentials

Inaugural Host: Dr. Murray Arlin

Welcomes you to Join Dr. Svoboda as the New Host

Tackling the BIG Questions & Exploring the Assumptions
that support your Implant Treatment Decisions

Current Topic: Are Misfits Important?

Response at www.ReverseMargin.com

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-...

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

“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”

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

1. What is the Standard of Care?
    a. it is determined what we learned to do at dental school
    b. it is a dynamic concept that is always the best we can do
    c. it is determined by the dental manufacturers
    d. it results from a process that is defensible by the clinician
    e. all of the above

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2. What is Implant Survival Rate?

a. the percentage of implants still in the mouth without disease

b. the percentage of implants still in the mouth over time

c. is determined by the number of patients without peri-implant disease

d. it is the same as the success rate

e. all of the above

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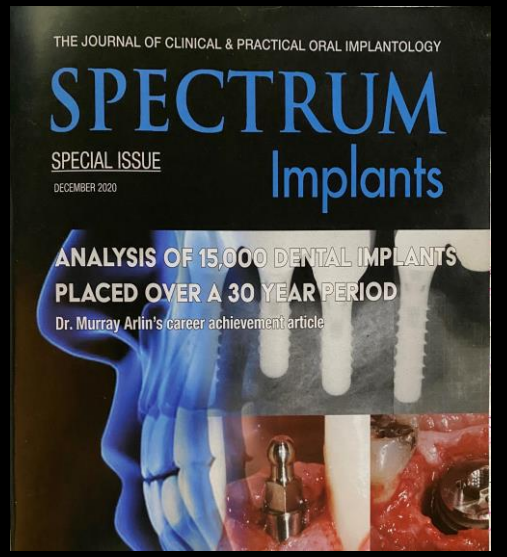
Why didn't his Implant Survival Rate improve over 30 years?

5 % failures by 2 years &

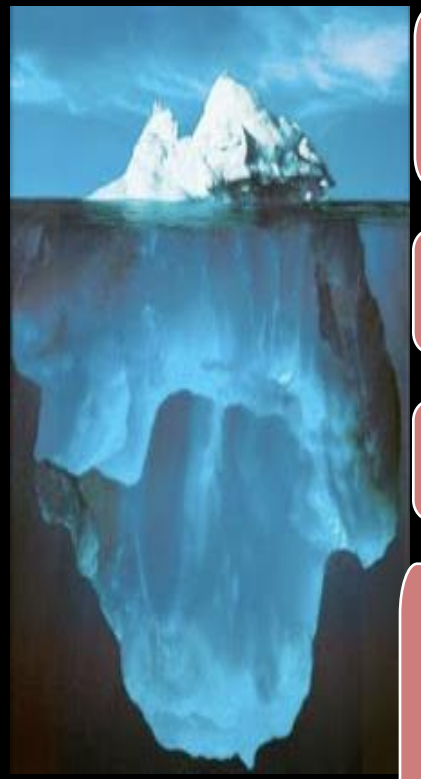
8 % by 10 years

1999 Group ~ 2019 Group

Are we missing Something????



Patients' Experience

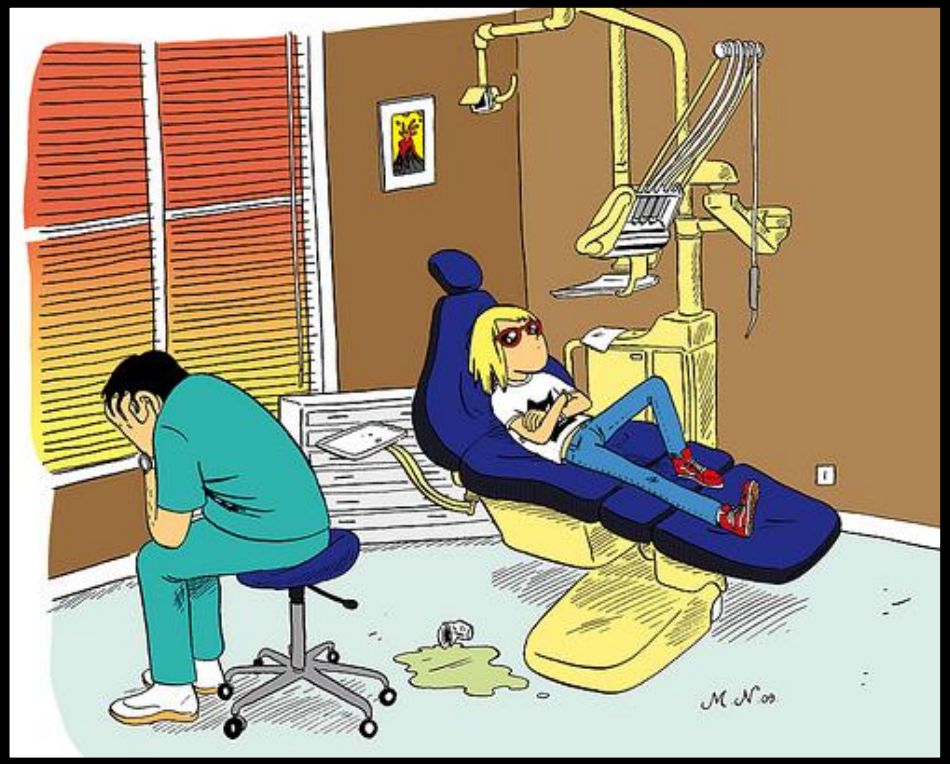


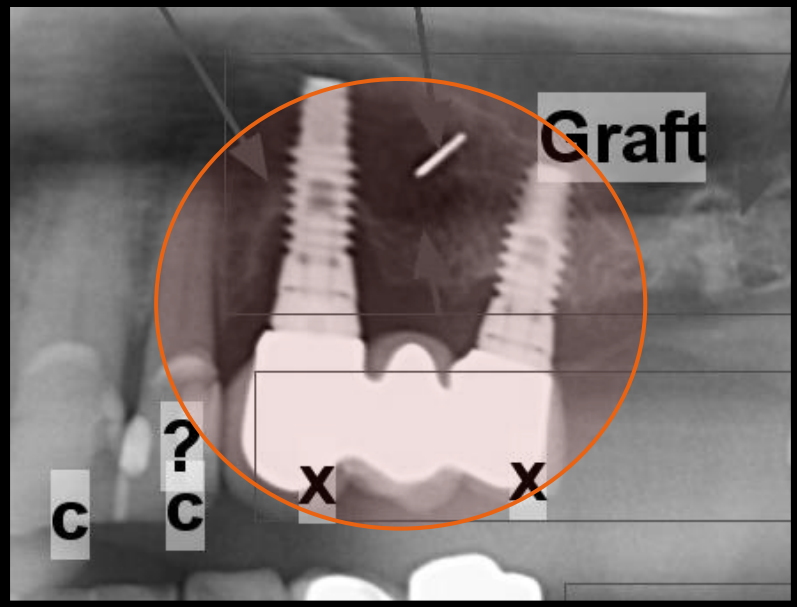
Implant Failures	14% over 10 yrs
Peri-implantitis	20%
Mucositis	47%
*Peri-implant Disease &/or Failure	81%

Same for Cement-in & Screw-in Installation

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

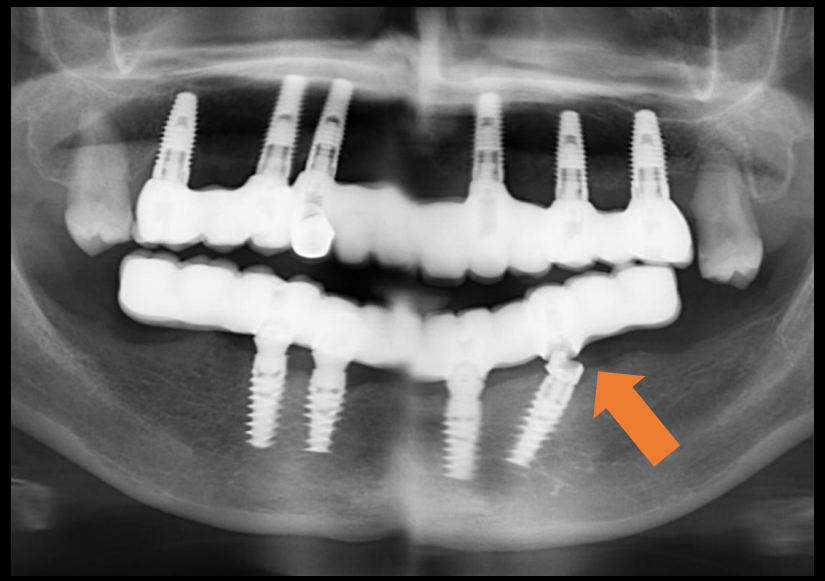
Complications Disappoint Patients

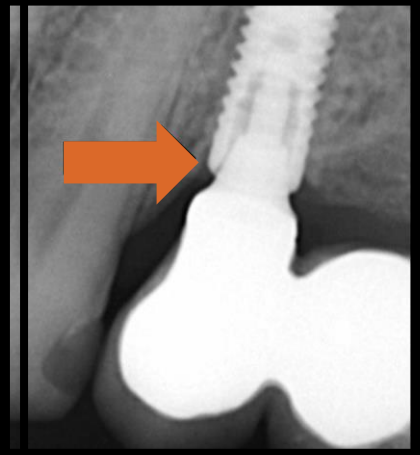




Stimulate a Whole Cascade of Liabilities for Referral Sources, Labs, Implant Companies

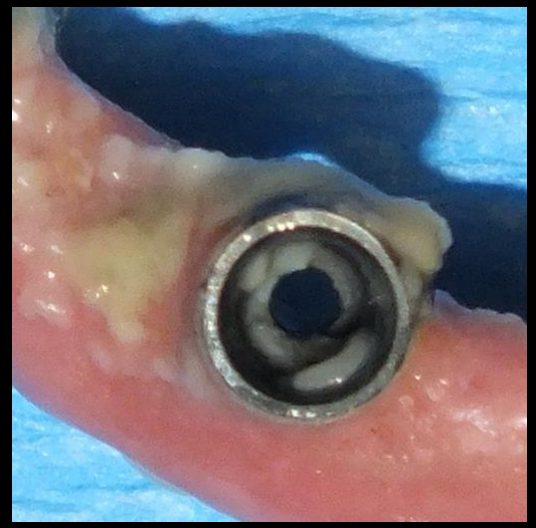
Physician: “Implants are a Cesspool of infection!”





Host Resistance

Pathogen Virility ⟷ Size of Inoculum



Are we still relying TOO MUCH on
Host Resistance to make our treatments work?

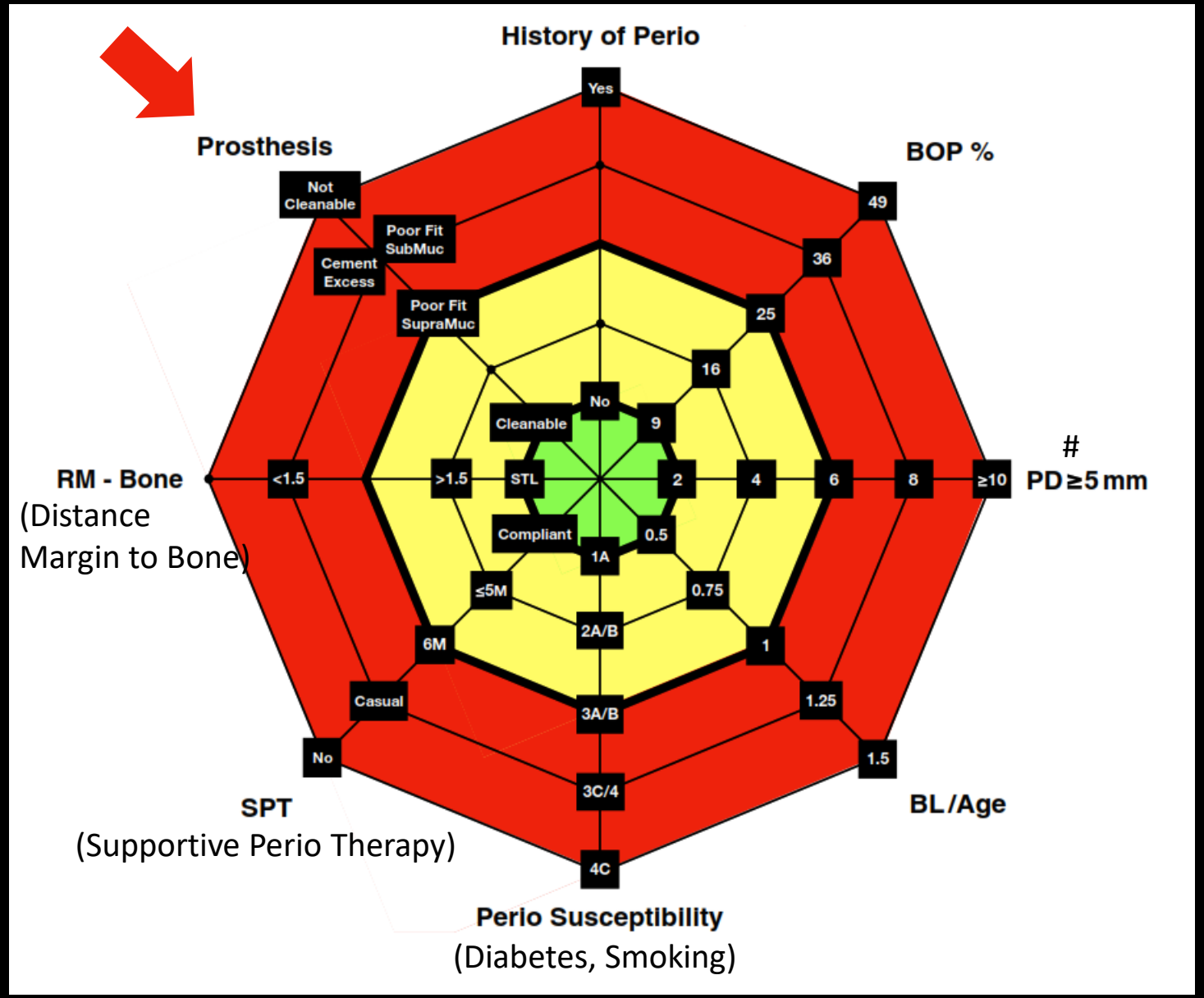
NO Predictable Treatment For Peri-Implantitis

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



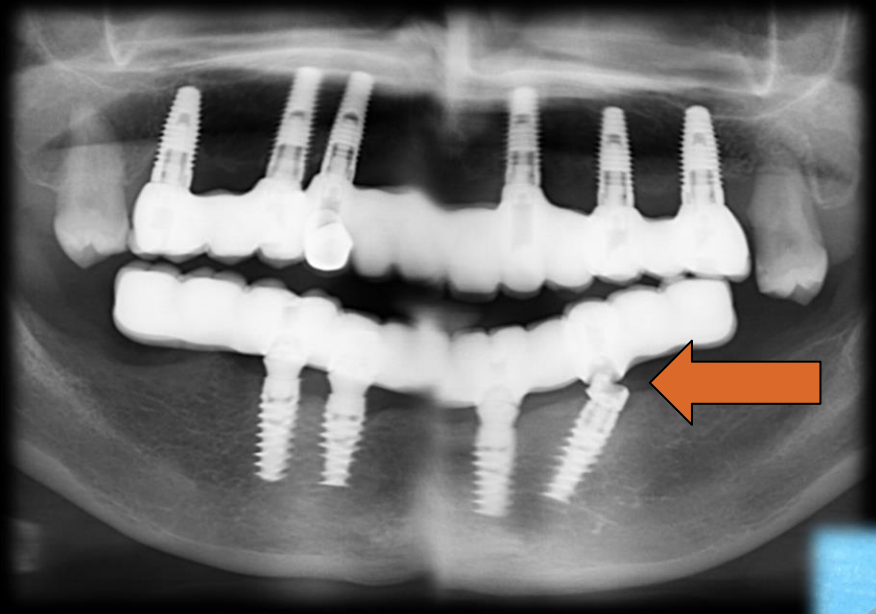
Peri-implant Disease Risk Assessment

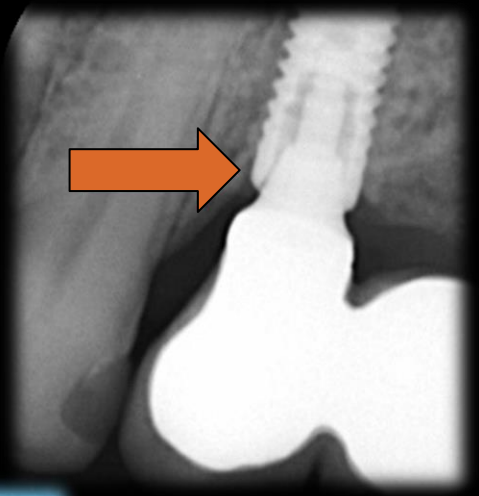
Heitz-Mayfield LJA, Heitz F, Lang NP.
Implant Disease Risk Assessment IDRA - a tool for preventing peri-implant disease. Clin Oral Impl Res. **2020**;31:397-403.

A Prosthesis Should be
Cleanable
Optimally-fitting parts
NO residual subgingival cement
to Reduce Risk
of Peri-implant 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.

What Causes these Problematic Mechanical Conditions?





The OLD Dragons of Dentistry

Are
Root Causes
of
Mechanical
Conditions

Mechanical Conditions

Predispose
Patients
to
Biological
Complications

Svoboda ELA. New Dental Implant Terminology for Exposing and Mitigating the Root Causes of Installation-Related Treatment Complications. Spectrum Implants: 2021;1-18. Download Article at www.ReverseMargin.com

Prosthesis Dimensional Error (PDE) & Tissue Effects (TE)

- Loose and tight contacts
- Misfit implant parts
- Joint instability
- Poor prosthesis margins
- Hyperocclusion
- Subgingival cement

Independently
They Can Cause Similar Complications

Together
They Are
Almost
INVINCIBLE

3. What are the root causes of complications related to prosthesis installation?

a. Prosthesis Dimensional Error related to the indirect process of prosthesis construction

b. adjacent and underlying tissues that resist optimal seating of a prosthesis in the mouth

c. prosthesis designs that block access to maintenance

d. the Gingival Effects that cause residual subgingival cement

e. all of the above

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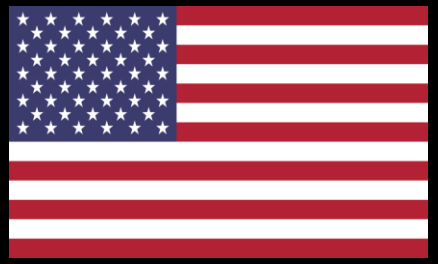


Health Canada & FDA Regulate the Sale of Parts

Manufacturers must demonstrate Implant-Abutment Stability According to ISO Standards

Connections are optimized according to Manufacturer's Directions

Industry Can Produce Parts

Error Tolerances ± 5 µm and better (verified)

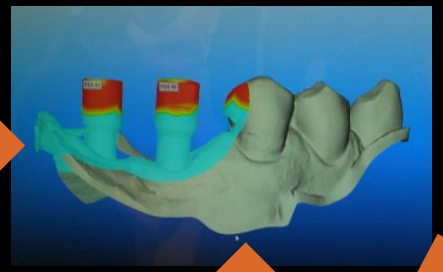
If ONLY DENTISTS could learn to exploit this amazing accuracy …

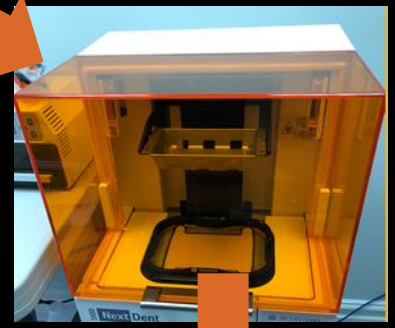
… that would be a real GAME CHANGER

What is Missing from Health Canada & FDA Tests?

1. Mouth - Contact with Teeth & other Tissues
2. Multiple Retaining Implants
3. Multiple Unit Prostheses
4. Effective Manufacturer's Directions to optimize the fit of in the mouth
5. How to prevent residual subgingival cement and poor margins in the mouth
6. Tolerances of manufactured parts?

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





Lab Makes the Prosthesis
Fit a Dental Model ≠ Mouth

Many Finicky Steps & Parts contribute to 3-D PDE

2022

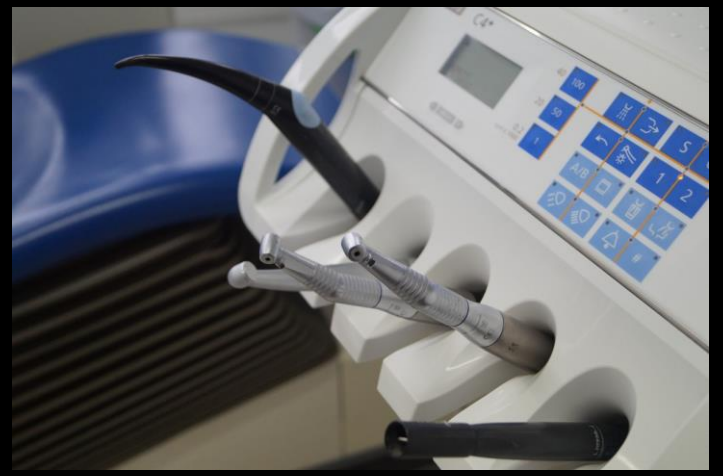
*Acceptable Levels
Prosthesis Error ±150 µm
30 X less accurate than
Manufactured Parts

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

Prosthesis Dimensional Error (PDE)
& the Tissue Effects

Are Why
Dentists Need
to Adjust
Contacts, Fit & Occlusion
In the Mouth

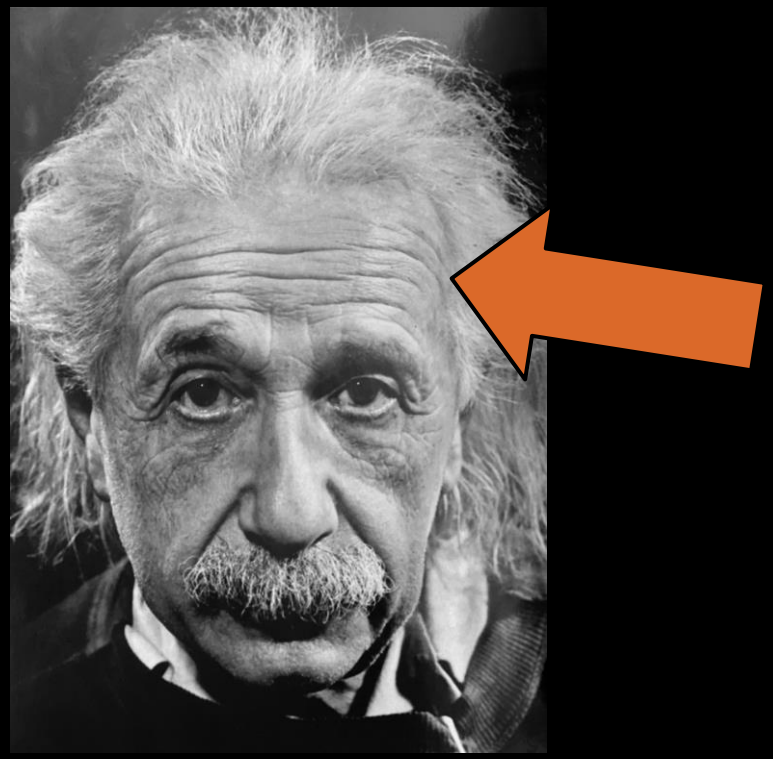
Fit is Variable


Does anyone really know the PDE of a specific prosthesis?

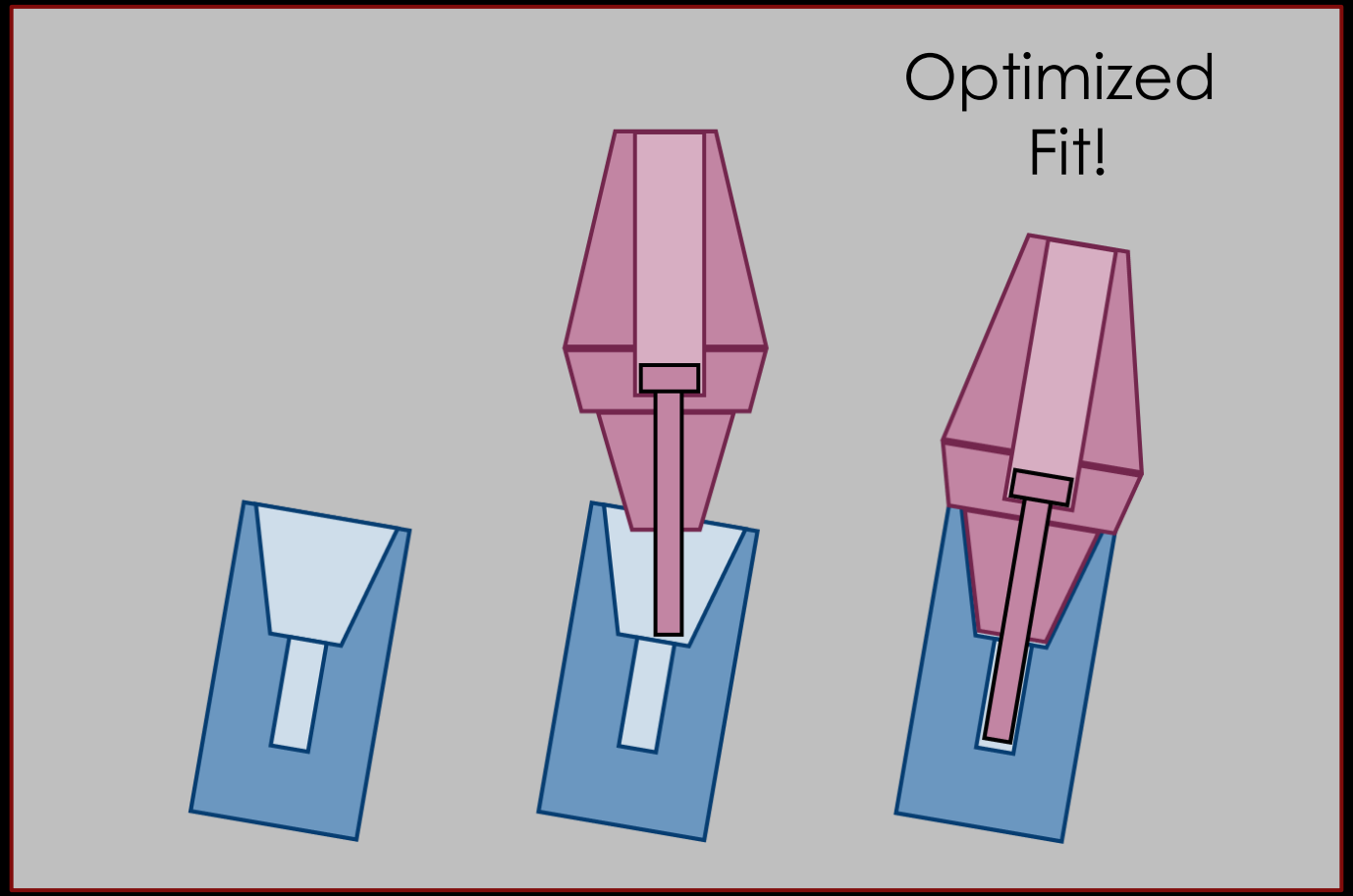
Very difficult to verify fit intra-orally

Can dentists connect parts with an optimized fit of components at the microscopic level?



YES with
Understanding,
Logic
&
a Desire to Improve

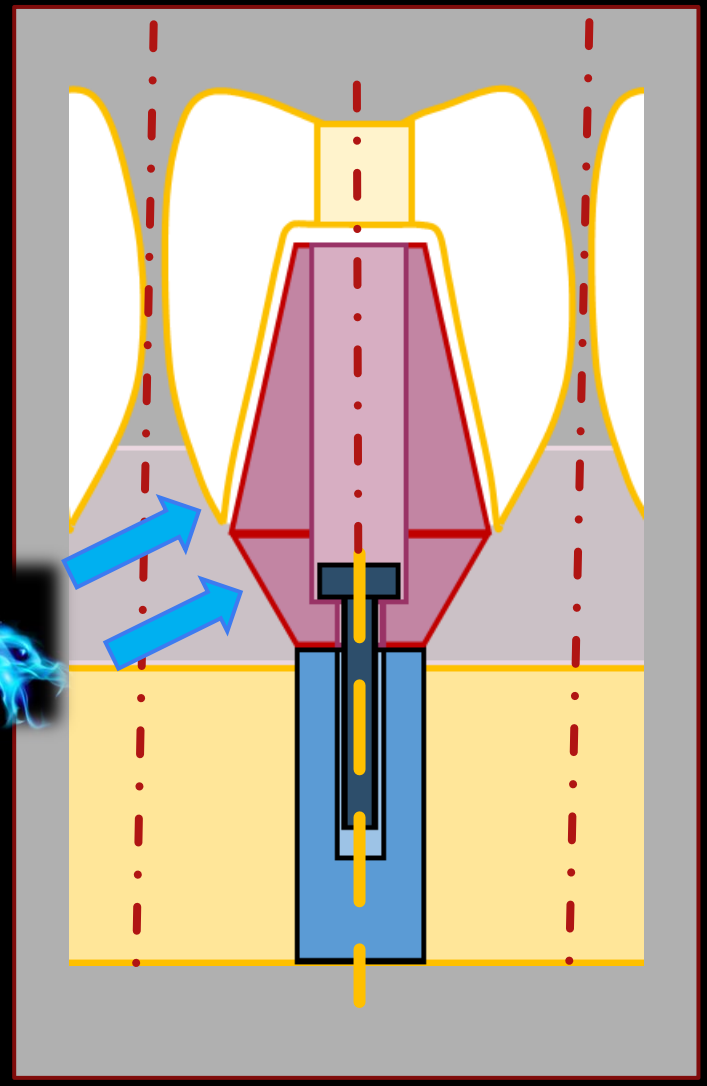
Materials, design, accuracy, precision of manufactured parts & **FIT** determine joint stability under load and its ability to exclude oral pathogens



Simplest to Manage Without Prosthesis attached

Single Screw-in Crown Challenge – No Contacts

The dentist can line up the
Path of Insertion of a crown
with the implant screw channel



However – “Resistance to Displacement”
by adjacent tissues becomes
more Difficult to Manage than abutment alone

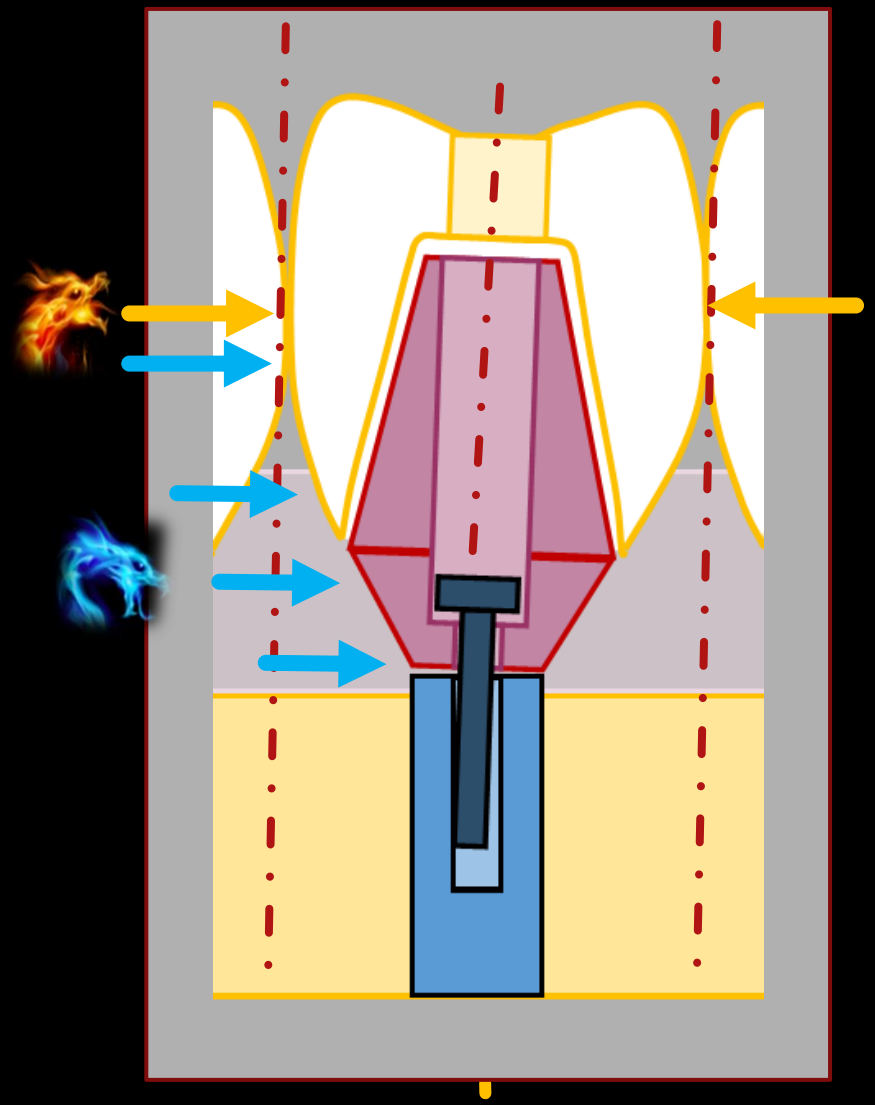
Single Screw-in Crown Challenge – With Contacts

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

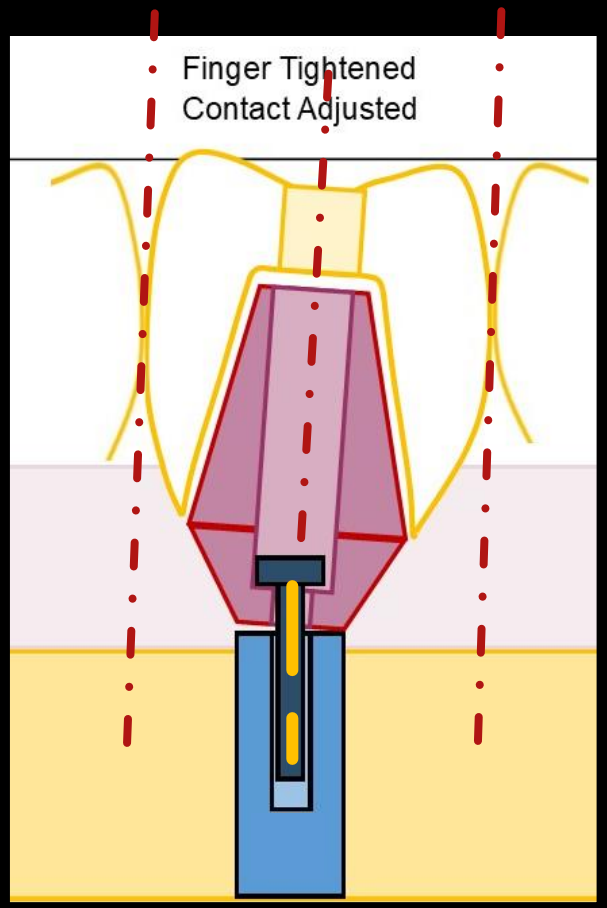
Should the dentist be **HAPPY** ?????

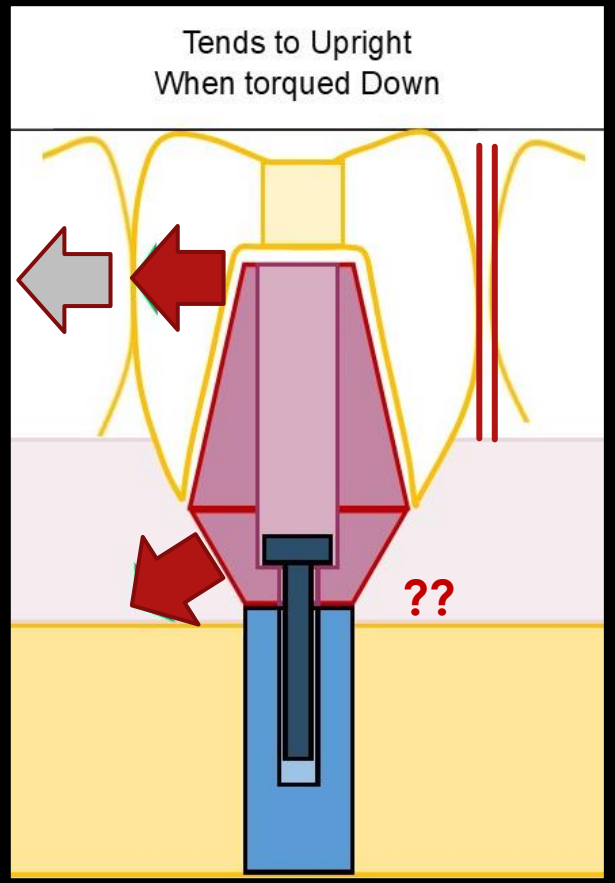
Misfit Joint Likely!

Contacts may have forced
the crown-abutment complex
into a path of insertion
other than that
required for an optimized
implant-abutment connection
& the TE
are even more difficult to control
and fit is very difficult to verify



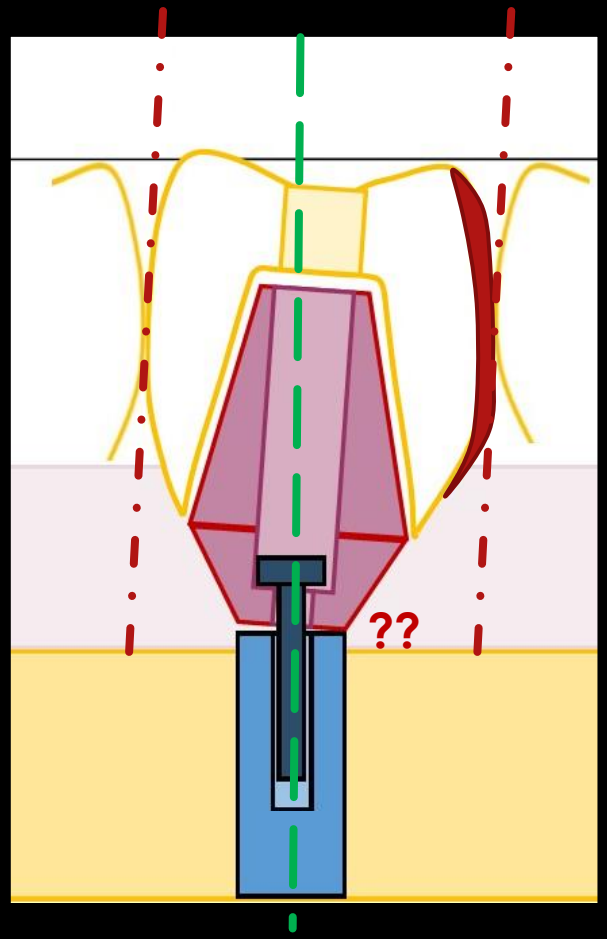
Final torquing of abutment screw may upright the abutment-crown complex somewhat …





… causing a tight & open contact &/or implant-abutment misfit

Open Contact – Transport to Lab



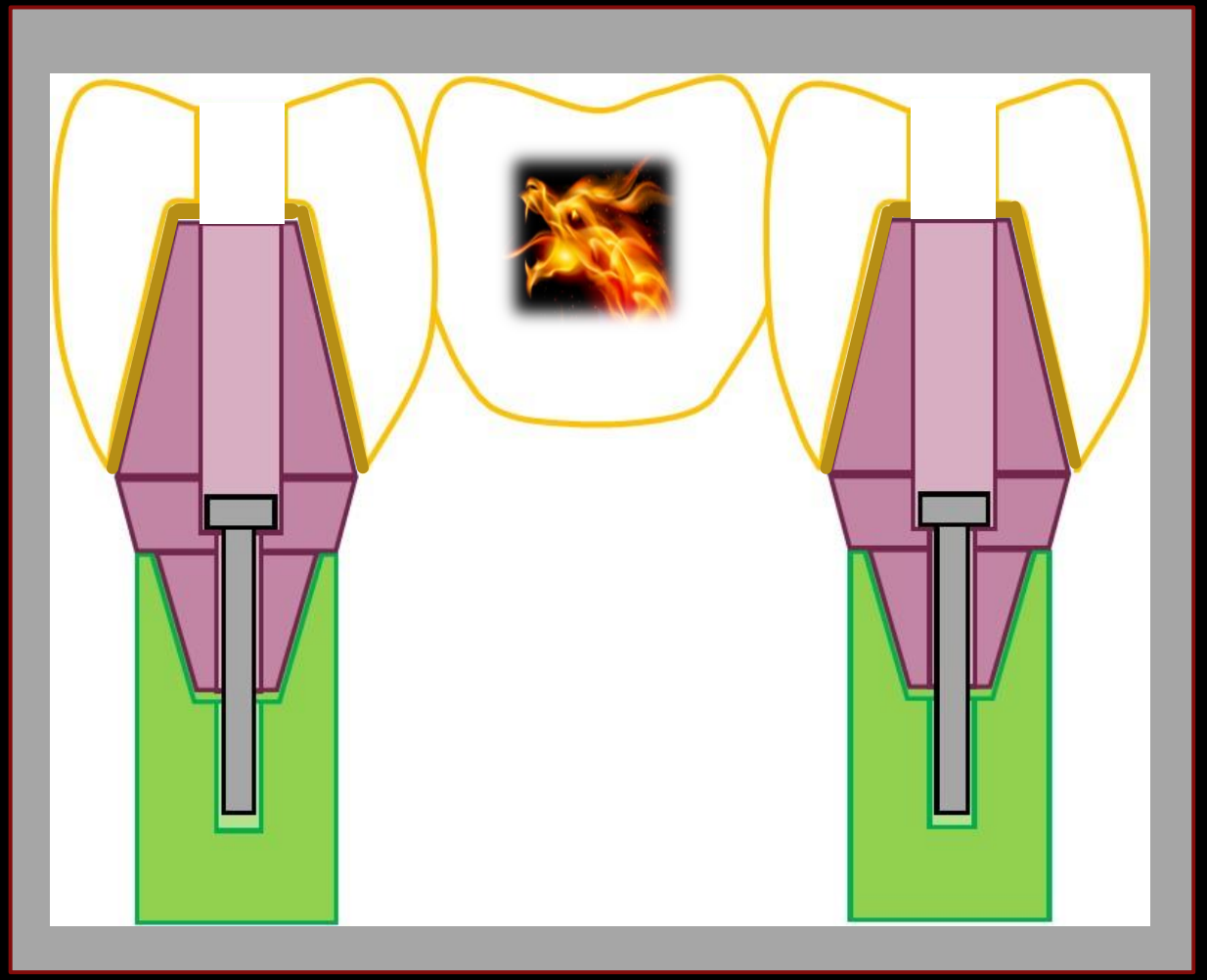
Lab - Put in oven to disassemble
Add porcelain to contact (overbuild)
Reassemble on the inaccurate model
Transport back to Dentist

Dentist Reappoints Patient
Adjusts contacts to seat Crown Complex
Screws it into Place & Hopes for the Best

Model ± 150 µm

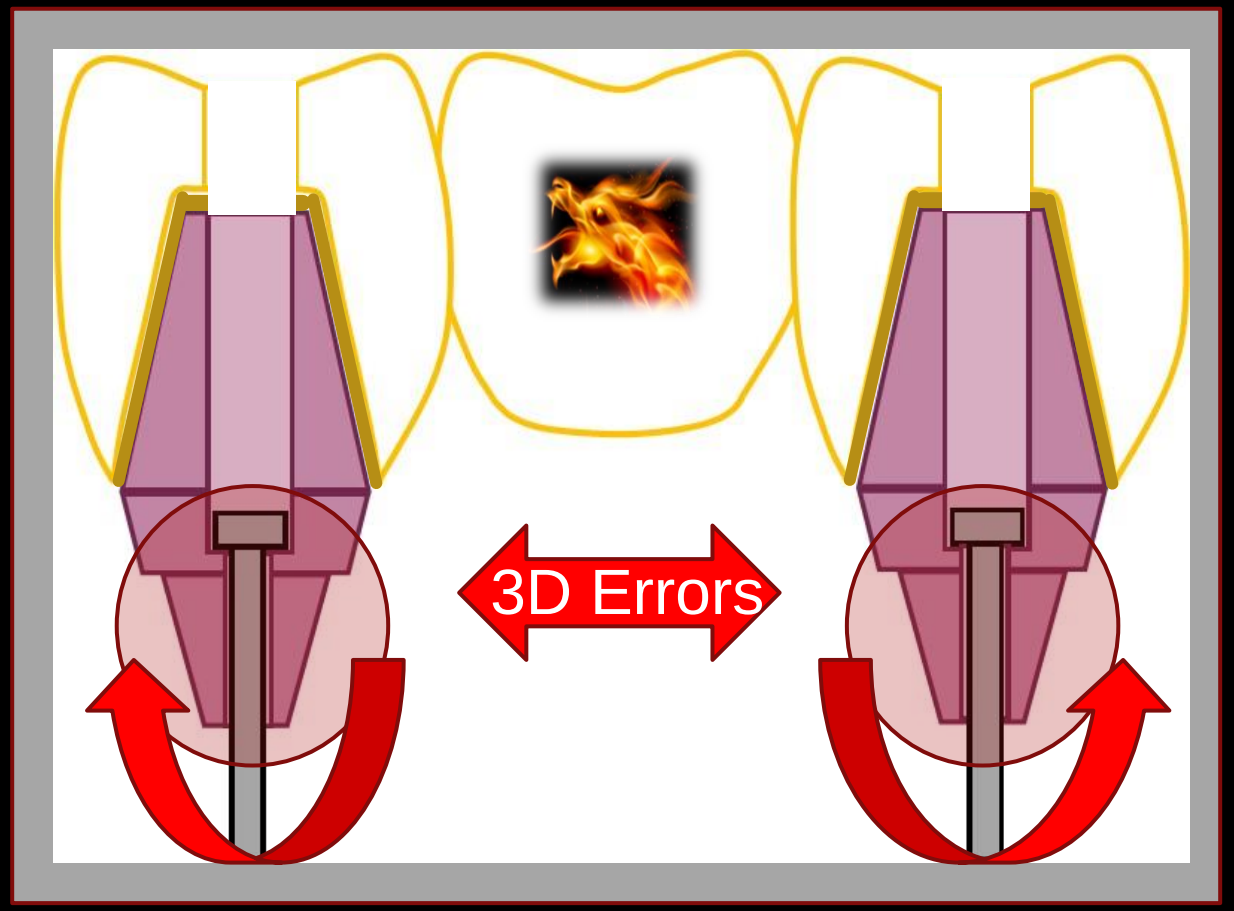
Screw-in System
3-unit bridge

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



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

Prosthesis Constrains the Abutments



Connectors are Malpositioned!

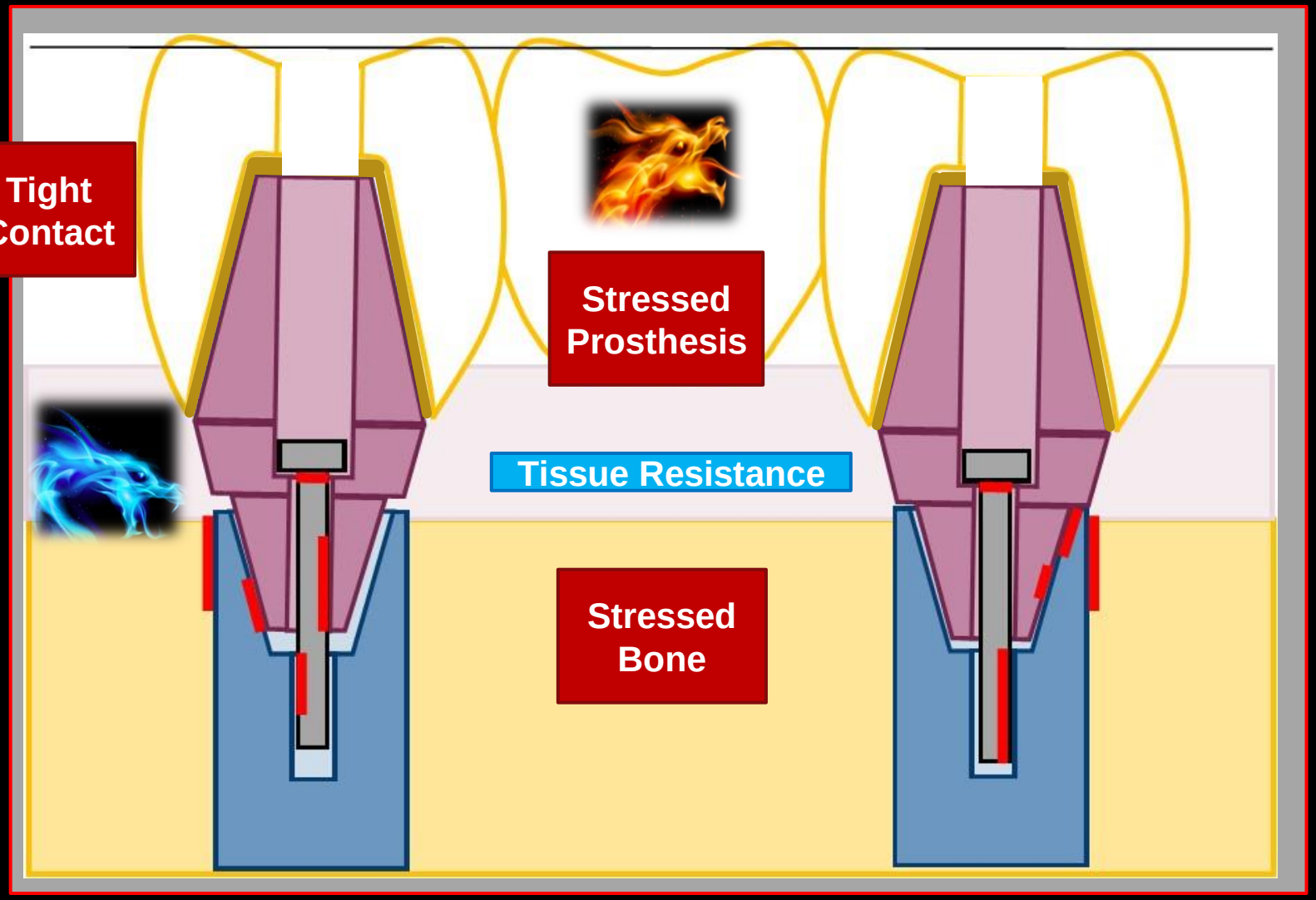
Multiple Units – Misfits Guaranteed!

Mechanical Problems

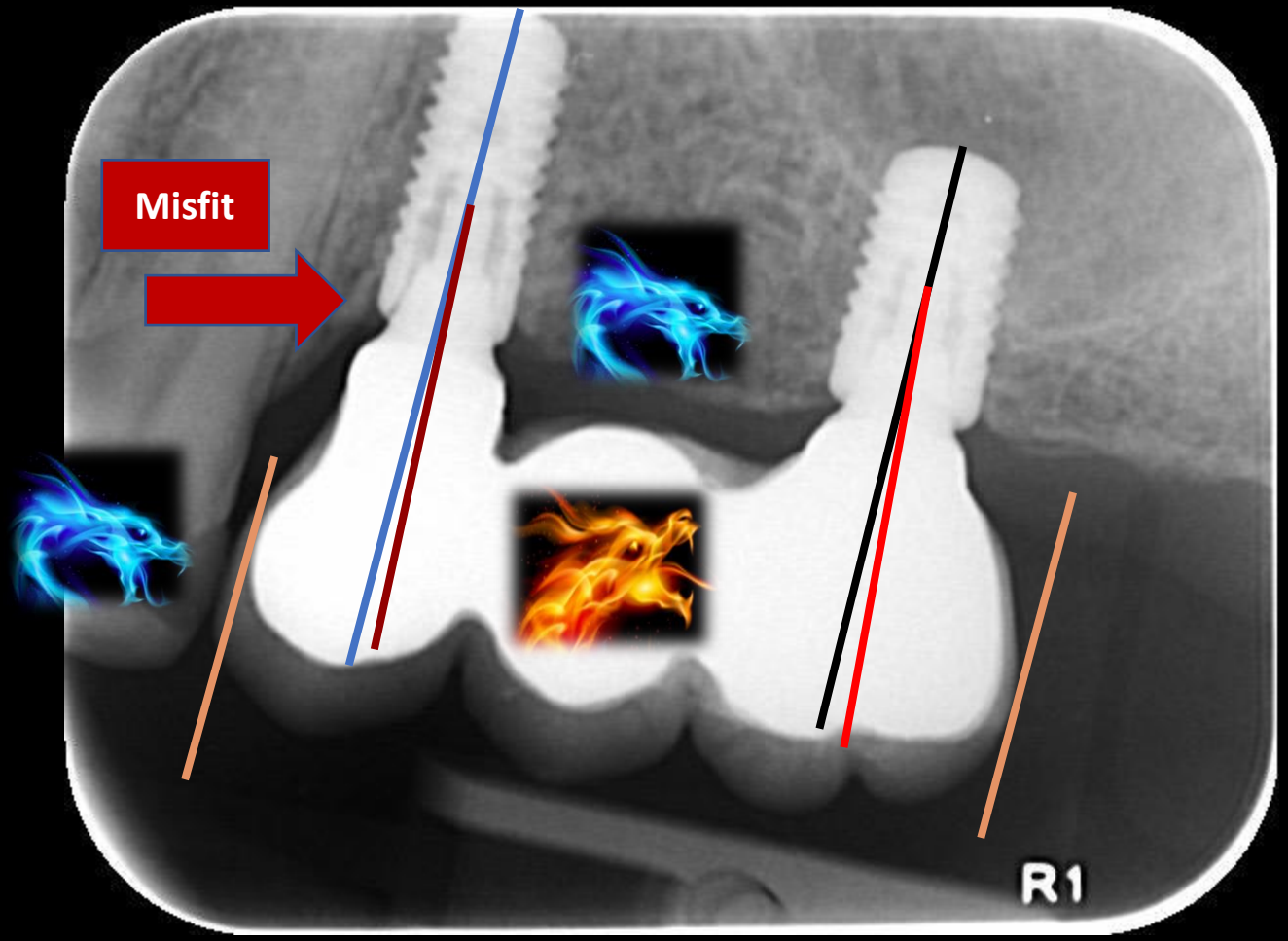
- Tight & Open Contacts
- Misfit of Components
- Deformation of Parts
- Broken Retaining Screws
- Unstable Joints
  - Micropump (Zipprich,YouTube 1,2)

Biological Problems

- Stress on Bone
- Voids & Invasion by Oral Pathogens



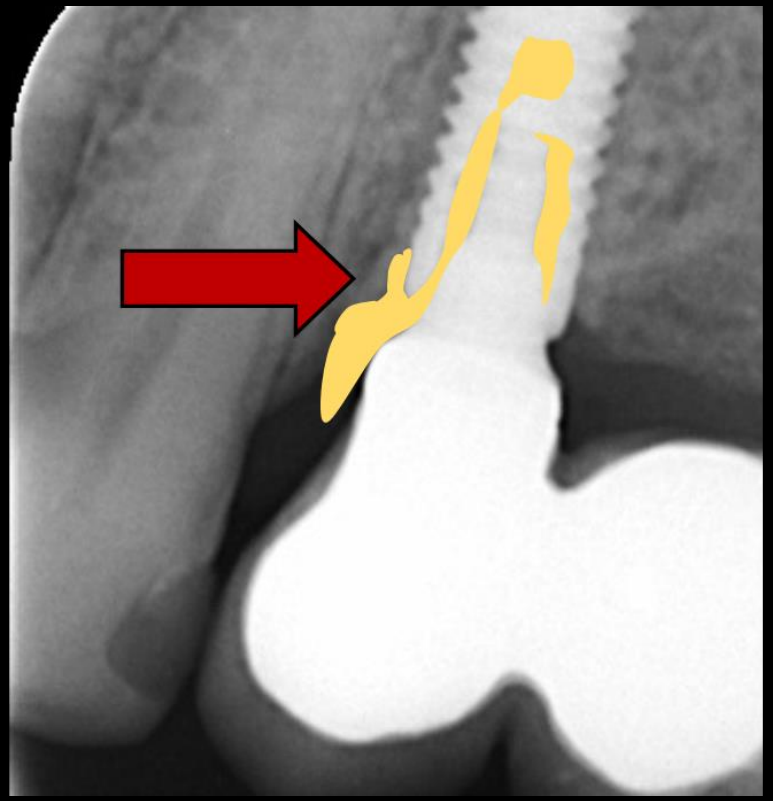
Current Screw-in Technique is Fatally Flawed!



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

NO Way Today!

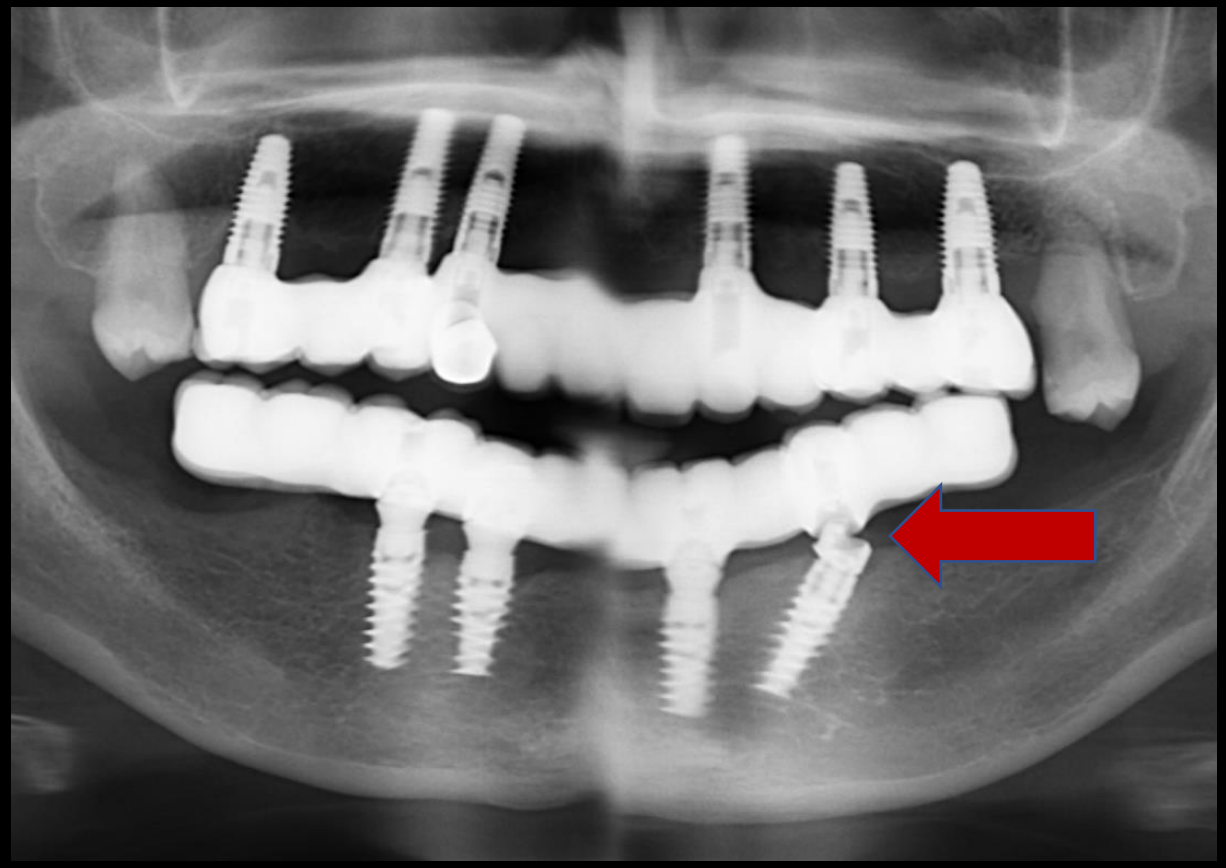
The Current Screw-in Technique



Joints Not
Optimally Stable
&
Reservoirs for
Oral Pathogens

Pumping Pathogens
with every BITE

Bigger Screwed-in Prosthetics



Even Bigger
Misfits
Guaranteed

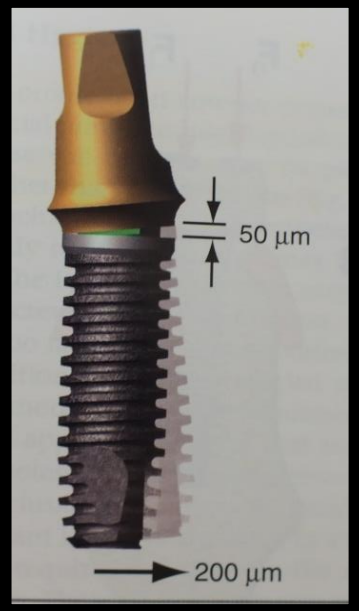
The Dreaded Macrogap

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

4. What can make a prosthesis less risky for a patient?

a. optimizing the fit of all connections

b. providing good access to care

c. preventing poor margins and subgingival cement

d. segmenting the final prosthesis

e. all of the above

4. What can make a prosthesis less risky for a patient?

a. optimizing the fit of all connections

b. providing good access to care

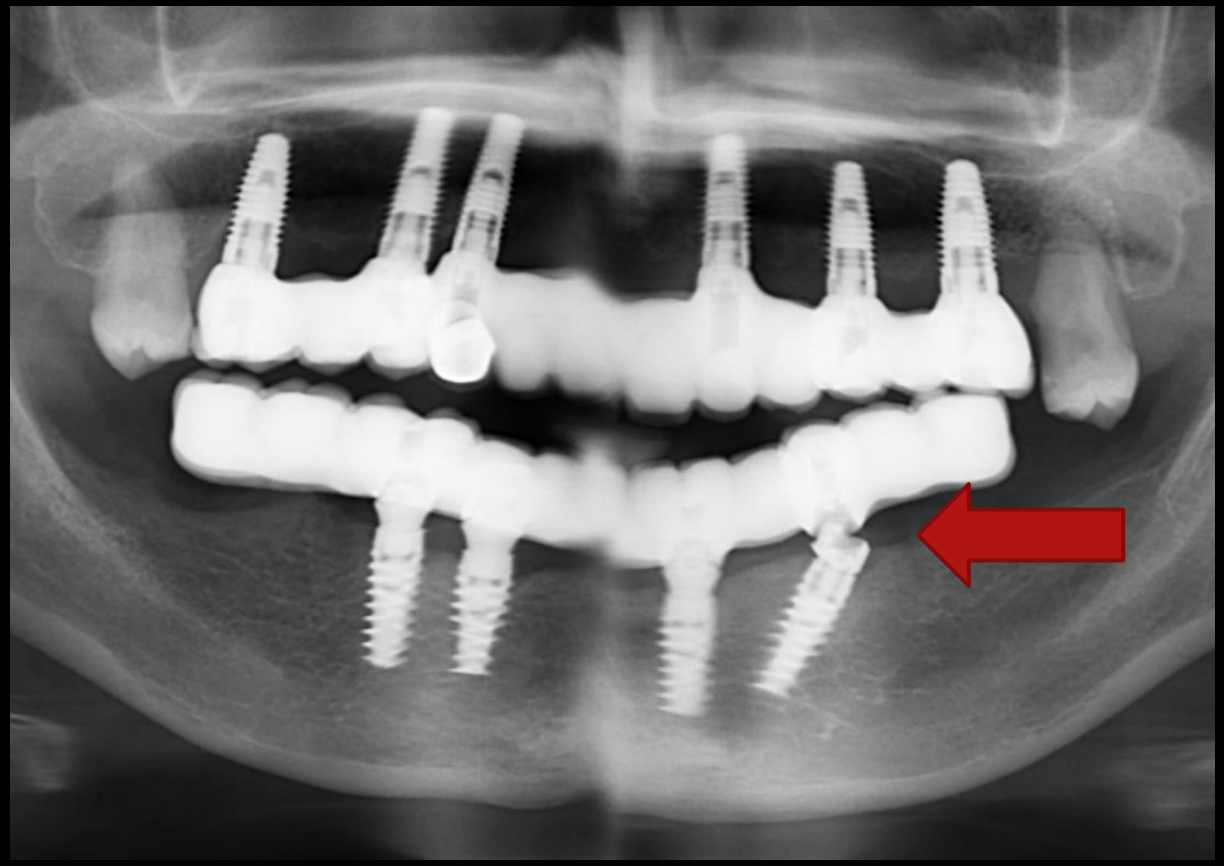
c. preventing poor margins and subgingival cement

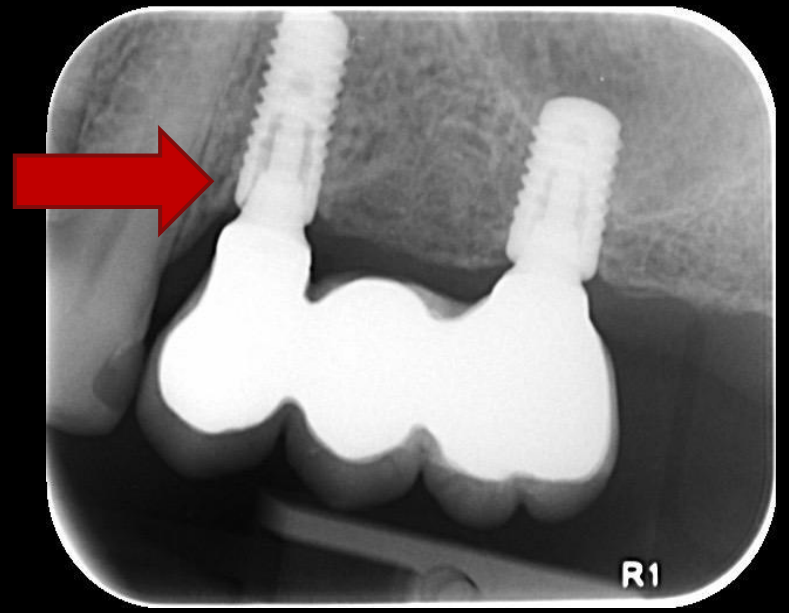
d. segmenting the final prosthesis

e. all of the above

In addition to 1) Misfit Connecting Parts

What else is causing problems for the Screw-in System?



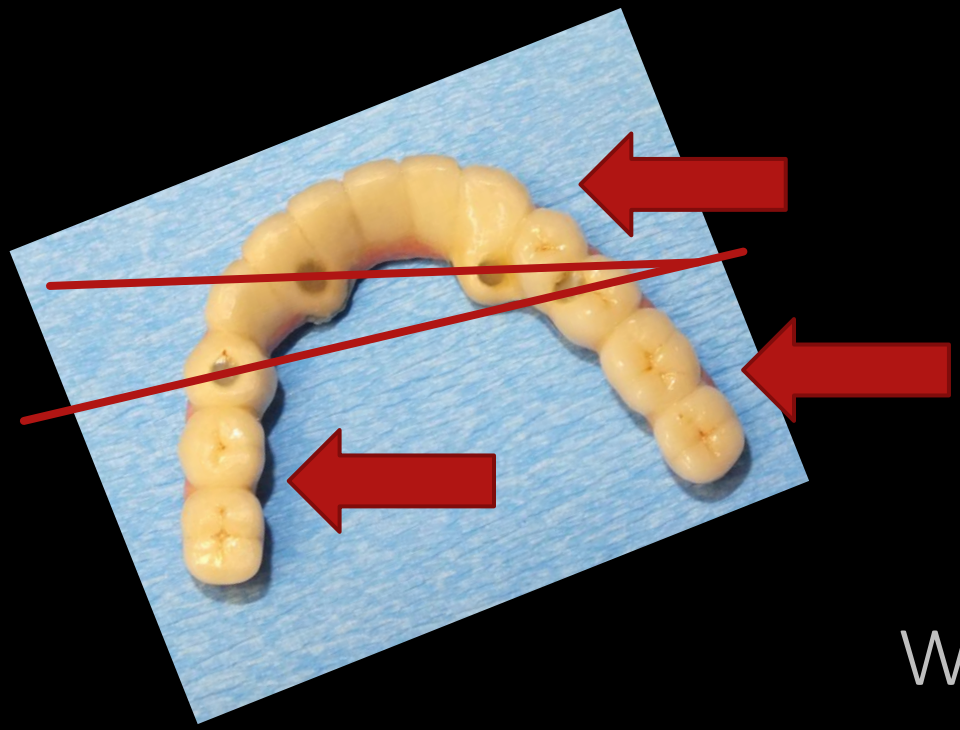


2) Stress Amplifiers on Components

-Cantilevering for screw access

-Cantilevering to for additional teeth

-Heavy functioning patient



Would optimized fits work better?

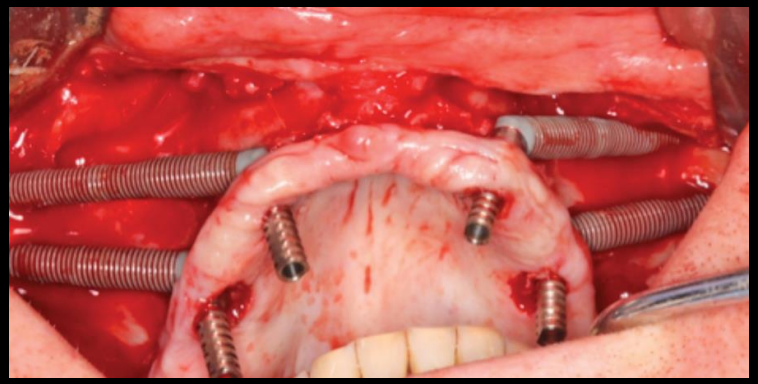
3) Like maintaining plastic screw-access covers?

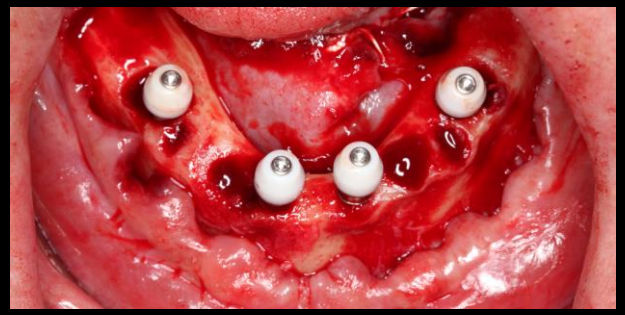
- Unesthetic
- Do not sustain occlusion
- Frequent maintenance

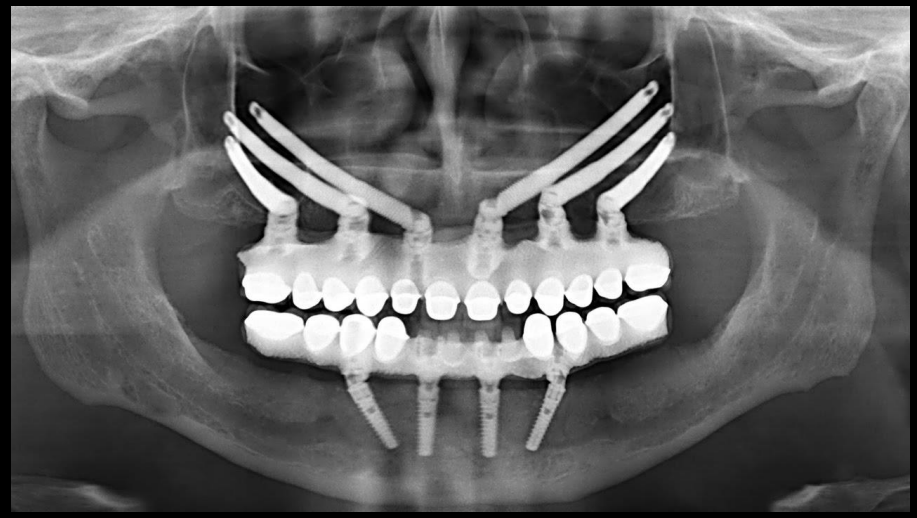
4) Does blocking access to maintenance matter?

These misfits are subgingival

Shouldn’t we optimize fit & 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)

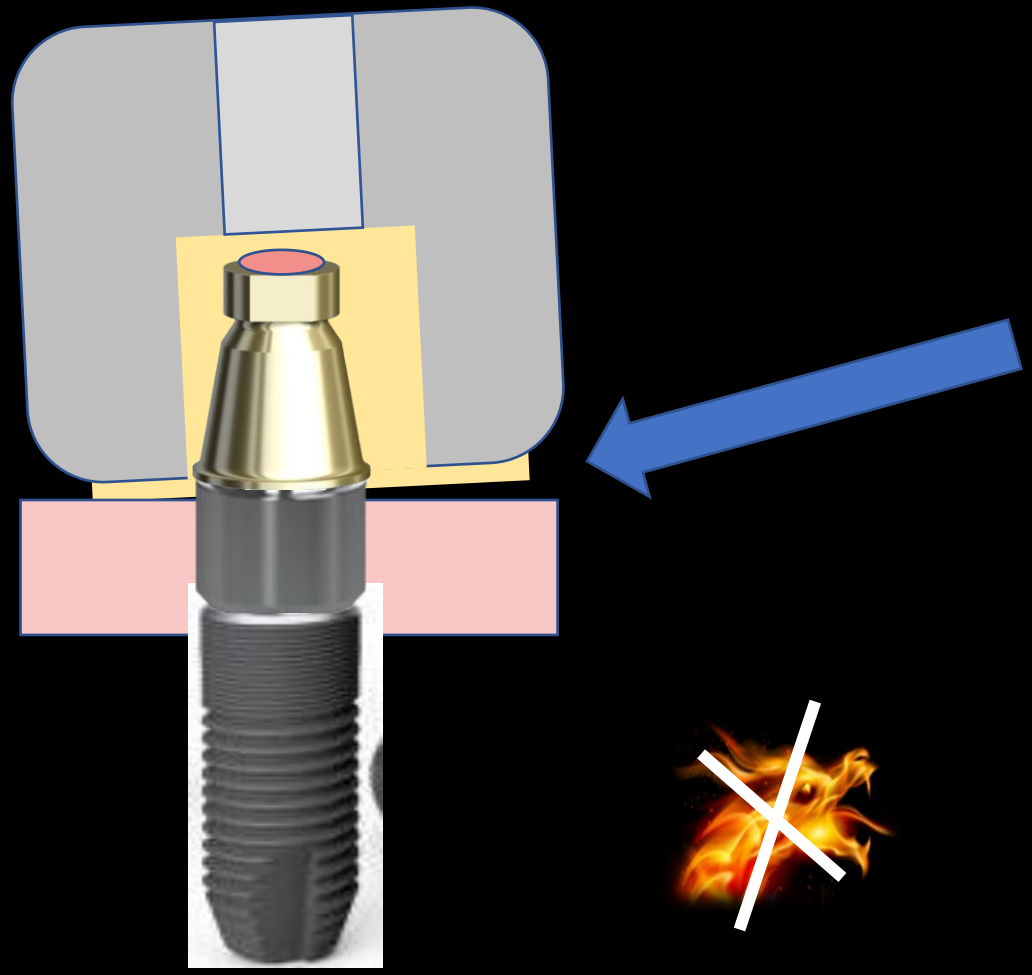
Fixing the All-on-X Screw-in System the Svoboda Way by separating the installation of implant parts from installation of the final prosthesis

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

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

Fit of these parts are now optimized

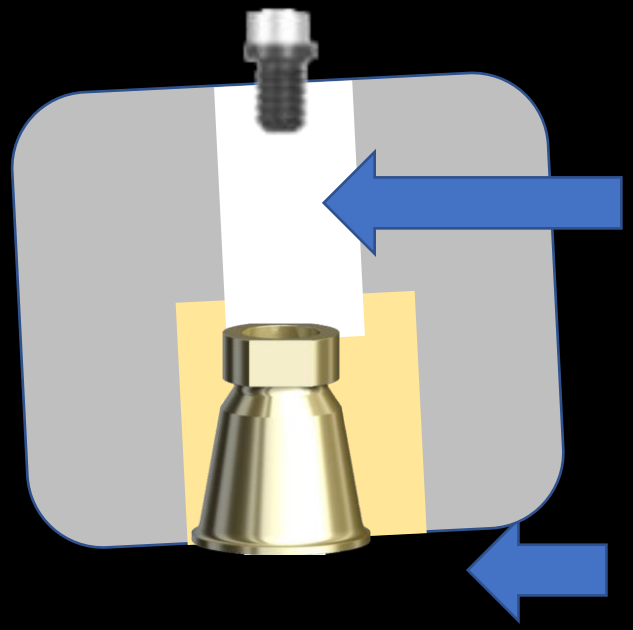
Prosthesis is adjusted to fit & luted-to the prosthetic-component already in the mouth



Excess cement extrudes from offset joint

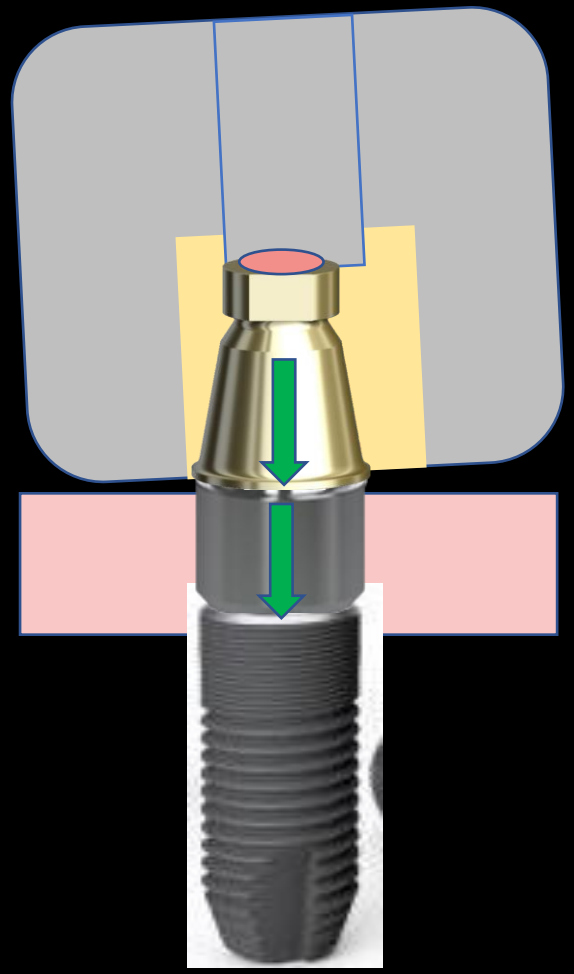
Passive fit of the prosthesis is accomplished

Prosthesis is removed from the mouth with connected prosthetic-component



Connectors & prosthesis are unscrewed from abutment

Tissue surface of the prosthesis is refined



Today

dentists can

consistently

optimize

the fit of parts

& deliver a

passive fitting prosthesis

The Svoboda Way

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

The Svoboda Way Hybrid

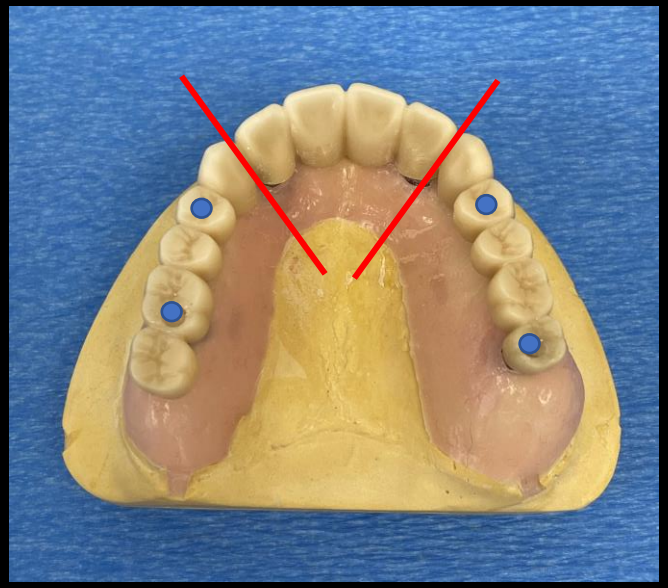
Is it cleanable? Do parts fit optimally?
Have we prevented subgingival cement?

YES, YES, YES &

Easily Retrievable

Prosthesis fit is Passive &

Segmented to reduce impact of implant failure



How does Screwmentation Differ from The Svoboda Way of Prosthesis Installation?

Screwmentation describes a system of single crown installation that fails to optimize the implant-abutment connection.

The Svoboda Way optimizes this connection for single and multiple unit restorations, prevents residual subgingival cement and open margins, and does not require crown removal and reinstallation to remove excess cement. It is a safer, simpler and more efficient installation system.

Screwmentation the Svoboda Way. www.ReverseMargin.com/articles

BUT

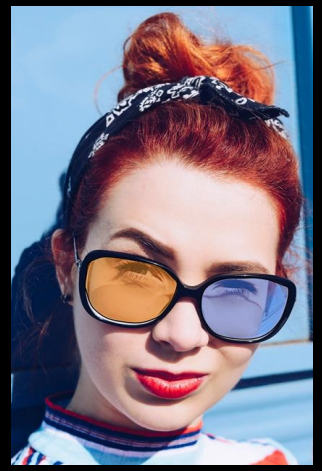
Yet another

BIG PROBLEM

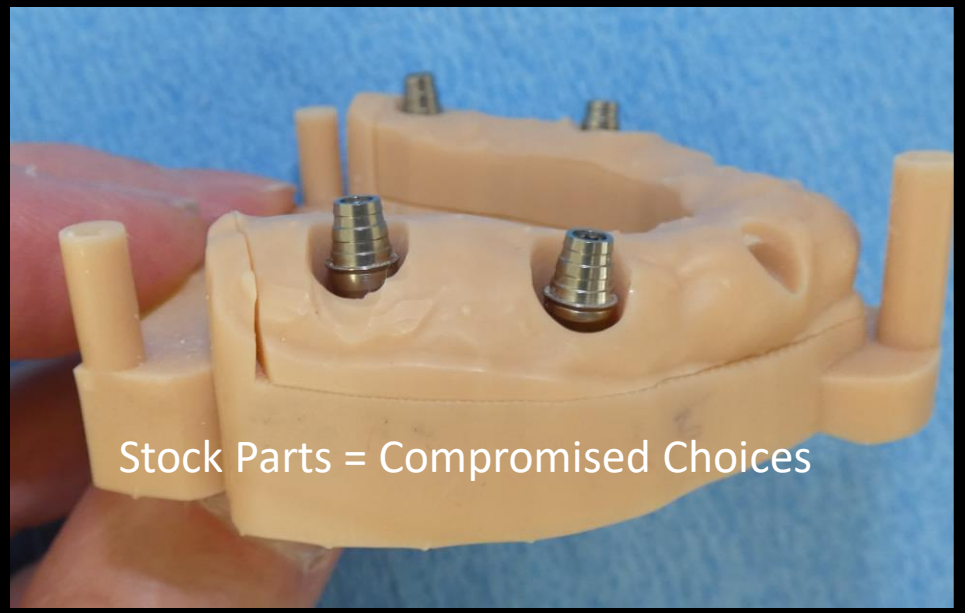
remains

with the

Screw-in System



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

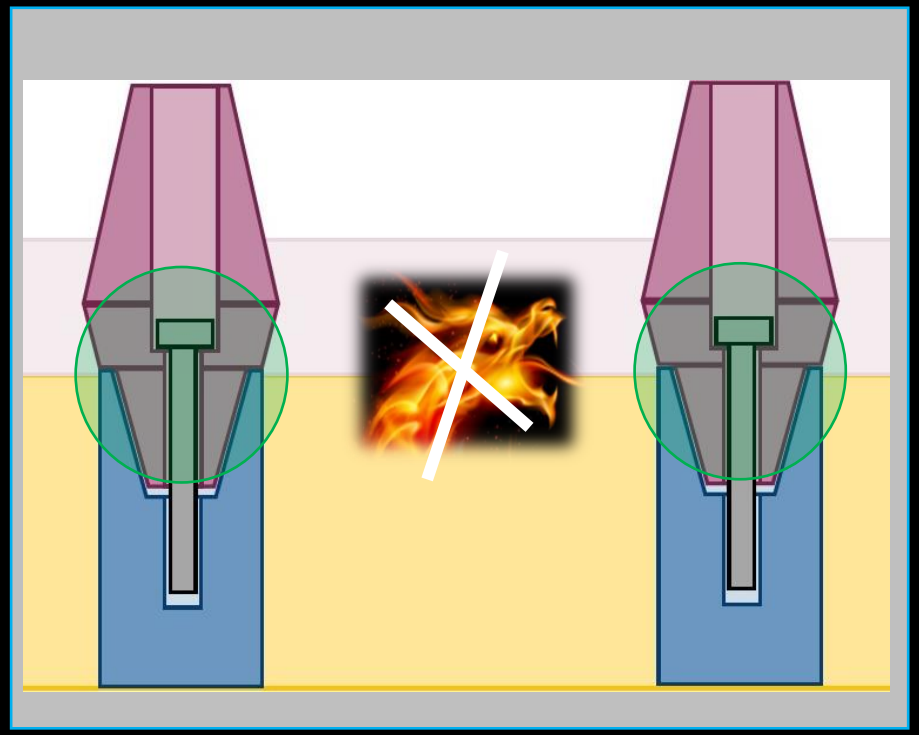


Custom Parts offer better control of emergence profile, screw access position, margin design & material choice

CAD/CAM Custom Parts = Better Control

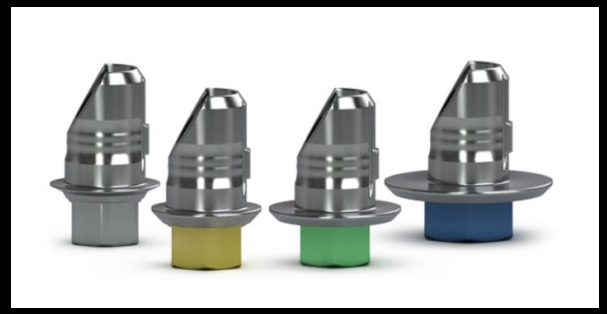
Easy Segmentation = Reduced Impact of Implant Complications

Cement-in Systems can consistently optimize implant-abutment connections



… because abutments are installed without the prosthesis attached

Cement-in Systems
can better exploit benefits of CAD/CAM design technology

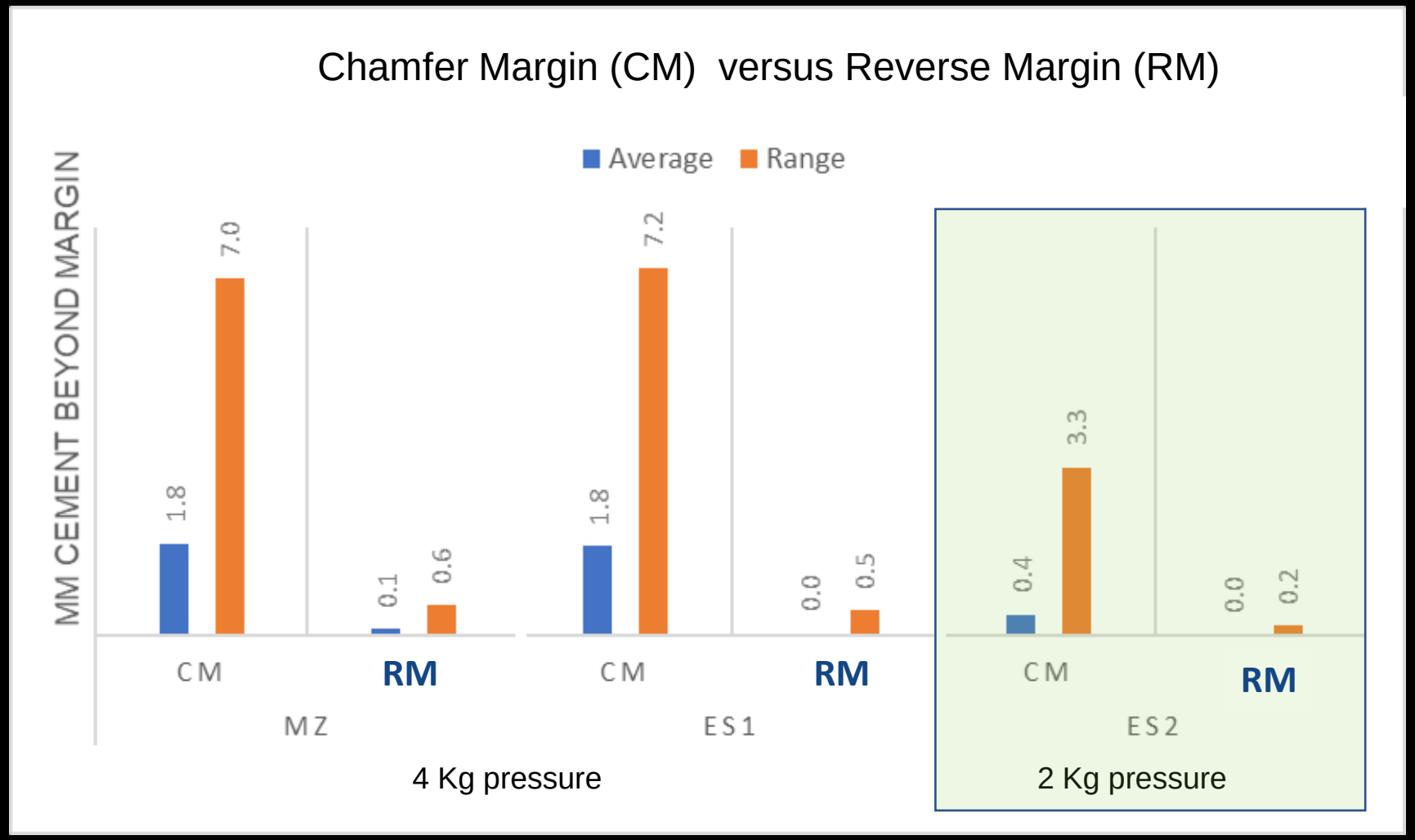


Can we prevent residual submarginal cement?

Experiment: Cement, retrieve, photograph, measure

RM is better than CM at Preventing Submarginal Cement

(margins 0.5 to 1.0 mm subgingival)

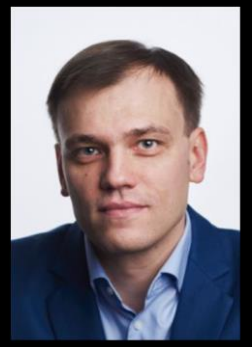


Reducing Force Reduces Subgingival Cement

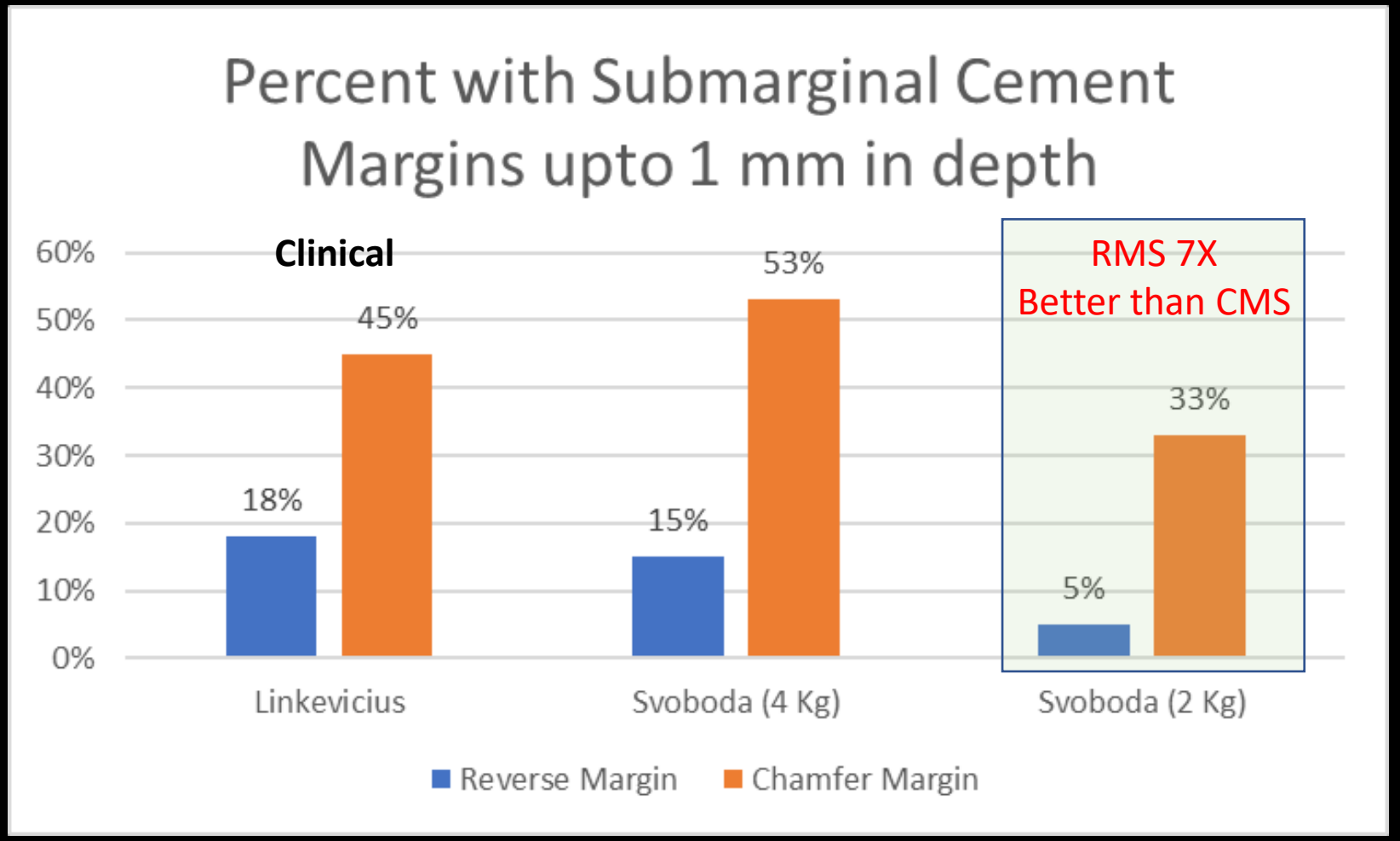
Svoboda ELA, Sharma A, Zakari M. Comparing the Efficacy of the Chamfer Margin and Reverse Margin Systems at preventing submarginal cement while varying pressure and margin depth, Spectrum Implants; 2021:1-13.

1) The Reverse Margin System outperformed the Chamfer Margin System

2) Lower seating pressure reduces the extension of excess cement

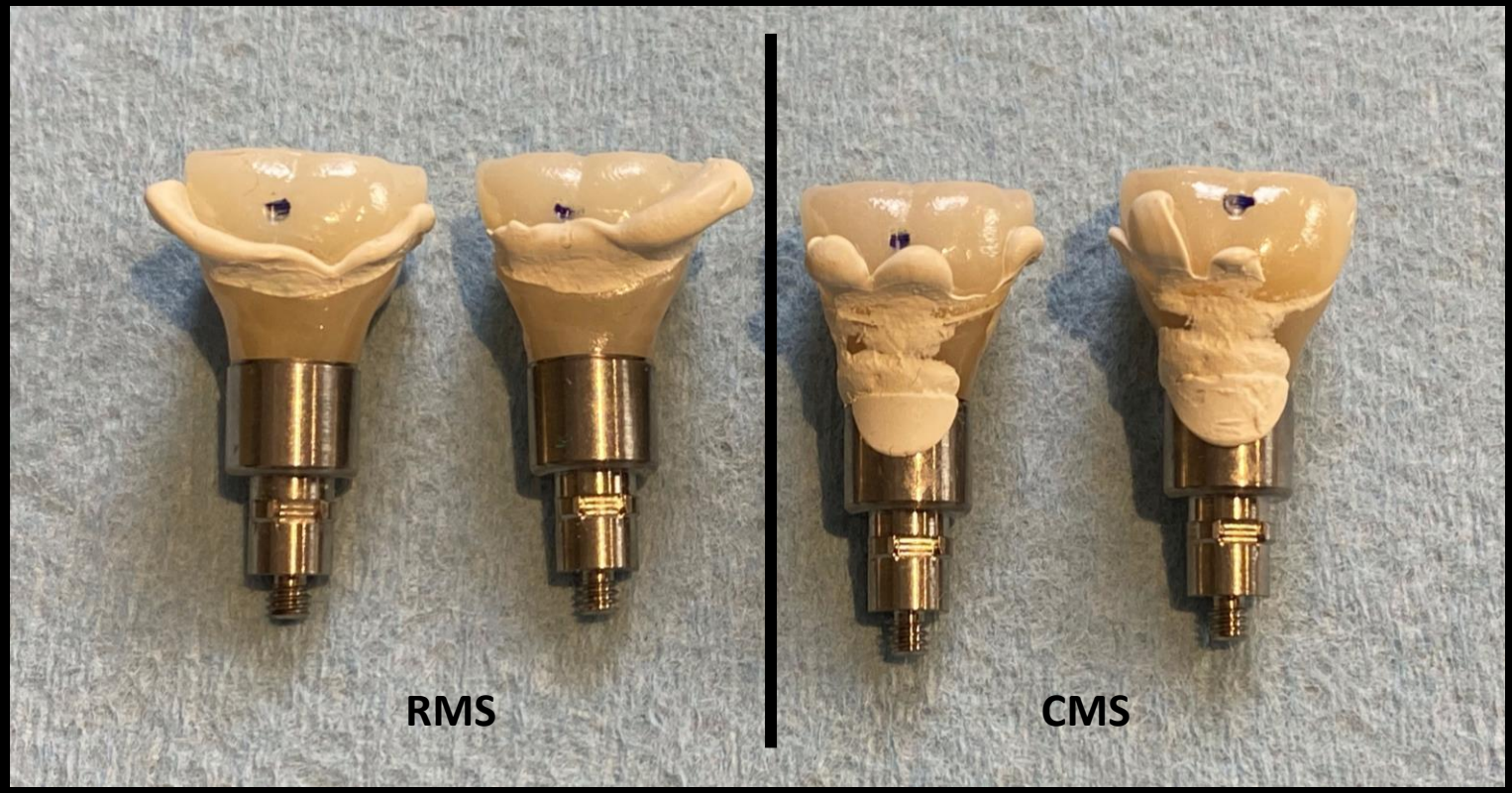


Clinical versus “in vitro”
Yes/No Submarginal Cement Occurrence



Andrijauskas P, **Svoboda E**, Alkimavicius J, **Linkevicius T**. Occurrence of cement rests on reverse margin custom abutments versus conventional custom abutments. Clinical Oral Implants Research 10/**2020**;31(S20):43.

What's better …. RMS or CMS????



What about even lower pressures and open margins?

Effect of Margin Depth, Installation Pressure & Abutment-Prosthesis Design on Submarginal Cement and Open Margins: an in vitro study

Emil L.A. Svoboda PhD DDS, Darminder Cheema DDS and Anit Sharma DDS

Spectrum Implants March/April 2022: V13 N2; 50-64.

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

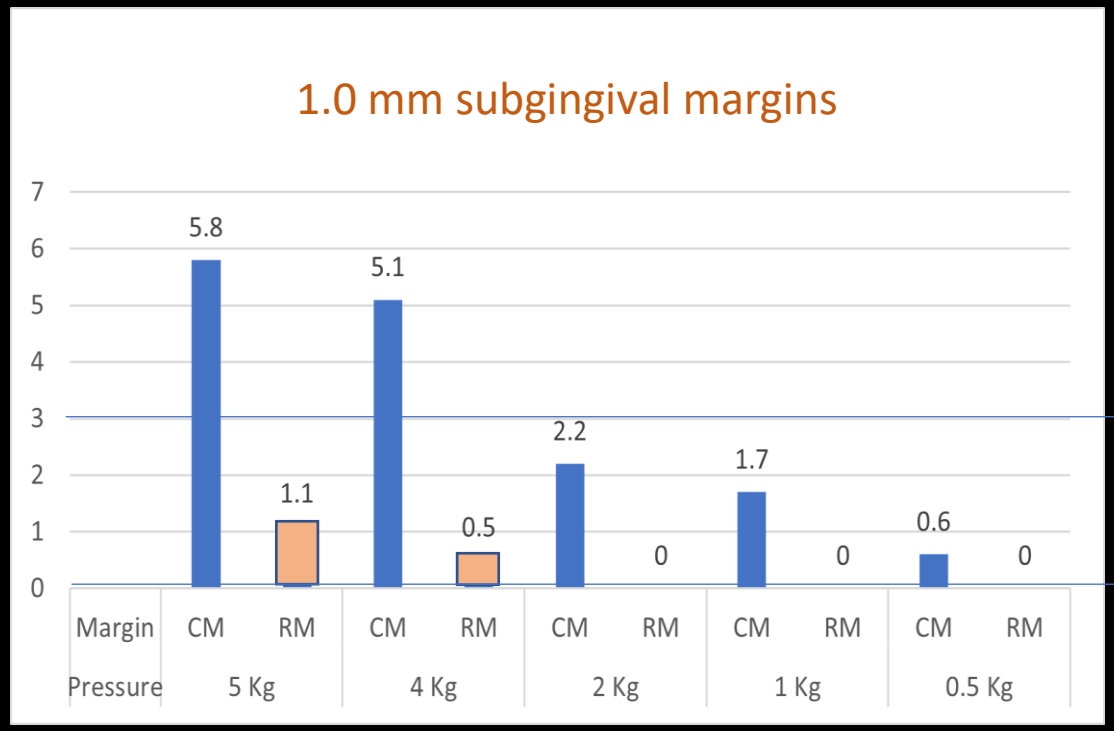
Rely X Unicem 2 from 3M Espe

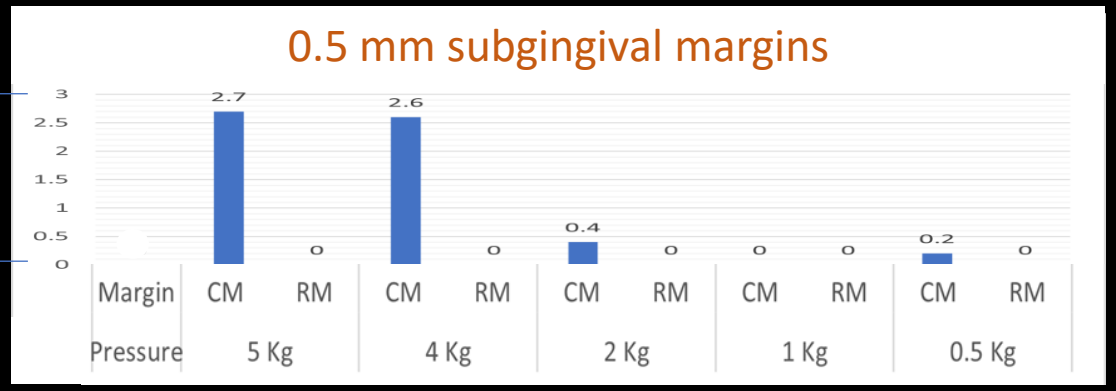
1) Effects Design and Pressure on Submarginal Cement when margins 0.5 to 1 mm below gingiva

- 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

		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**

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

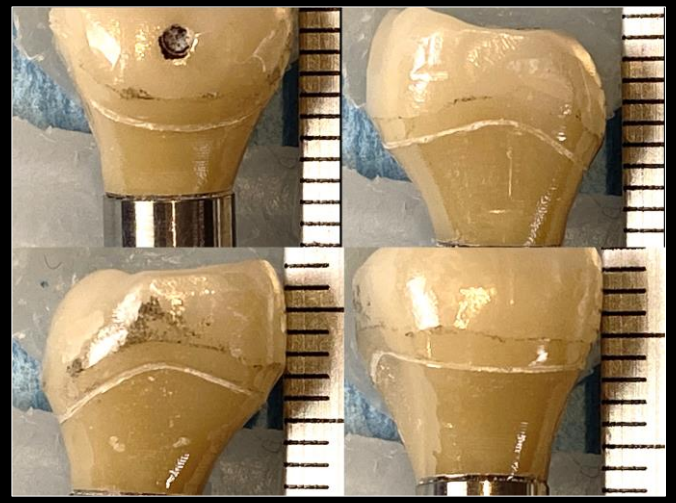
2) Effects of System Design and Cement on Open Margins

Control: Are Open Margins caused by Mechanical Misfits with and without Cement?

When NO Gingiva, 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

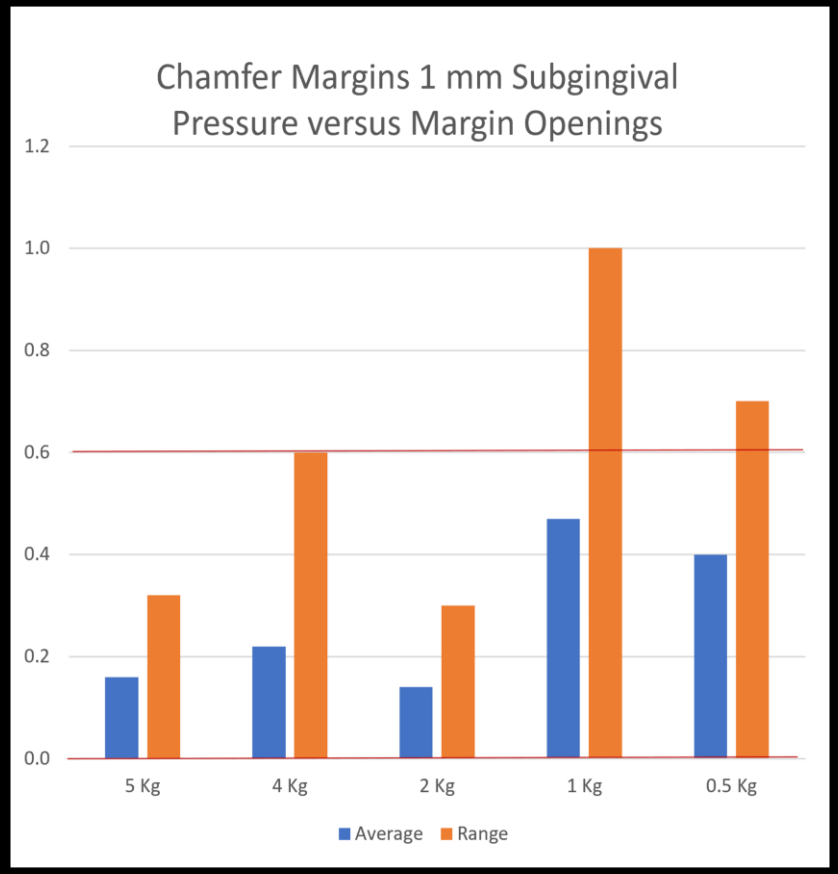
The Gingiva done it!



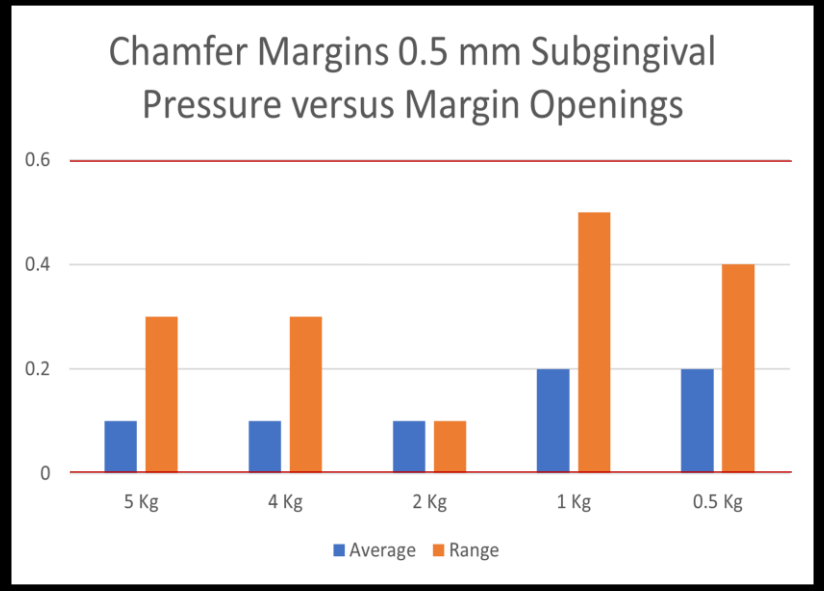
CM	Total	
Pressure	Average	Range
5 Kg	0.1	0-0.3
4 Kg	0.2	0-0.6
2 Kg	0.1	0-0.3
1 Kg	0.3	0-1.0
0.5 Kg	0.3	0-0.7

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

5. What statements are true according to the cementation experiments?

a. the RMS can prevent submarginal cement when crown margins are 1 mm subgingival

b. the RMS is designed for low-pressure cementation without causing open margins

c. 100% of the CMS trials had open margins after cementing crowns

d. reducing margin depth and pressure reduces subgingival cement

e. all of the above

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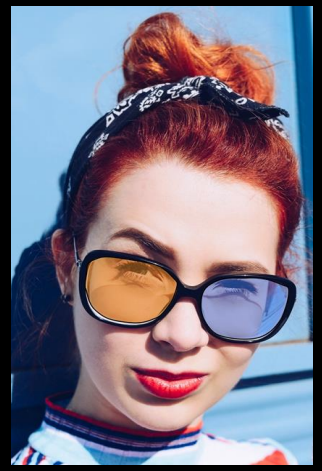
Conclusions:

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 (Unlike the CMS).

3. Open margins observed with the CMS were caused by resistance to displacement by adjacent Gingiva and increased with decreasing installation pressure

4. The results of these studies further support the concepts about the root causes of complications, as described in Dr. Svoboda's "Terminology article" at www.ReverseMargin.com

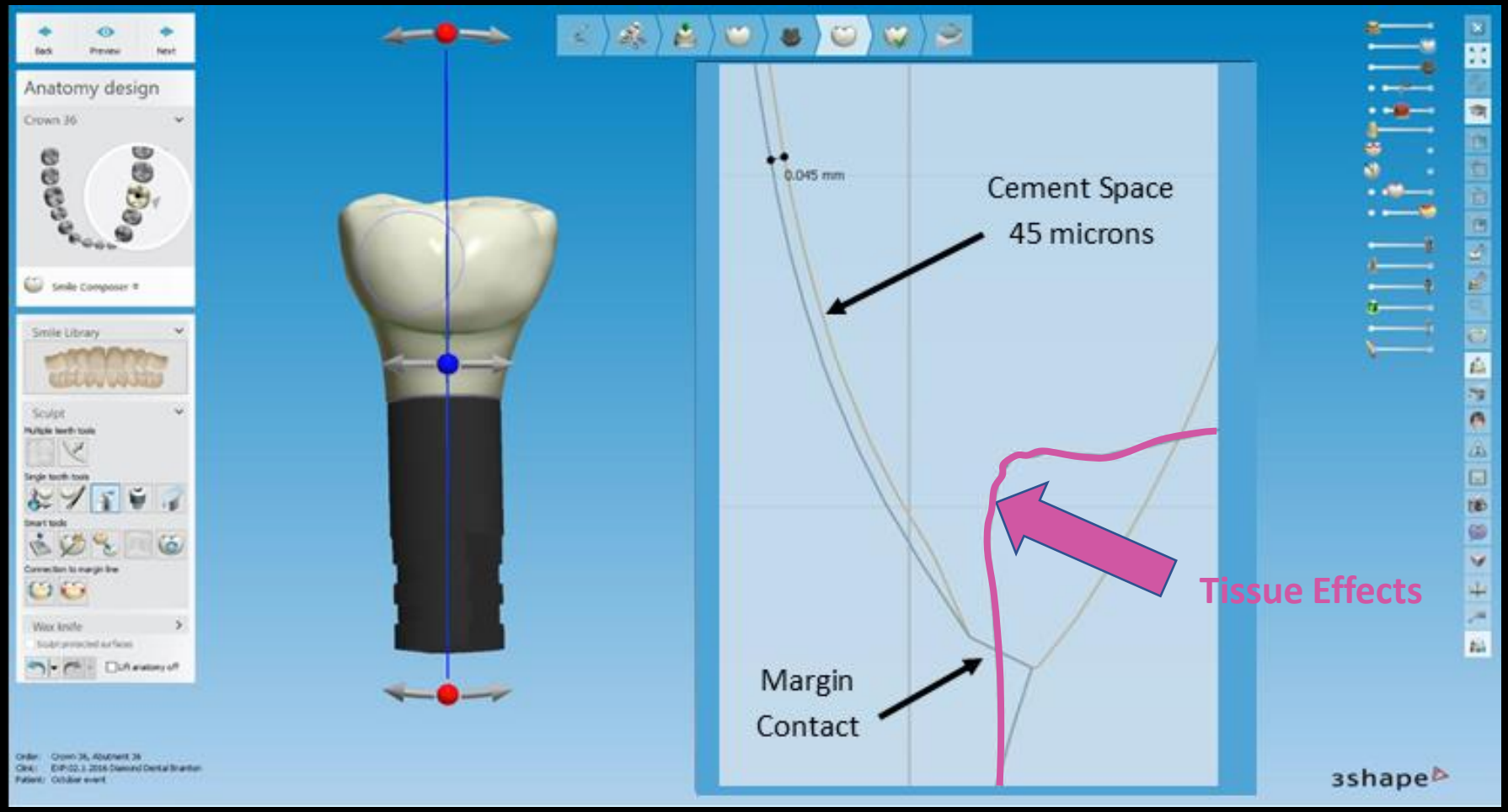


How Does the RMS Mitigate PDE & the Tissue Effects?

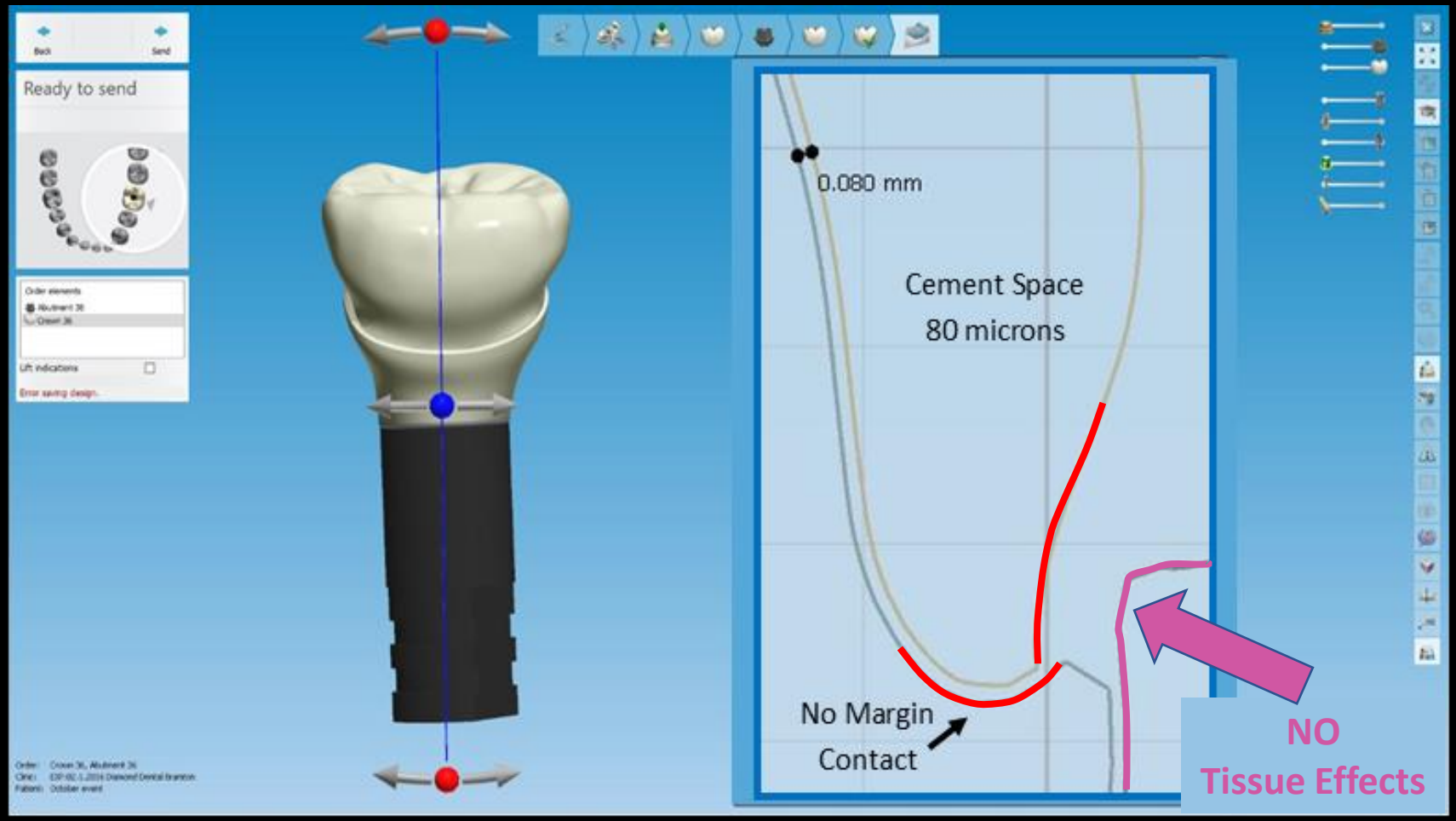
Resistance to Displacement (RTD) & the Gingival Effects (GE)

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.

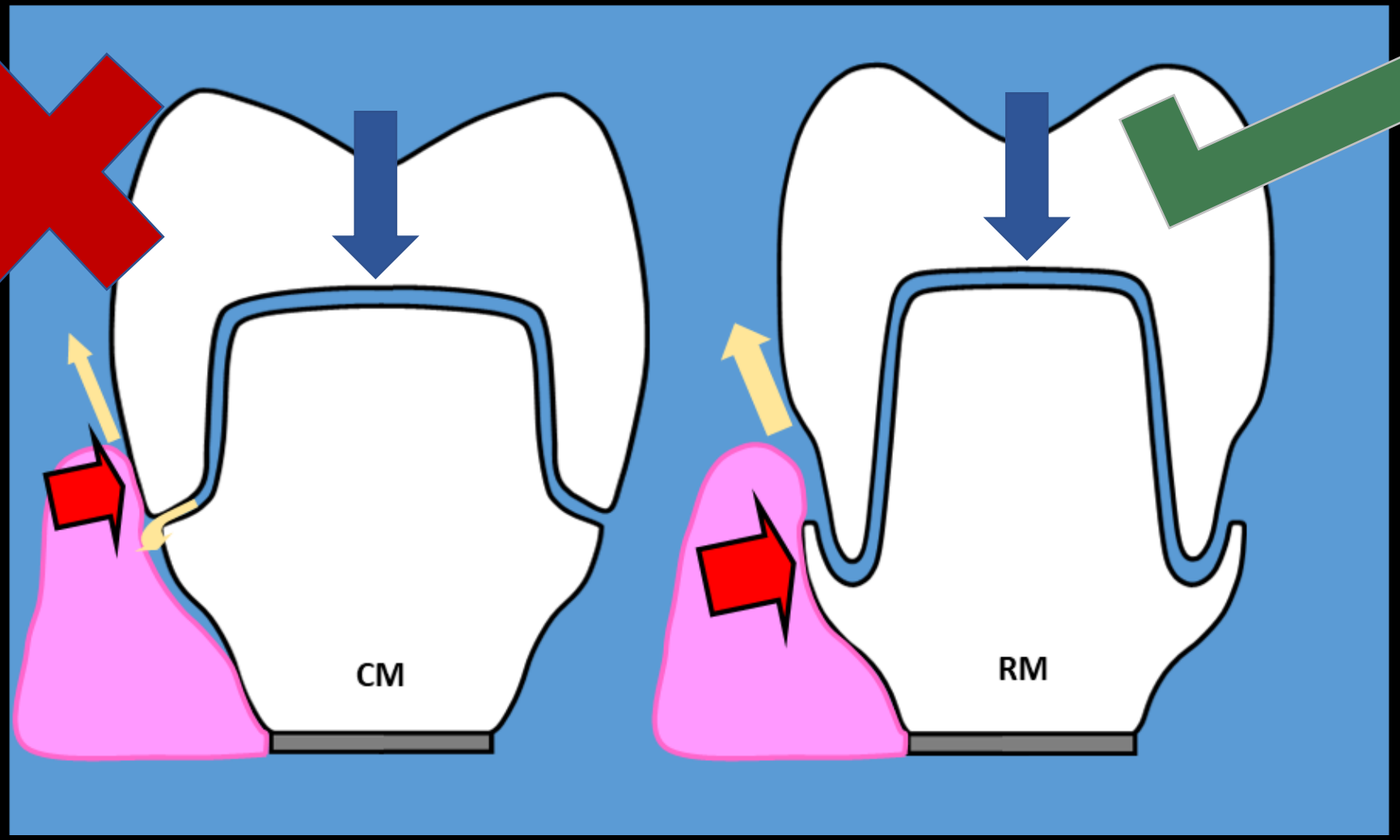
CMS Design Stimulates Both Tissue Effects … Crown interacts with Gingiva



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



Which System can Mitigate both TEs including the GE & RTDE?



Prevents both subgingival cement and open margins

6. Comparing CMS to RMS, select the True statements.

a. the CMS abutment is often easier to install than the RMS

b. unlike the CMS, the RMS prevents the prosthesis from interacting with adjacent gingiva

c. the CMS is more effective at tolerating PDE than the RMS

d. installation of an RMS prosthesis would be expected to be easier than a CMS prosthesis, and try-in step would not likely cause bleeding

e. CMS excess cement is injected into the tissues while RMS ejects cement out of the tissues

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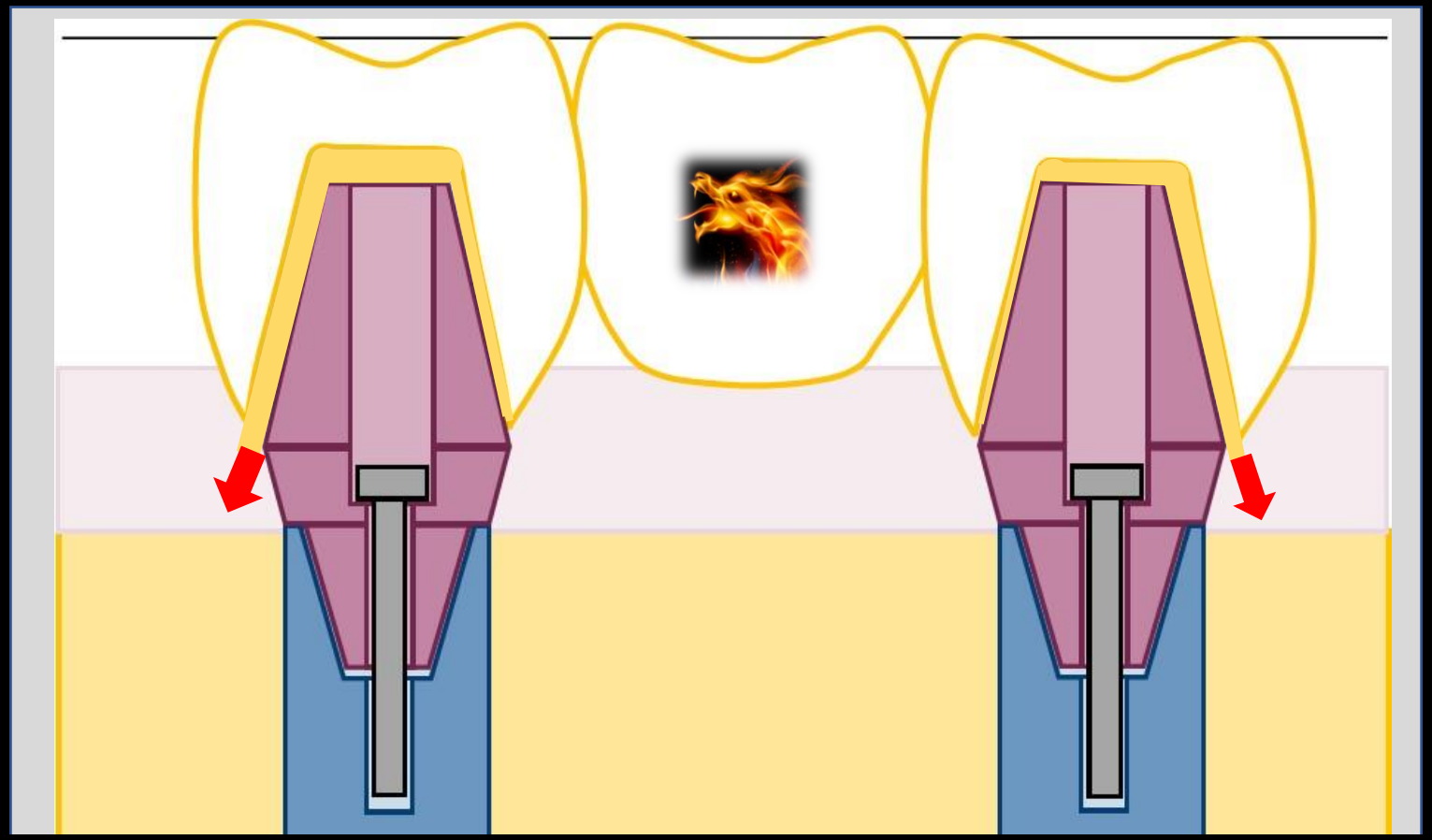
e. CMS excess cement is injected into the tissues while RMS ejects cement out of the tissues

We Have NOW
shown how to Mitigate
the
Tissue Effects
(GE & RTDE)

What about
Prosthesis Dimensional Error (PDE)?

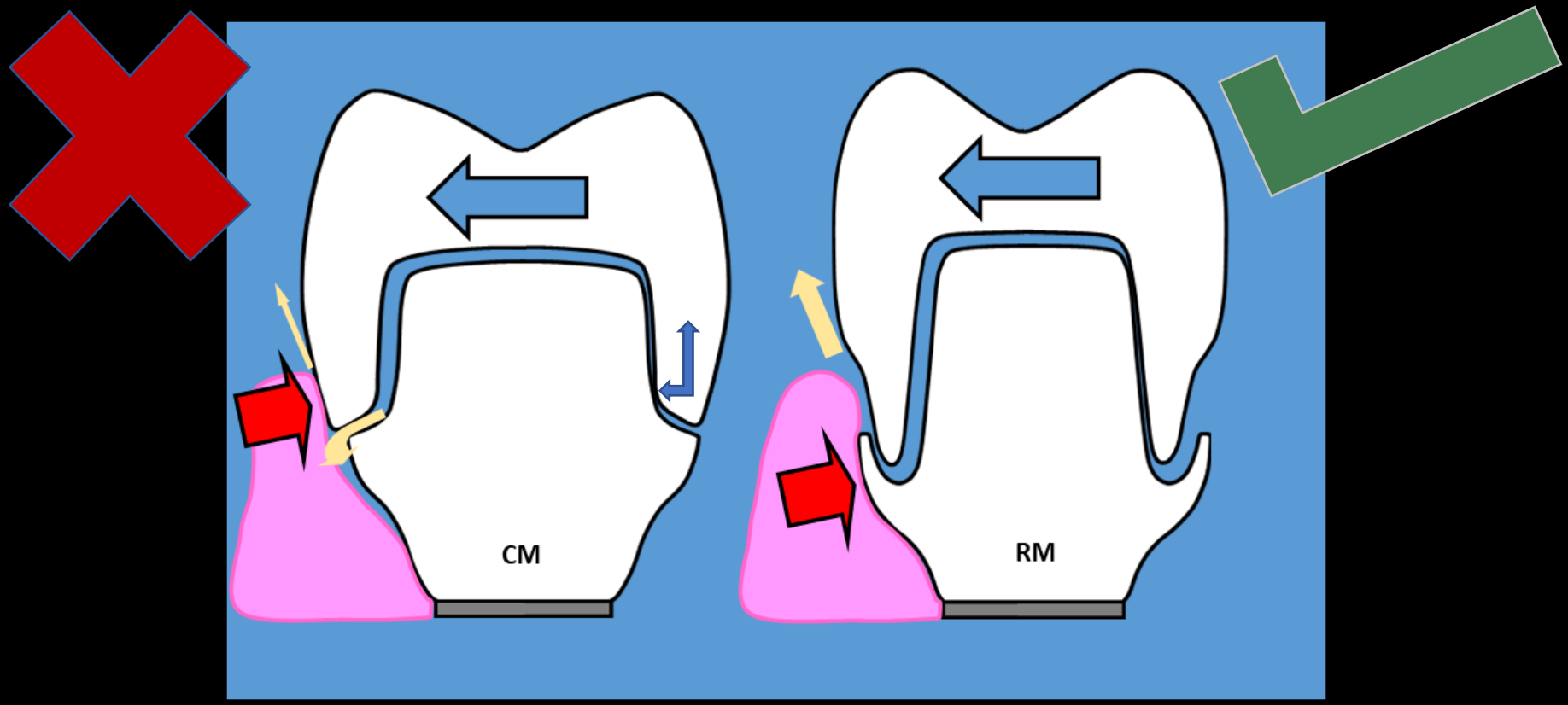
Chamfer Margins are designed to contact their prosthesis margins when installed. This provides zero tolerance to expected PDE.



Also,
a 45 µ cement space
is inadequate to
tolerate
expected PDE

Thus, poor contacts, hyperocclusion, submarginal cement,
& open, overhanging & overextended margins are common occurrances

Unlike CMS, RMS can Safely use Cement Space to Safely Tolerate expected PDE



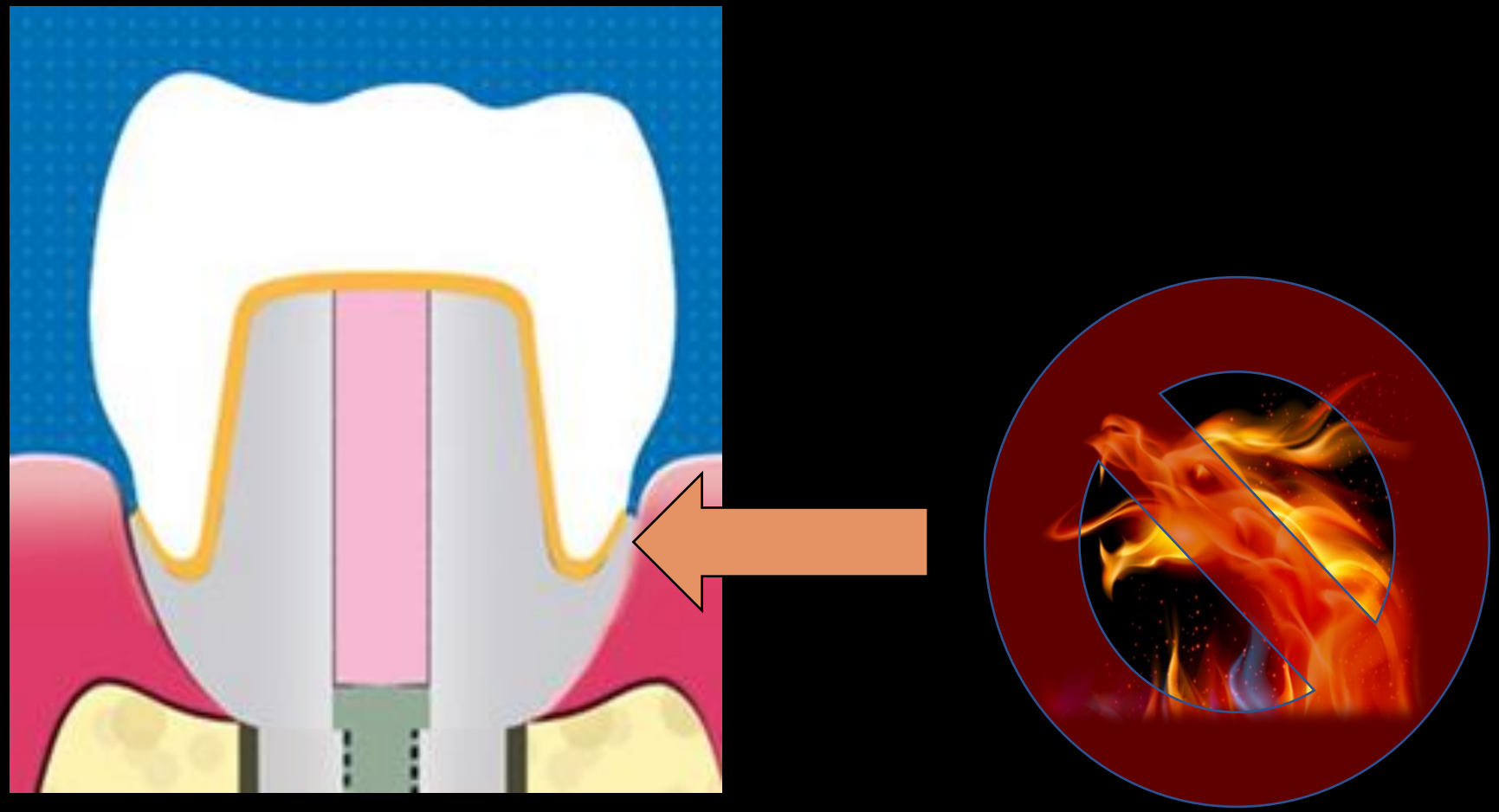
RMS margins are designed to float within the margin trough and have sufficient cement space to tolerate expected PDE

Did you know?

Dental Labs
& Milling Companies
Increase Cement Space
at the Margins
to make
Prosthesis Installation Easier?

This guarantees open & overhanging margins!

Reverse Margin System Tolerates PDE



Cement Space on both Sides of Prosthesis Margin

7. Select the True statement about prosthesis installation.

a. contacts are more difficult to adjust with the CMS than the RMS

b. it is easier to maintain a dry field when cementing an RMS crown rather than a CMS crown

c. tissue contact with a pontic is easier to adjust using the RMS than CMS

d. the RMS prevents open margins at low pressure, unlike the CMS

e. all the above

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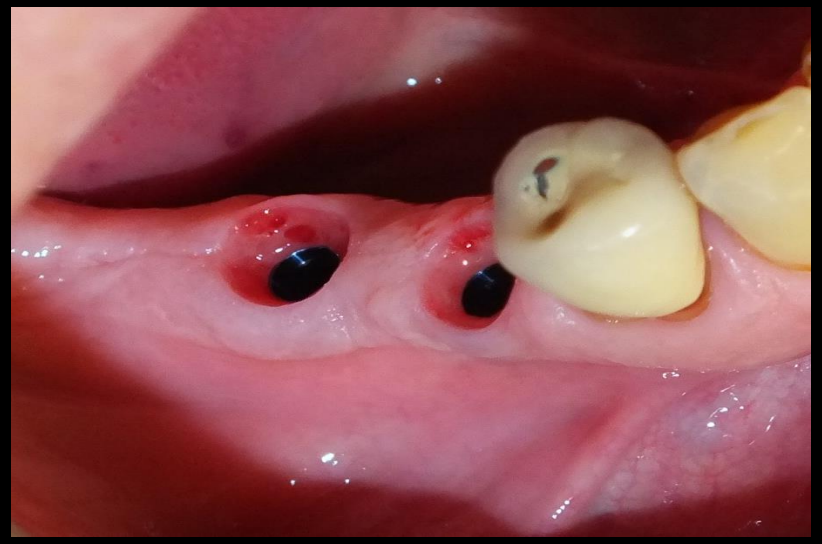
1

Healing Abutment Shapes the Trans-tissue Portal

Reduces the RTDE



Facilitates NEXT STEP

2 Installing the RM Abutment

Shape reverses cement flow & pushes tissues away from the crown

Abutment eliminates GE & RTD during crown installation

3 Installing the RM Prosthesis

Crown shape tolerates PDE as margins
float in abutment margin trough

Prosthesis is self-centering & self –leveling
No more submarginal cement, overhanging & open margins

Smoother the Treatment - Happier the Patient





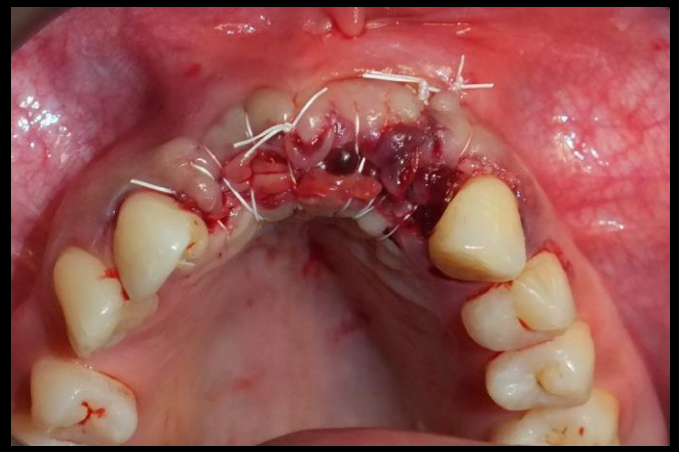




Easy Maintained

AF 19

Another Happy Patient!



Their Happiness

is Good for Business

22 Years of Happiness is Great for Business

Complications are Expensive!

8. How does your implant supplier actively support your efforts to reduce implant treatment complications?

a. they provide me with the tolerances of their manufactured parts so I can choose what is best for my patients

b. they provide me with instructions for optimizing the fit of their parts in the mouths of my patients

c. they highlight the weaknesses of their proposed installation systems so that I can choose the best treatment options for my patients

d. they provide me with instructions that can both optimize the fit of parts and prevent residual subgingival cement

e. none of the above

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Isn’t it time for a change?

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

Reverse Margin™ System

Helps dentists optimize the fit of implant parts & prosthetics in the mouth

Makes installation simpler & safer

Reduces liability & is great for business

Dentists Can Now

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

*Thomas G Wilson Jr. The Positive Relationship Between Excess Cement and Peri-implant Disease: A Prospective Clinical Endoscopic Study. J. Periodont 2009;1388-1392

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

Make that Healthier Choice

Choose the RM System

to Usher in

a

New GOLD

Standard of Care

Diamond Dental Studio
Designs and Mills RMS Prosthetics for You or Your Lab

DiamondDentalStudio.com

Safer Cementation is the Gold Standard of Care because Disease Prevention IS BEST!

Resources

www.ReverseMargin.com

Questions?

drsvoboda@rogers.com