

DIGITAL DENTISTRY
&
OFFICE ECONOMICS

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presentation
topics

part

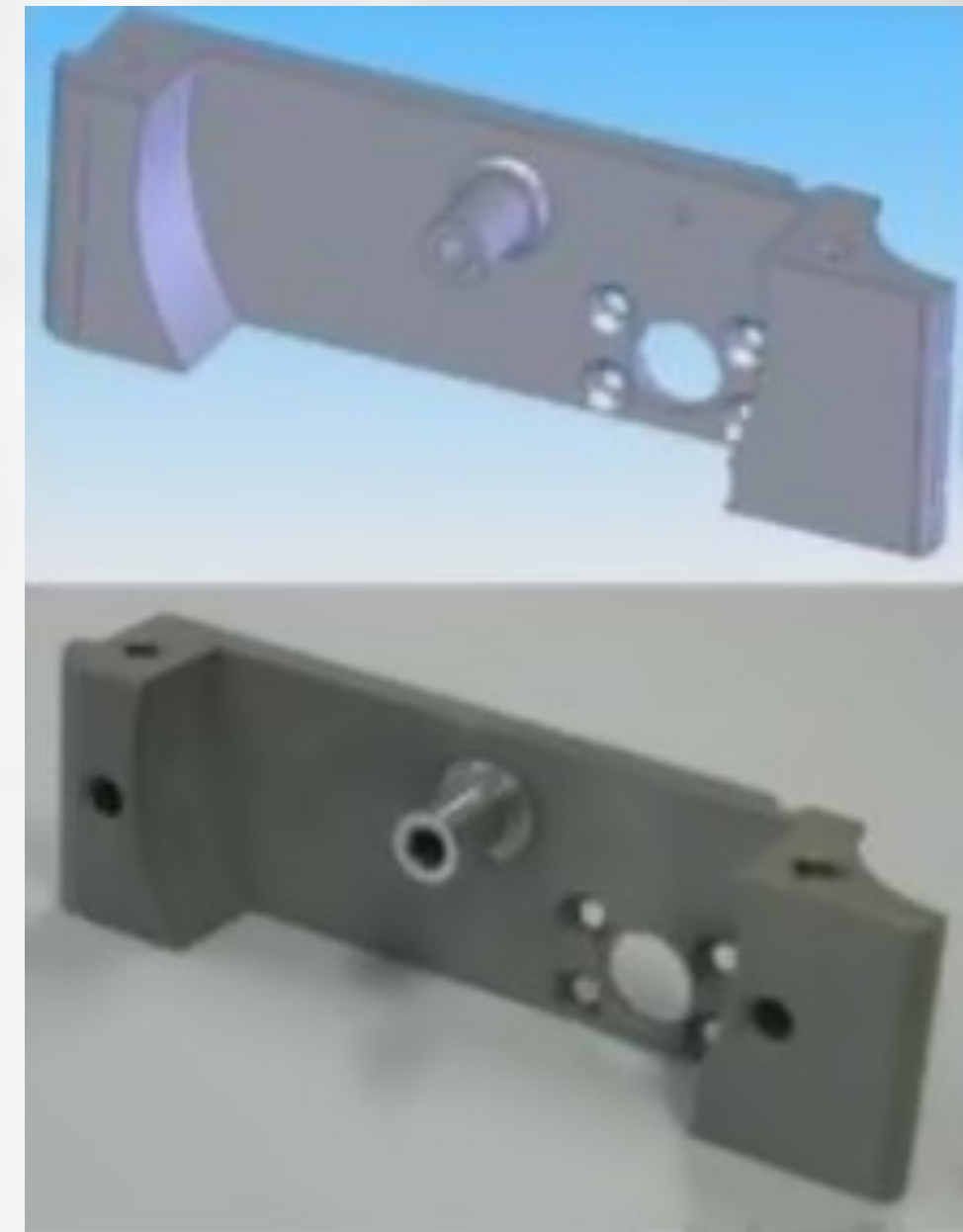
1

CAD/CAM

Definition & Component

DEFINITION

- **Computer Aided Design (CAD)** is defined as the application of computer and graphics software to aid the product design from conceptualization to documentation
- **Computer Aided Manufacturing (CAM)** is defined as the effective use of computer in manufacturing planning and control.



CIM

Computer-integrated manufacturing

Computer-integrated manufacturing in dentistry **CIM**

- Data acquisition unit:
 - 1) intra oral scanner
 - 2) laboratory scanner
 - Software for designing virtual restorations
 - *3shape*
 - *exocad*
 - *InLab SW*
 - Computerized milling device
 - 3D Printer
-
- The diagram illustrates the integration of various dental manufacturing components into a Computer-Integrated Manufacturing (CIM) system. On the left, a list of components is grouped into two main functional areas. The top area, indicated by a red bracket, includes 'Data acquisition unit' (with sub-items '1) intra oral scanner' and '2) laboratory scanner') and 'Software for designing virtual restorations' (with sub-items '3shape', 'exocad', and 'InLab SW'). A red arrow points from this group to the text 'CAD', which is underlined in red. The bottom area, also indicated by a red bracket, includes 'Computerized milling device' and '3D Printer'. A red arrow points from this group to the text 'CAM', which is also underlined in red. The background of the slide features a faint, grayscale image of a dental arch with a spring-like structure, suggesting the application of these technologies in dental prosthetics or orthodontics.

The background of the slide is a blurred, light-colored image of a dental arch model. A scanner probe is visible, positioned over the teeth. The overall tone is light and professional.

digitalization of dental arch

Intraoral scanner

laboratory scanner



software

3Shape

Exocad

Full anatomy/ Coping
Temporary
Implant abutment
Articulator adjustment
Smile design
RPD
Denture
Attachment

CAD POTENTIAL



CAM



MILLING (SUBTRACTIVE)

3D PRINTER (ADDITIVE)

Economy :
Money

Time saving
Accuracy
Publicize

TOPICS

CROWN / BRIDGE

IMPLANT

Office milling

SMILE DESIGN

TREATMENT PLANING

CLEAR ALLIGNER

PATIENT involvement



Emerald
Scanner

PLANMECA
Makes your
SMILE



IOS

TRIOS
MEDIT
PLANMECA
CRESTREM
LUNCA
HELIOS

HELIOS 600

Your Ideal IOS, Helios 600



ACCURACY CONCLUSION

Digital impression techniques are a **clinically acceptable alternative** to conventional impression methods in **fabrication of crowns and short FDPs**. For fabrication of implant-supported crowns and FDPs, digital impression systems also result in clinically acceptable fit. Digital impression techniques are faster and can shorten the operation time. Based on this study, **the conventional impression** technique is still **recommended for full-arch impressions**.

the accuracy of the length

Ahlholm, P 2016

Digital Versus Conventional Impressions in Fixed Prosthodontics: A Review

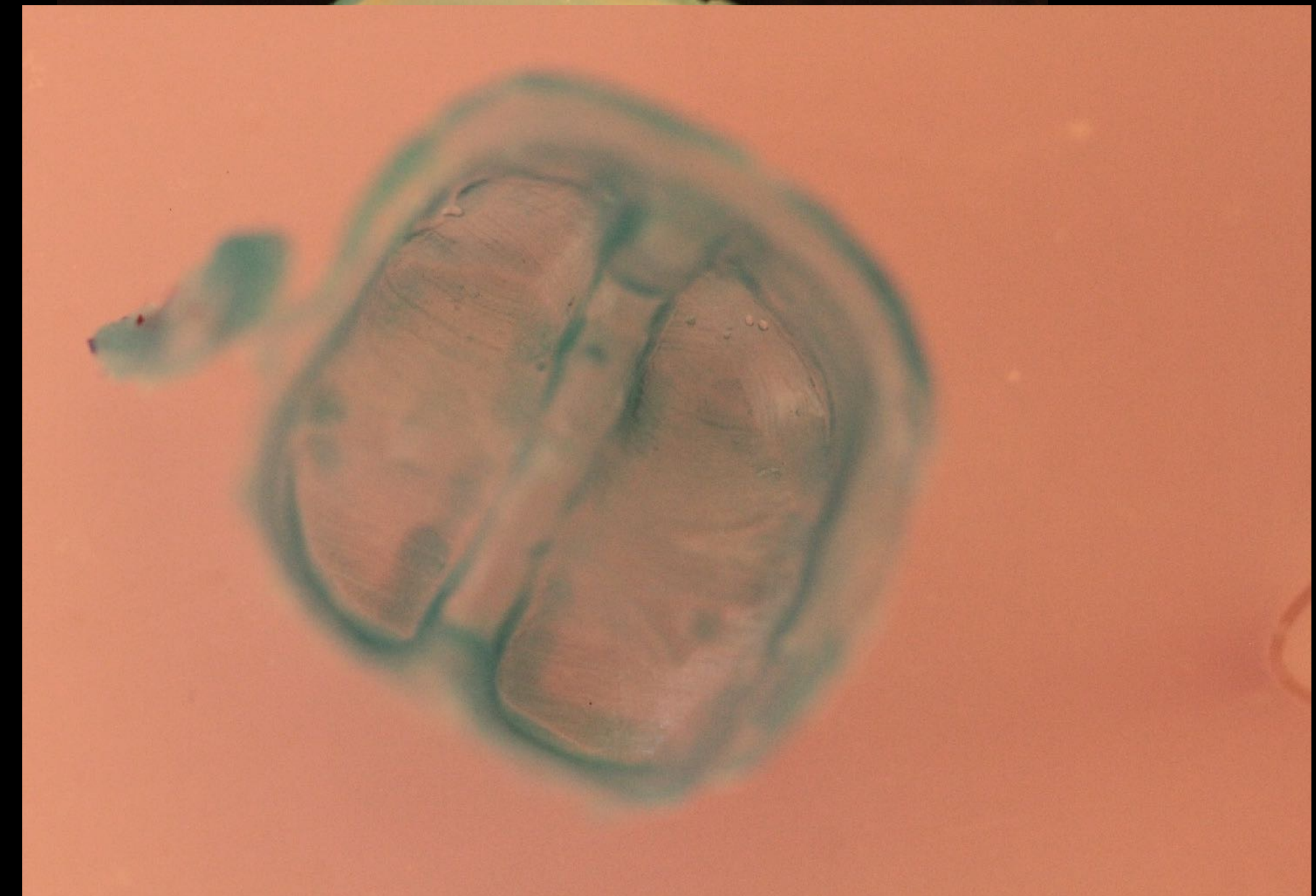
Journal of Prosthodontics

need to consider

lack of physical dental model

Advantage

- great accuracy of short bridge /crown
 - ★ fitness
 - ★ occlusion
- accuracy of bite registration
- speed of workflow



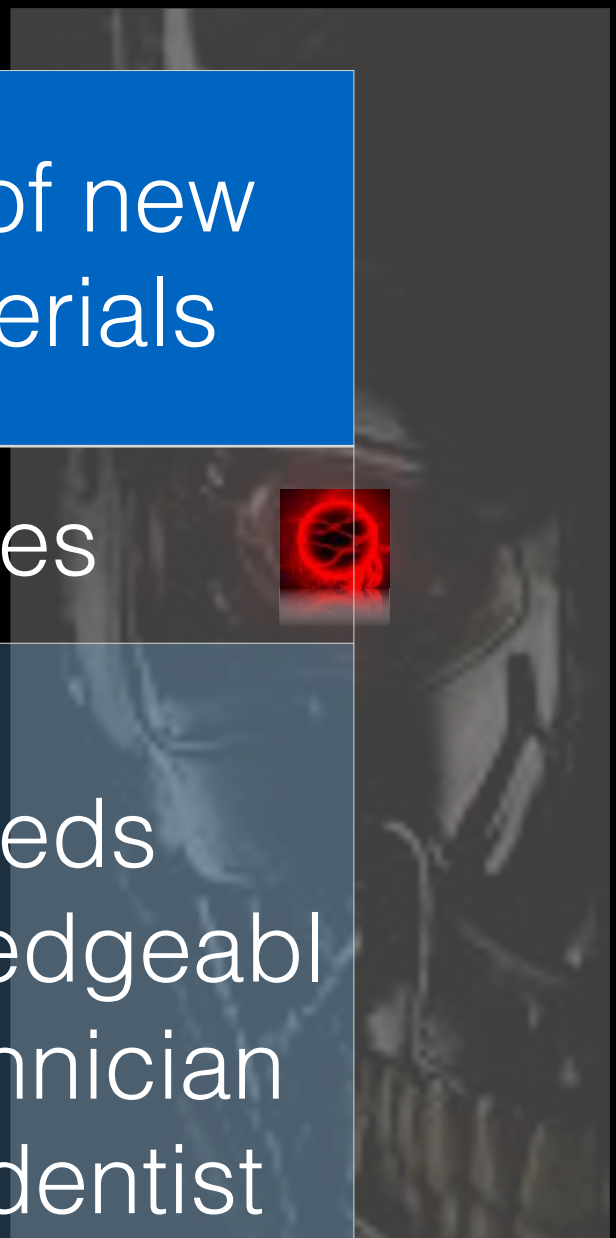
accuracy of monolithic zirconia crown made by trios 3 IOS and digital work flow
Eftekhar Ashtiani R ,nasiri khanlar L , biabanaki ,
dental material , under press

OFFICE - LAB communication conventional impression

• treatment planning	preparation	impression	fitness	occlusion	color	use of new materials
no	no	yes	yes	maybe	no	yes
–	–	–	needs knowledgeable technician	–	–	needs knowledgeable technician and dentist

OFFICE - LAB communication Digital impression

• treatment planing	preparati on	impressio n	fitness	occlusio n	color	use of new materials
helpful	helpful	helpful	yes	yes	no	yes
needs knowledgeable technician	show undercut s & path of insertion	need more document s	needs knowledgeable technician			needs knowledgeable technician and dentist

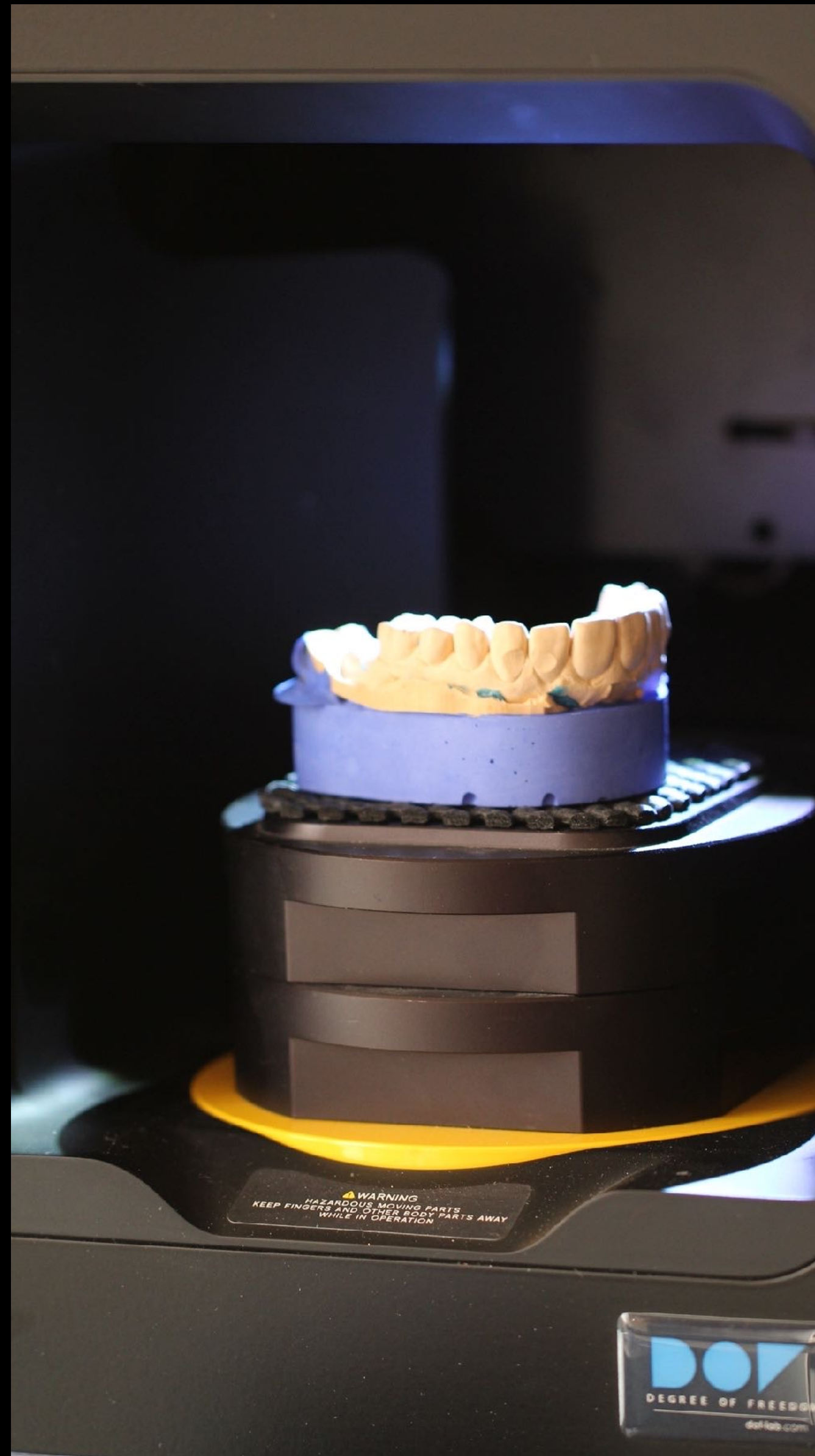


LAB scanner

impression scanning

common problem of modeling

calibration



precision
speed
separate die

TOPICS

CROWN / BRIDGE

IMPLANT

Office milling

SMILE DESIGN

TREATMENT PLANING

CLEAR ALLIGNER

PATIENT involvement

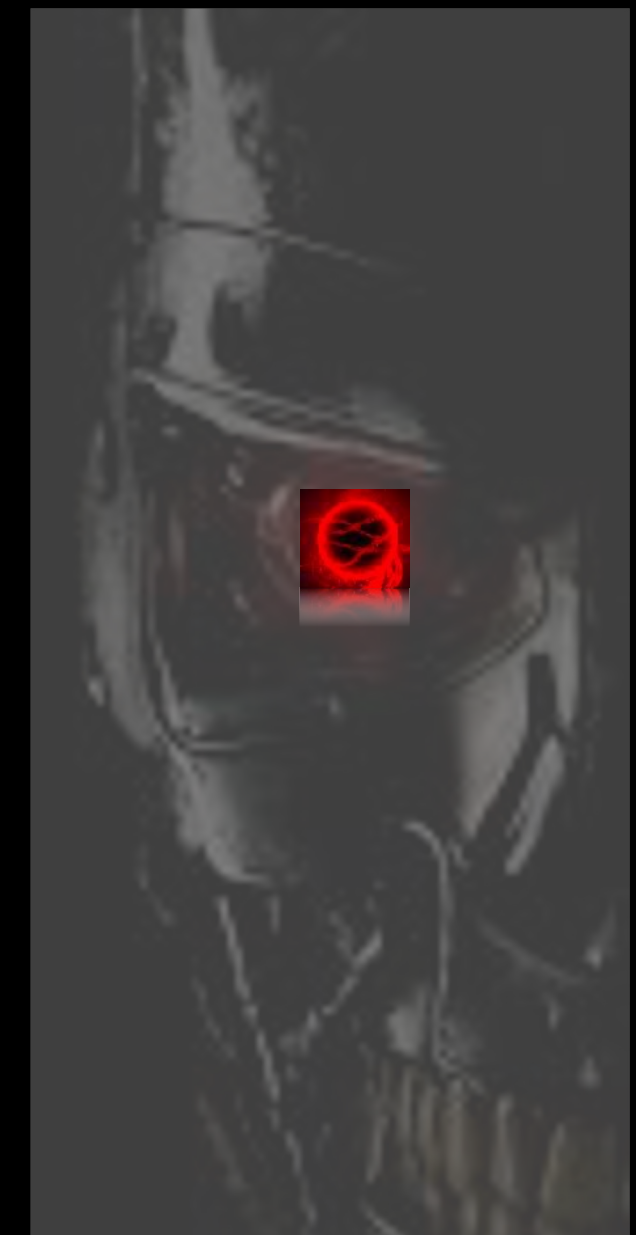
**IMPLANTS
&
DIGITAL DENTISTRY**

★ Treatment planing

Impression

Abutment making

Final restoration





Passive guided implant software

Simplant

Noble biocare

Easy guide

Straumann

Implant master

Sky Blue

Guidemia

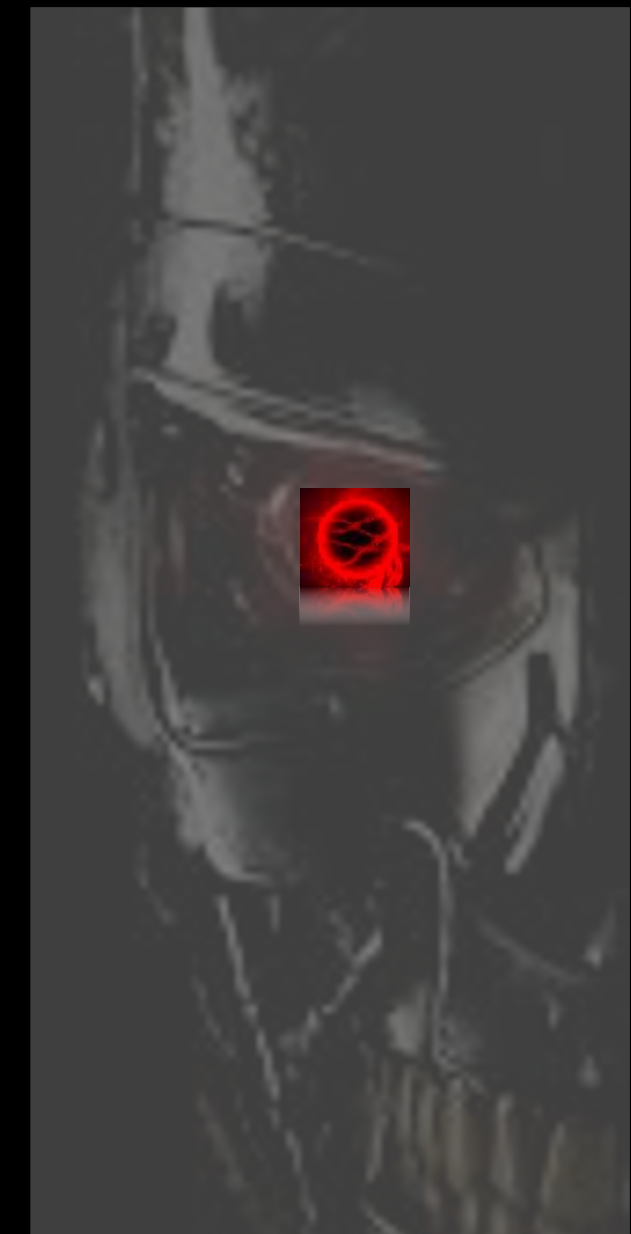
3shape

...



General concept of technology

1. 3D radiography by means of planed radiographic stent
2. .Import the DICOM file to software
3. .Placement of implant in the place
4. .Generate STL file
5. .Send the file for CAM machine
 - Milling
 - printer



INDICATION

and

\$

Three or more implant (cost / benefit)

Proximity to vital anatomic structure

Proximity to adjacent teeth

Questionable bone volume

Critical implant positioning(esthetic area)

Flapless surgery when indicated

Immediate restoration when indicated

Passive guided implant placement

is it
ACCURATE ?

Element of Accuracy

Radiographic accuracy and detail

Detecting the vital structure

Accuracy of guide production

Stability of guide in mouth

Detect the vital structure

Accuracy of measurements was found to be more operator dependent with CBCT

Dentomaxillofac Radiol. 2011 Feb;40(2):67-75.

A comparative study of the accuracy and reliability of multidetector computed tomography and cone beam computed tomography in the assessment of dental implant site dimensions.

[Al-Ekrish A](#), [Ekram M](#).

Stability of guide in mouth

tooth support > soft tissue support > bone support

minimizes error

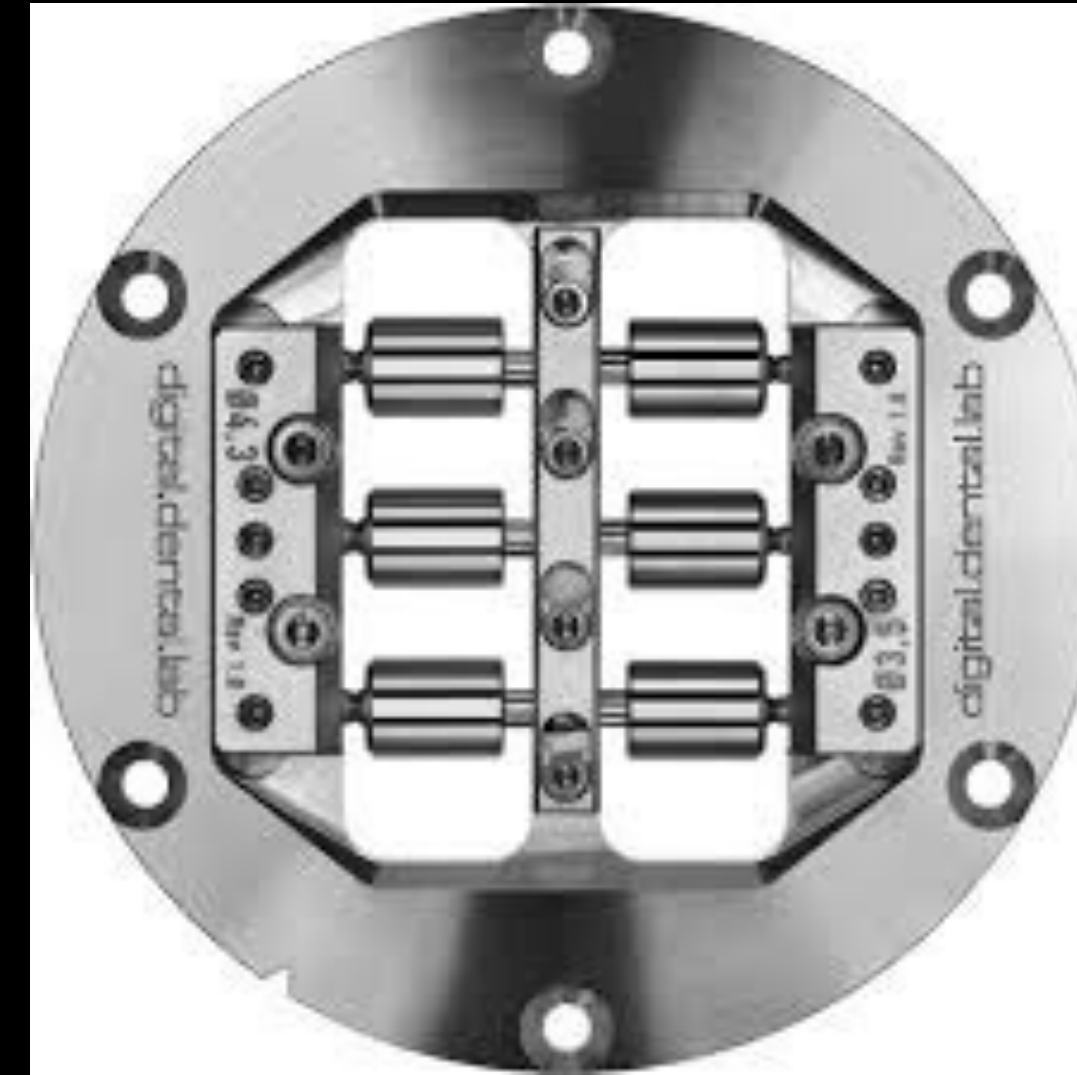
single guide / metal guide sleeves / rigid screw or pin
fixation

**IMPLANTS ABUTMENT
&
DIGITAL DENTISTRY**

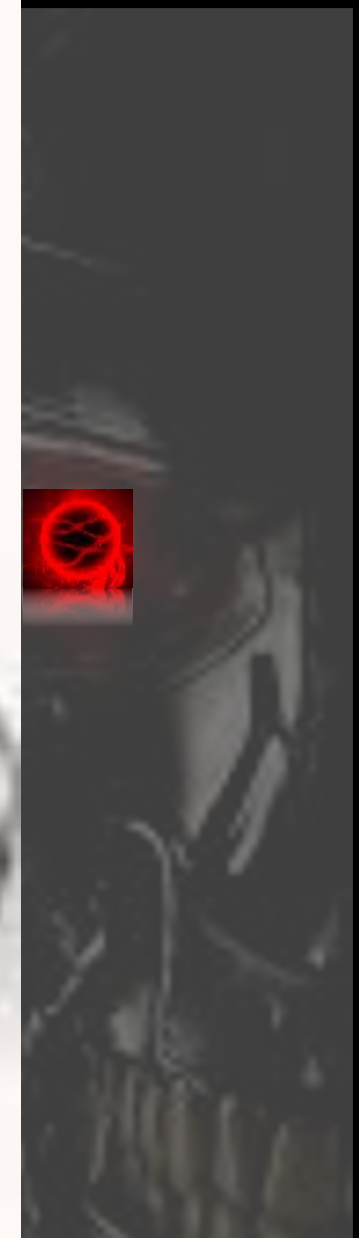
Custom cad cam abutment

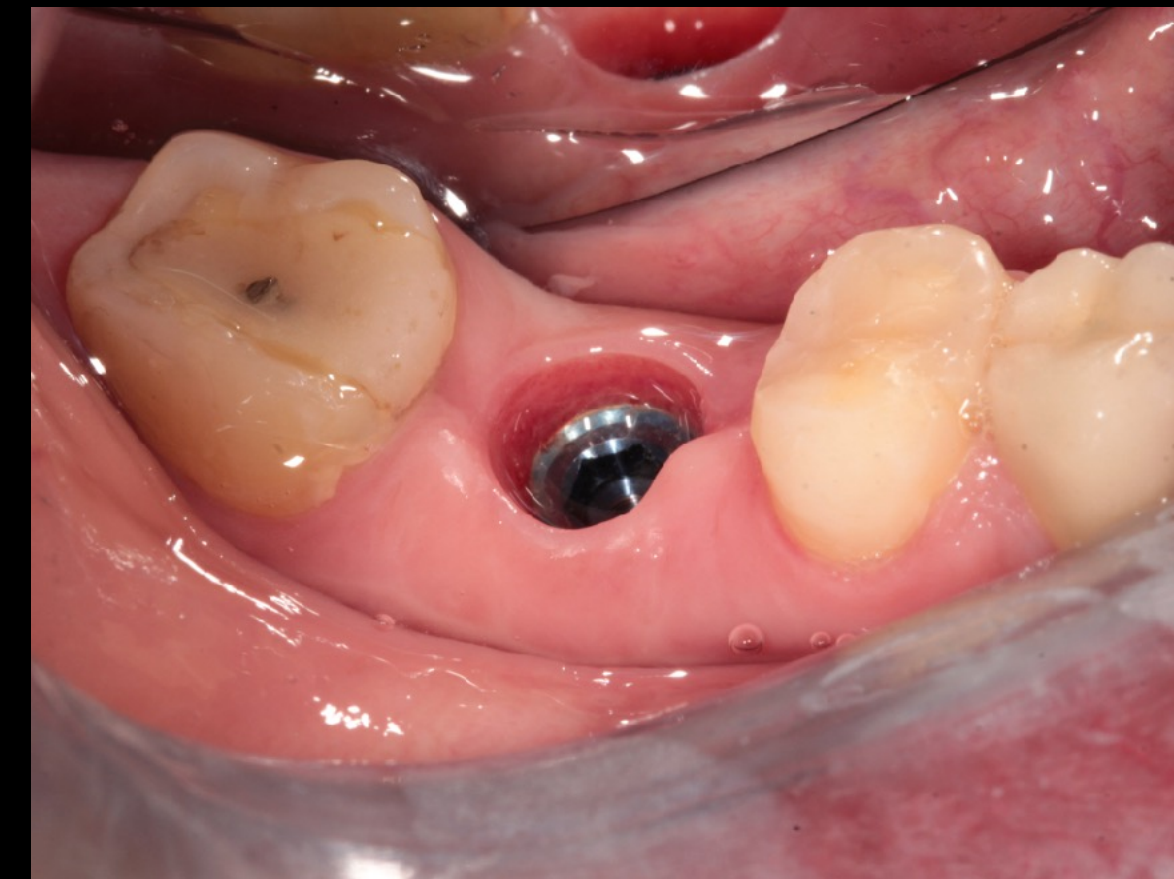


Ti custom blank



Ti-base cad cam





**IMPLANTS SUPRA-STRUCTURE
&
DIGITAL DENTISTRY**

DIFINITIVE implant SUPRA STRUCTURE

- METAL-CERAMIC

WAX

hard metal

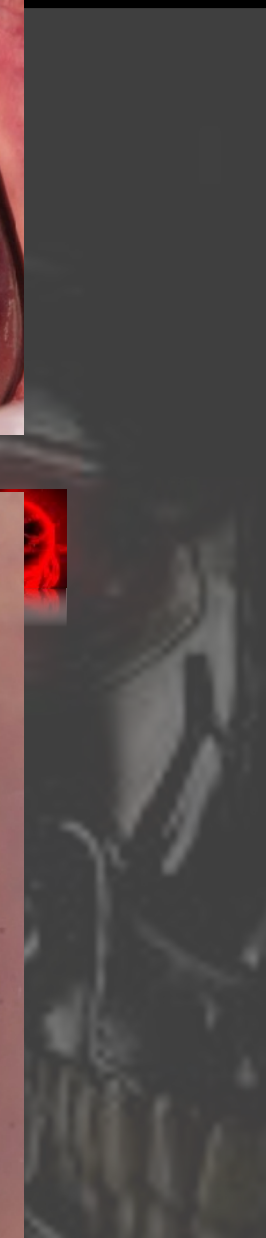
SOFT METAL

- LAYERED ZIRCONIA

- MONOLITHIC ZIRCONIA

- MILLED CERAMIC





TOPICS

CROWN / BRIDGE

IMPLANT

Office milling

SMILE DESIGN

TREATMENT PLANING

CLEAR ALLIGNER

PATIENT involvement

topic

MILLING

myth

- axis 5 Versus 4
- wet / dry
- spindle power
- accuracy
- bur no
- software

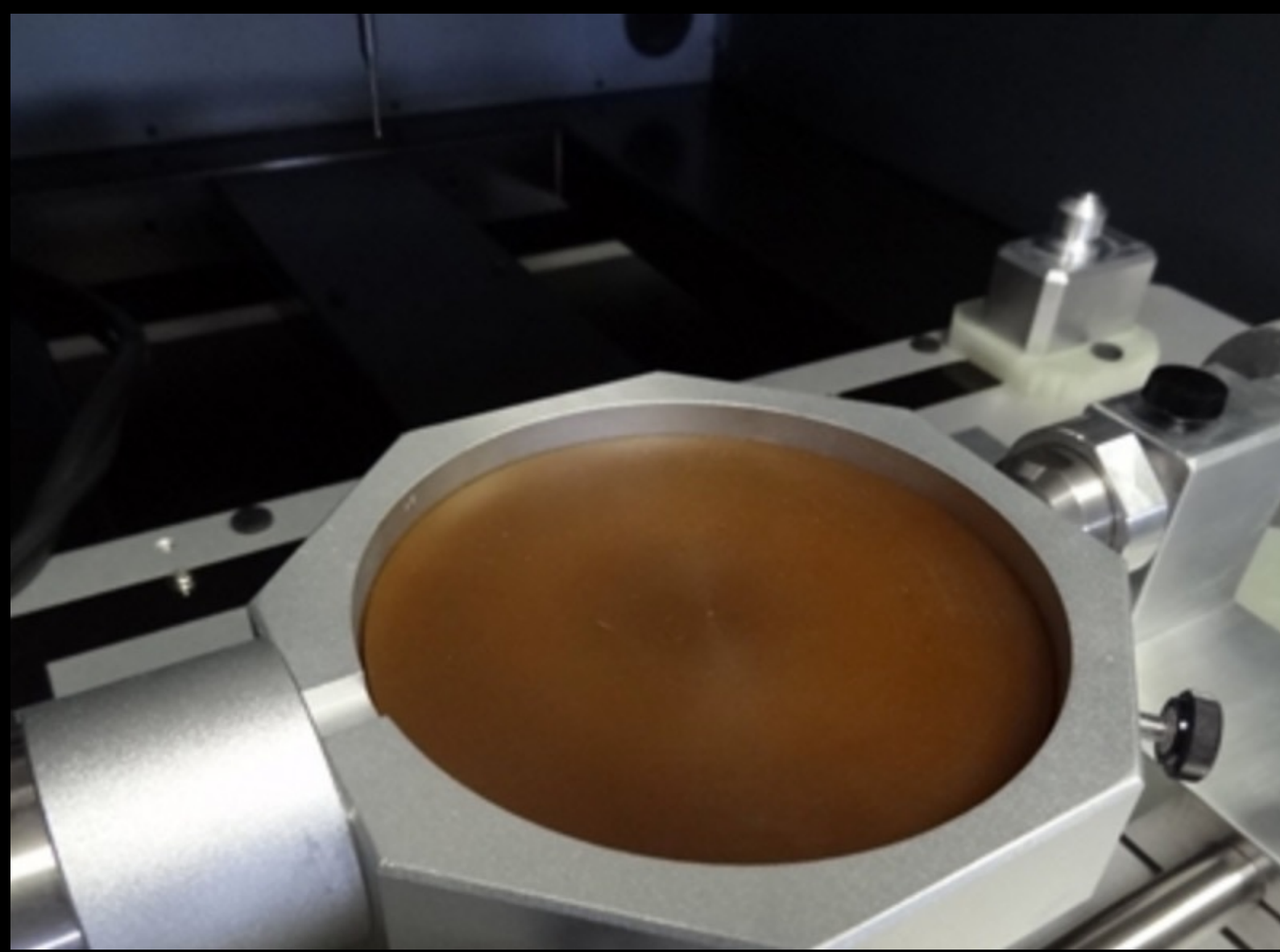
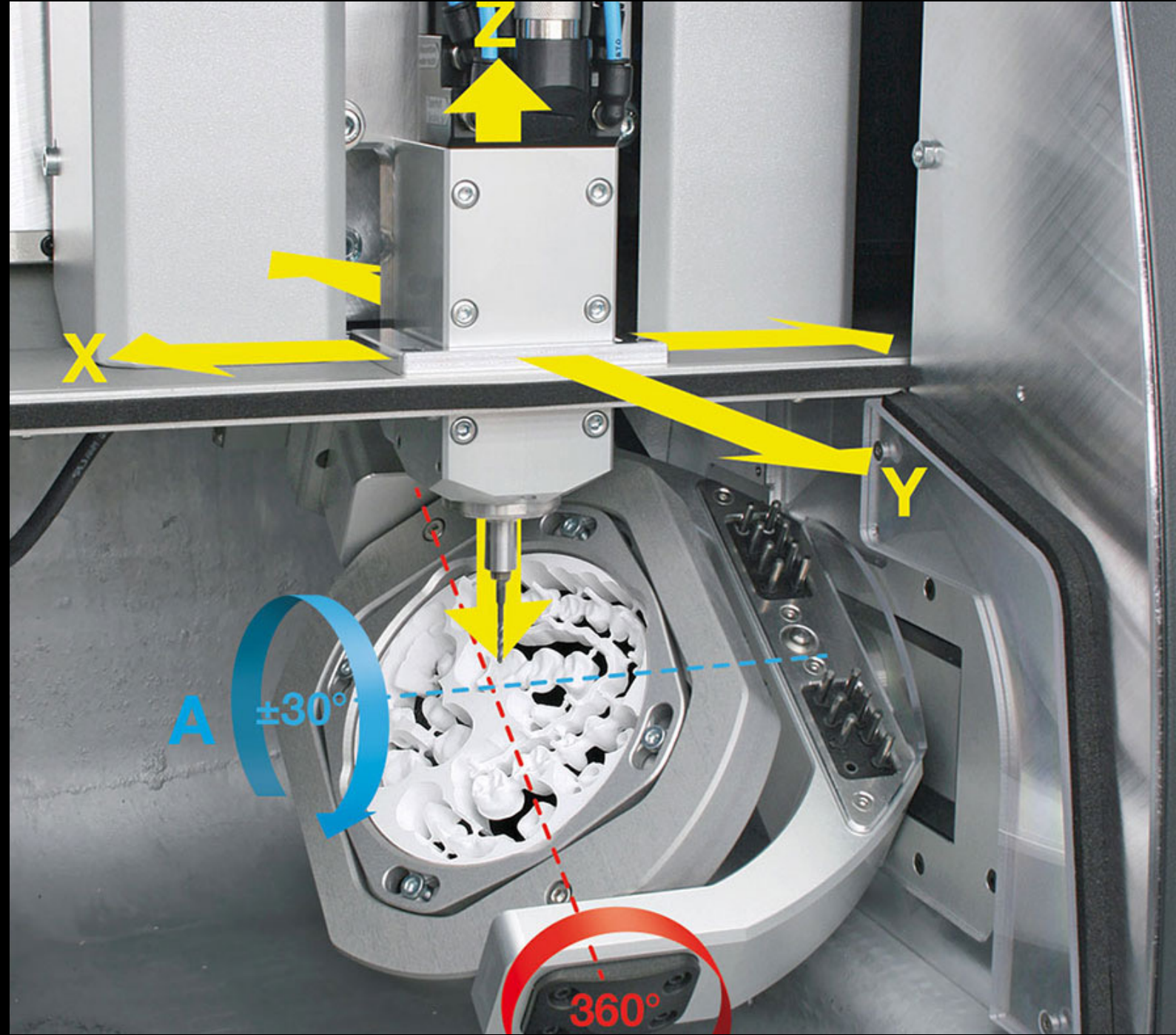
4 versus 5 axis

4 versus 5 axis

- speed of milling **BUT** software oriented
AND add price
- lower waste of materials
- accuracy
- maintenance

5Axis

Restoration Type	4-Axis	5-Axis
Bars		●
Bridges — Anatomical	●	●
Bridges — Framework	●	●
Bridges — Screw-retained, 2 implants	○	●
Bridges — Screw-retained, > 2 implants		●
Crowns	●	●
Crowns — Screw-retained	○	●
Copings	●	●
Custom Abutments — from preform blank	○	●
Custom Abutments —Zirconia w/ Ti Connection	●	●
Inlays/Onlays	●	●



4 Axis

CHAIR SIDE MILLING

myth

- speed
- one day crown
- aesthetics

truth

- price
- design /time by dentist
- fitness
- color
- need lab skill
- material

TOPICS

CROWN / BRIDGE

IMPLANT

Office milling

SMILE DESIGN

TREATMENT PLANING

CLEAR ALLIGNER

PATIENT involvement

**There is more to front teeth than
looks alone**

diagnosis and treatment planning

Treatment begins when
there is a problem

But

Can Anyone EXPRESS The problem

**WHY DESCRIBE OF ESTHETIC
PROBLEM IS DIFFICULT**

ESTHETIC

- Objective

- Multidisciplinary

- perceptive
- Approach

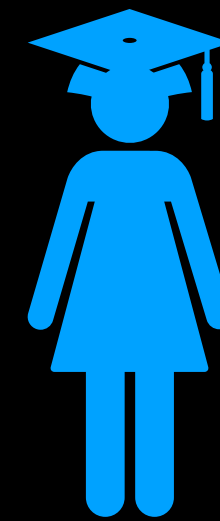
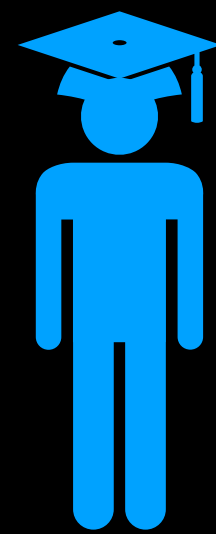
- Patient desire

- Objective
- Unrealistic?
- Achievable?

DSD
DSS
3D SYNC

PT
present
condition

UNKNOWN
PT
Desire



TOPICS

CROWN / BRIDGE

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PATIENT involvement

Treatment planning

- SHOW/HIDE ?
- Antagonists
 - Jaw scans
 - Full anatomic
 - All other parts
 - Connectors
 - Merged parts

Merge and save restorati... ? x

SAVED FILES

Restart Merging

Cancel Merging

Remove Existing Merged Parts

Optimize for better free-forming and 3D printing

- Tooth 23 (Anatomic crown) - Restorati...
2015-12-13_00010-001-23-crown_cac
- Tooth 12 (Anatomic crown) - Restorati...
2015-12-13_00010-001-12-crown_cac
- Tooth 24 (Anatomic crown) - Restorati...
2015-12-13_00010-001-24-crown_cac
- Tooth 11 (Anatomic crown) - Restorati...

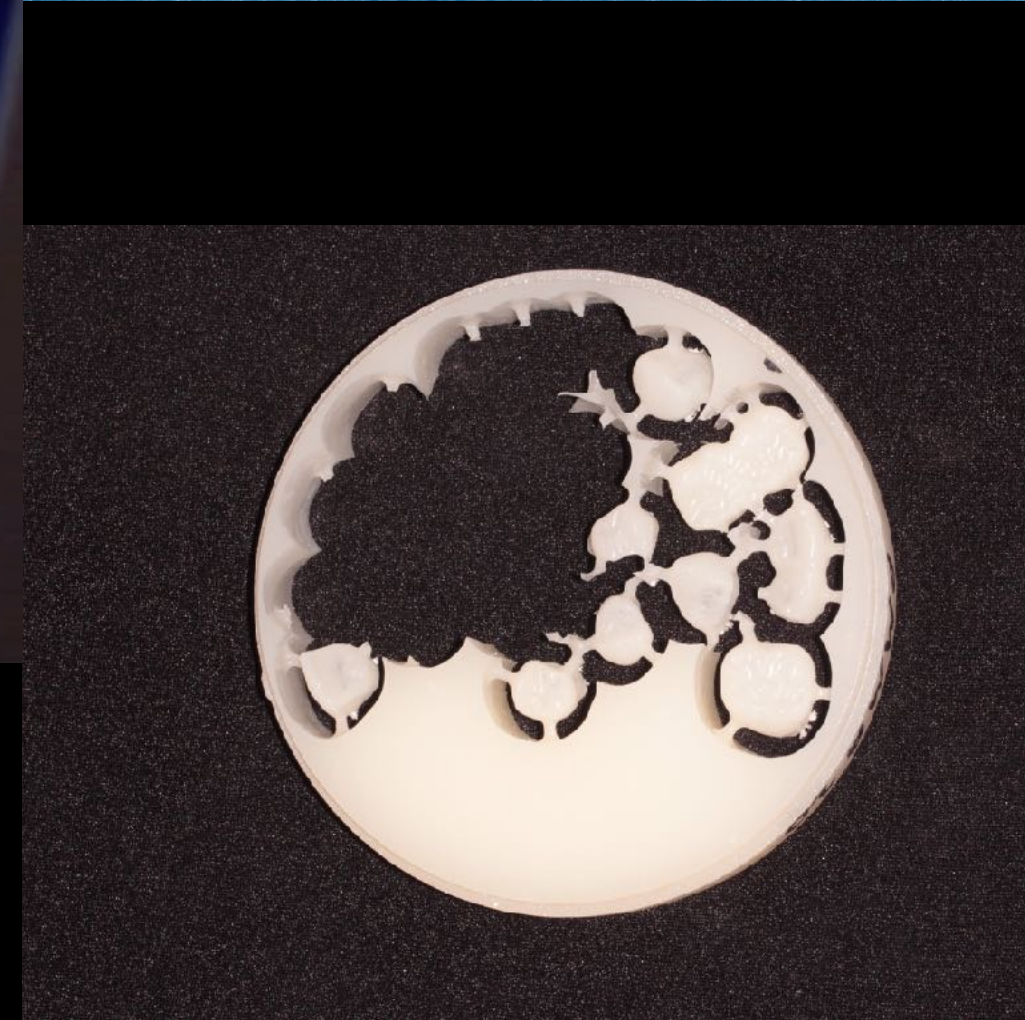
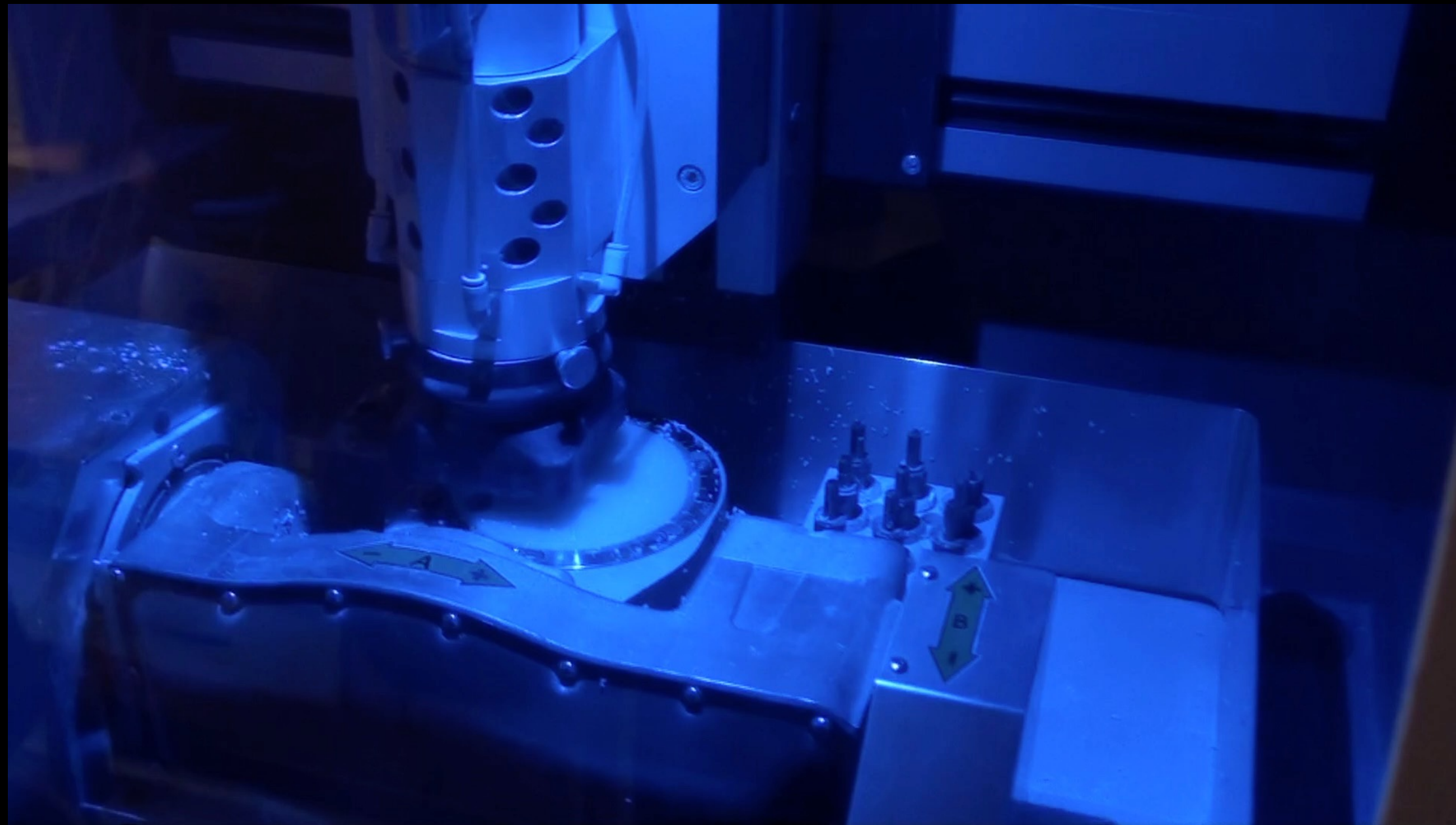
OK Cancel



exocad







TOPICS

CROWN / BRIDGE

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SMILE DESIGN

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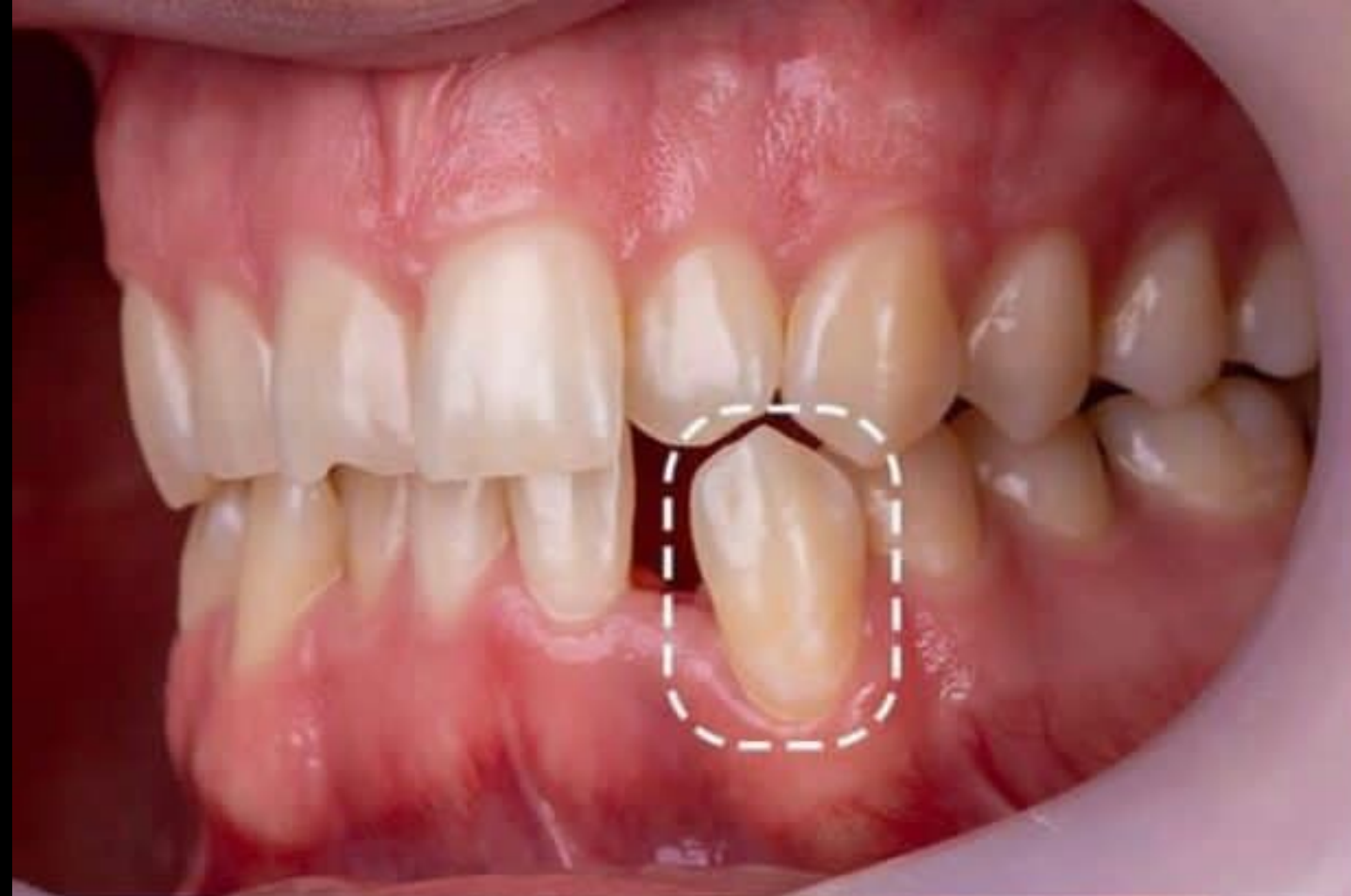
قبل

بعد



تغییرات در ۴ ماه

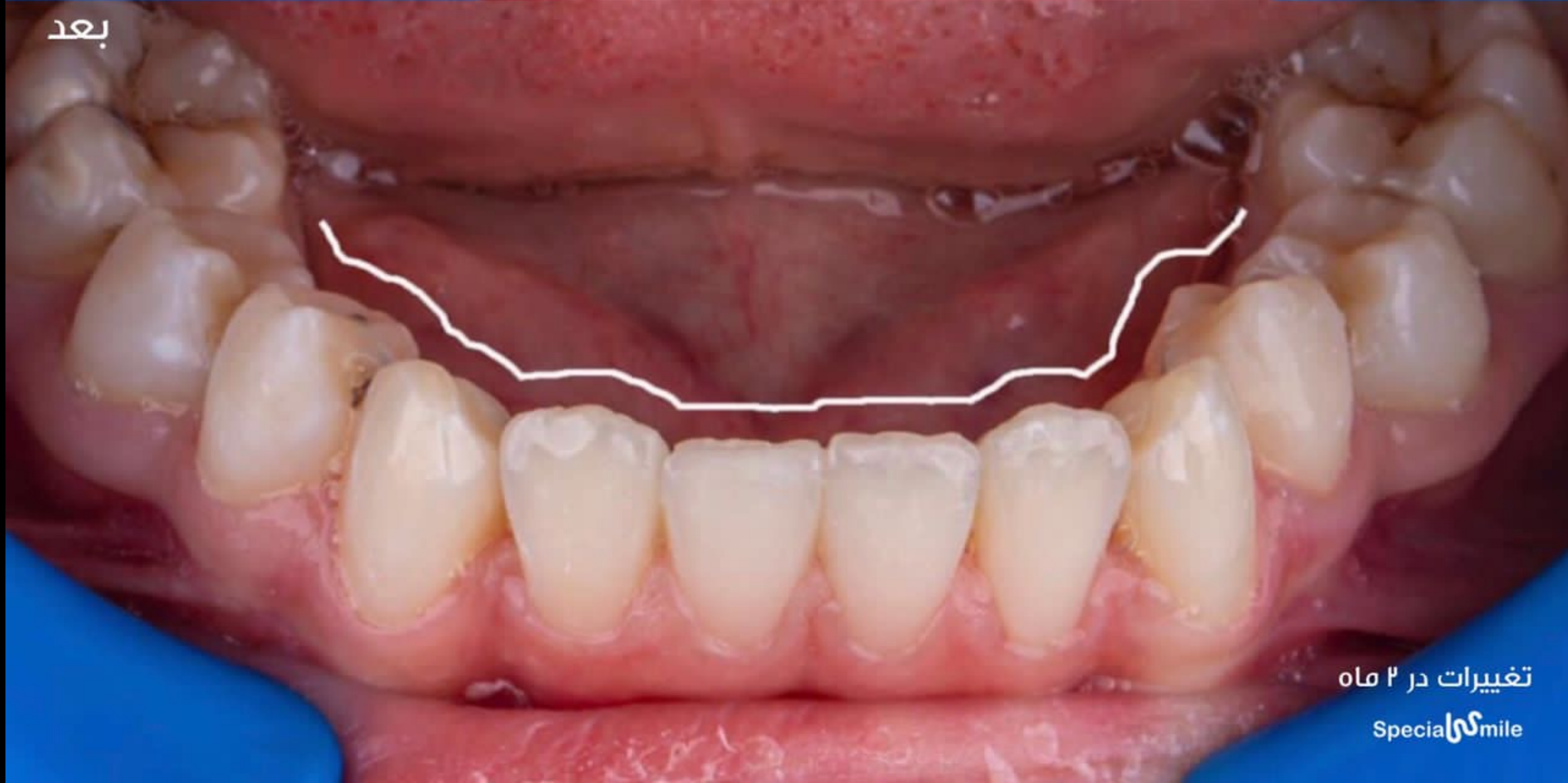
SpecialSmile



تغییرات در 0 ماه
SpecialSmile



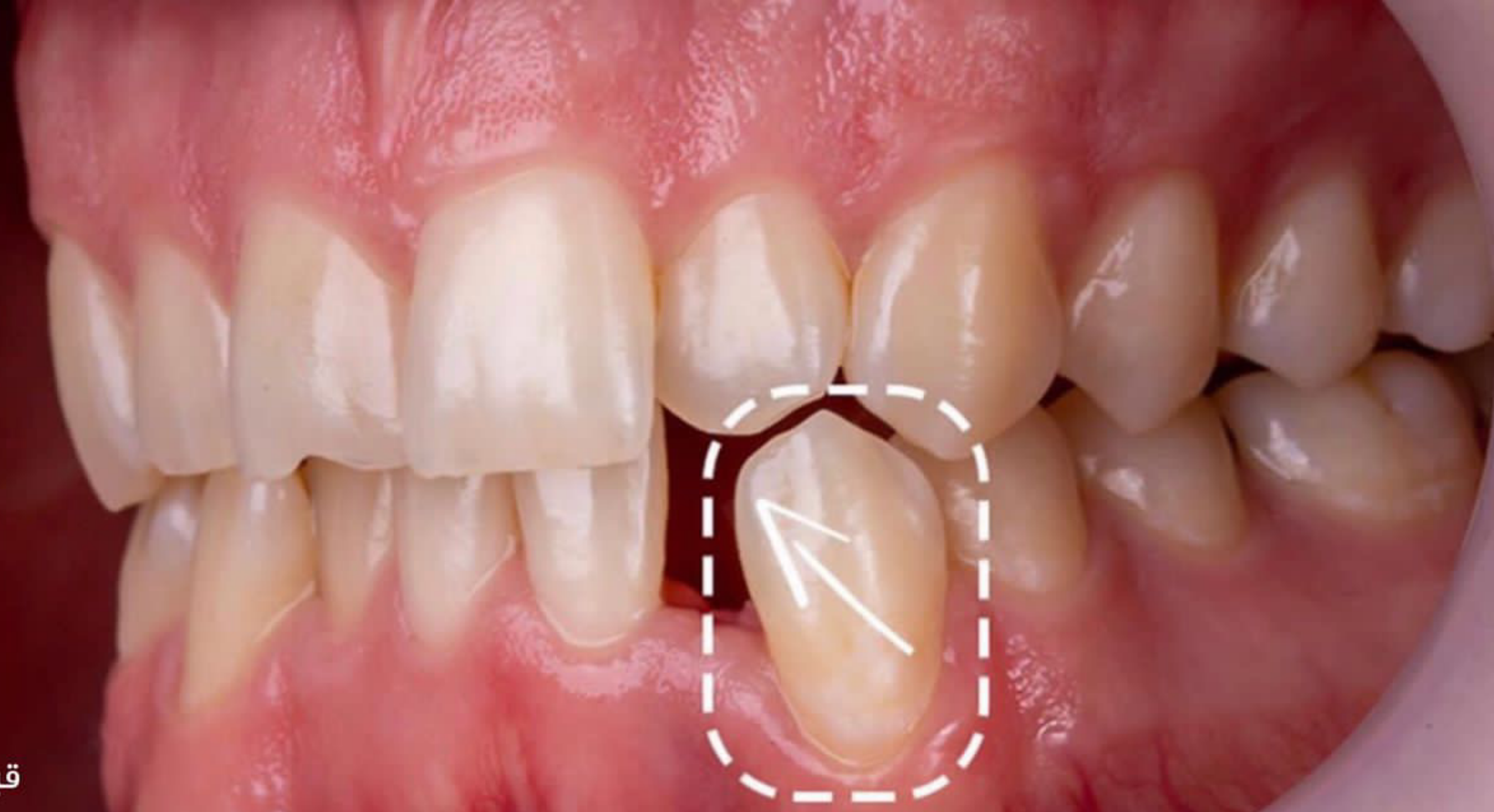
قبل



بعد

تغییرات در ۲ ماه

SpecialSmile



قبل

بعد



تغییرات در ۵ ماه
SpecialSmile

TOPICS

CROWN / BRIDGE

IMPLANT

Office milling

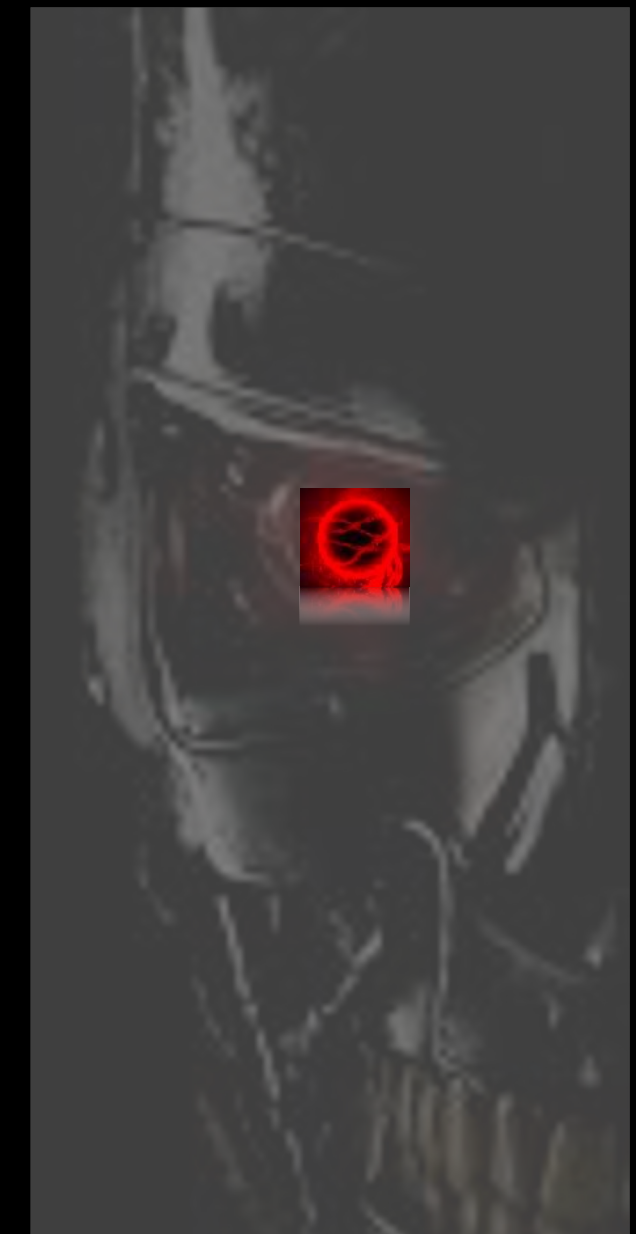
SMILE DESIGN

TREATMENT PLANING

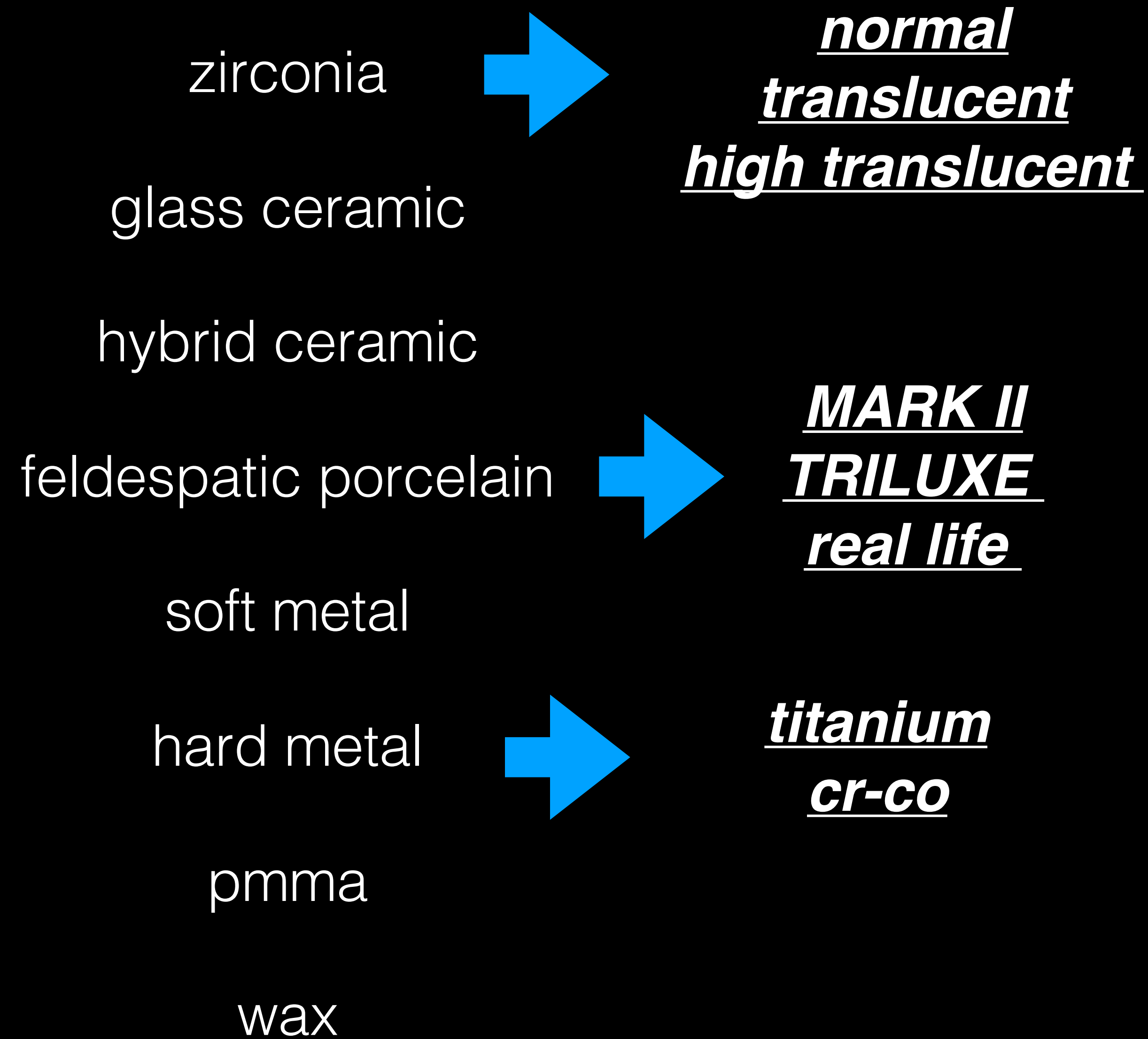
CLEAR ALLIGNER

PATIENT involvement

MATERIALS
&
digital workflow



wide and new material to choose



Zirconia

Glass-ceramic



CE 0483 FDA IDI

topic



ZiRconia

zirconia

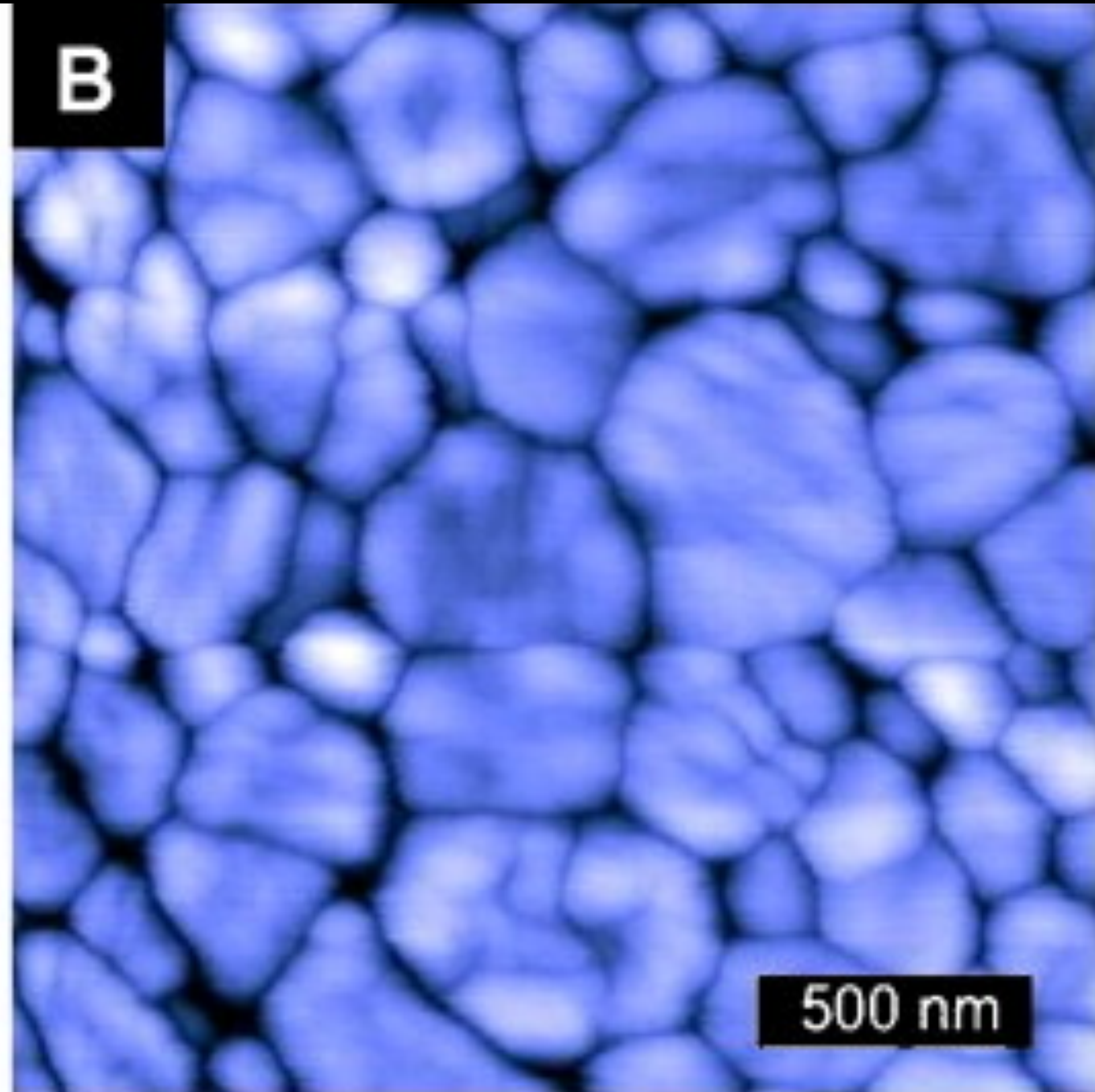
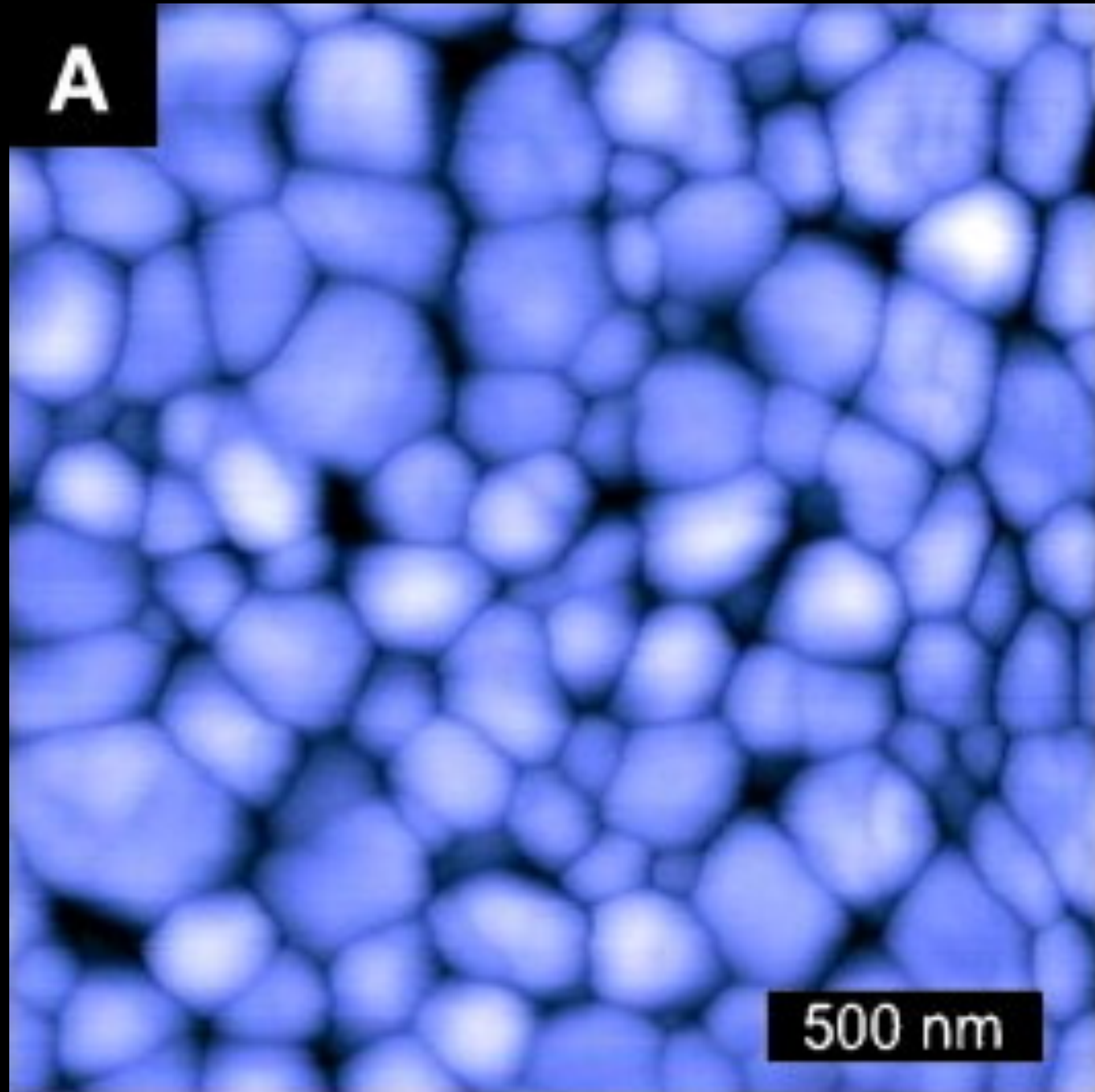
- chemistry , phase
- phase change , transformation toughening
- types , indication
- problems , cautions

ZIRCONIA

chemistry , phase

- ZrO_2 , yttrium stabilize
- PHASE :
 - monoclinic
 - tetragonal
 - cubic





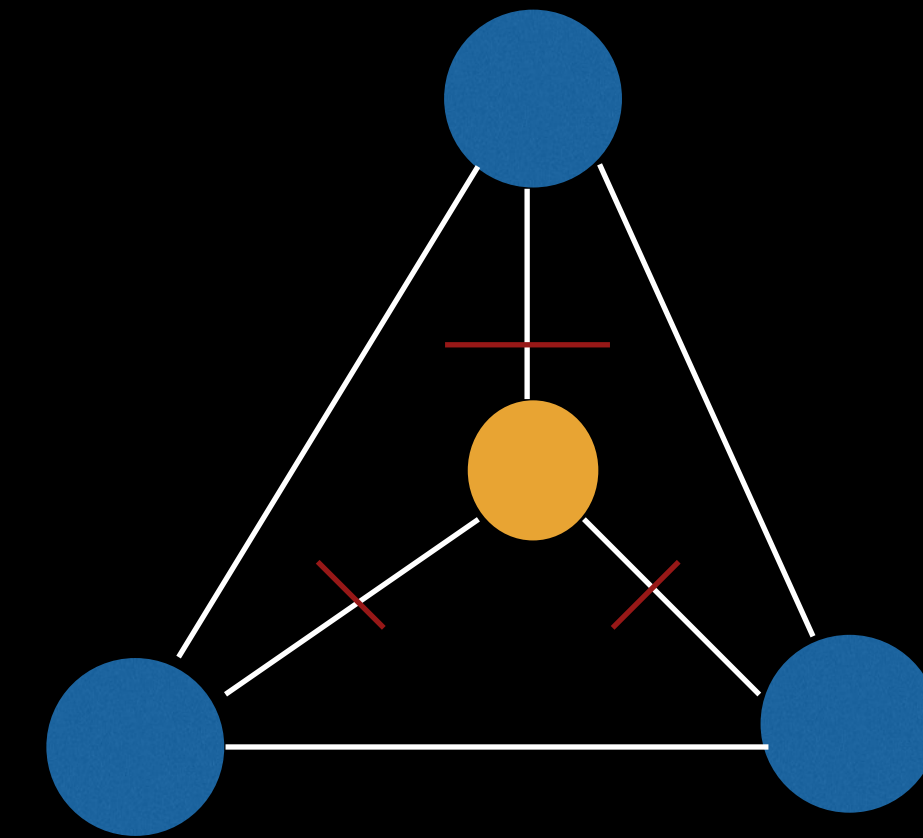
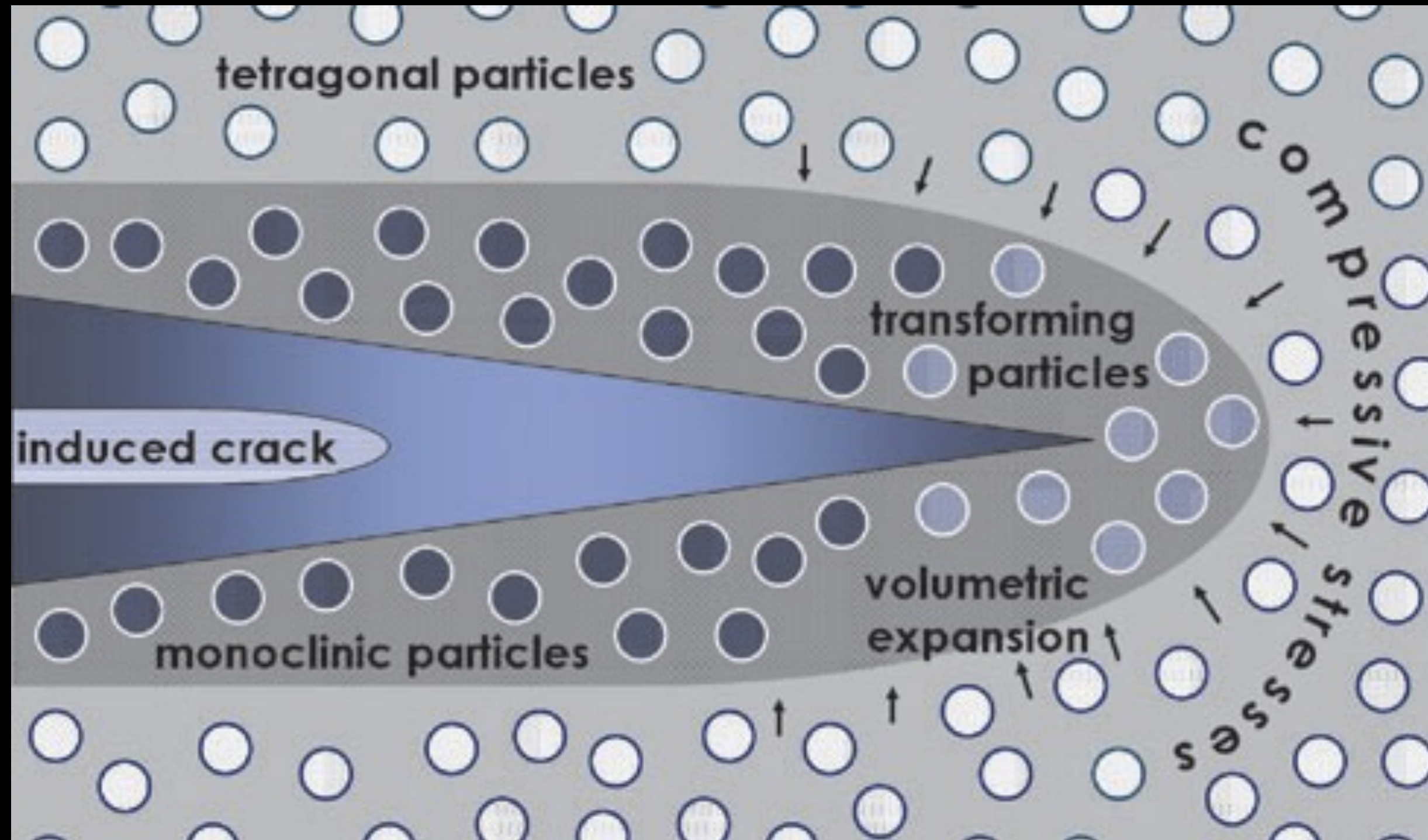
ZIRCONIA

phase change , transformation toughening

- cause of phase change
- crack repair



Y-PSZ transformation toughening



ZIRCONIA

types , indication

- NORMAL

opaque, 1200 MPa

framework

- HIGH TRANSLUCENT

semi translucent 1200 MPa

framework , post. crown/bridgework

- SUPER TRANSLUCENT

semi translucent 600 MPa

single unite /anterior &posterior



zirconia handling

Contamination of dental zirconia before final firing: Effects on mechanical properties

[Seiji BAN](#), [Yuji OKUDA](#), [Makoto NODA](#), [Jiro TSURUKI](#), [Tatsushi KAWAI](#), [Hiroshi KONO](#)

- [Dental Materials Journal](#) 2013

white stage Zr must respect by technician

- contamination
- milling process
- sintering
- coloring
- design
- grinding / sand blasting
- porcelain apply

PROBLEMS WITH ZIRCONIA

FRACTURE

PORCELAIN BOND

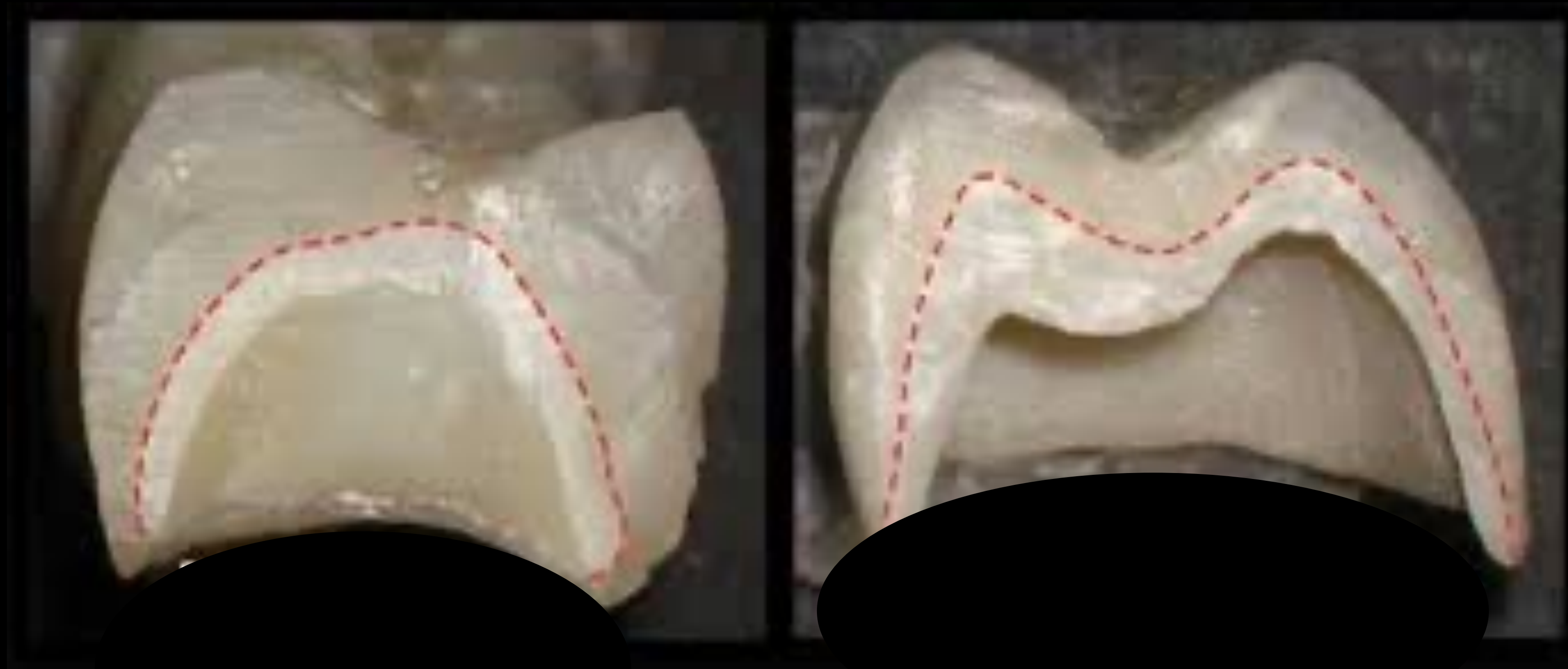
BONING TO TEETH

low-temperature degradation (LTD)

zirconia coping design

Three generations of zirconia: From veneered to monolithic. Part I

[B Sławarczyk, C Keul, M Eichberger Quintessence international 2017](#)



[Ceramics International](#) 2016, **Effects of coping designs on stress distributions in zirconia crowns: Finite element analysis**

Seung-Ryong Ha^a Sung-Hun Kim^b

ZIRCONIA

problems , cautions

- fitness
- fracture
- porcelain fracture
- cementation
- LTD



Interface Oral Health Science 2014 pp 317-323

Clinical Chipping of Zirconia All-Ceramic Restorations

PORCELAIN BOND

Miyazaki T, Nakamura T, Matsumura H, Ban S, Kobayashi T.

Current status of zirconia restoration.

J Prosthodont Res. 2013 Oct;57(4):236-61

super translucent ZIRCONIA problems , cautions

- fracture
- occlusal adjustment
 - correct impression
 - correct bite
- color standard
- bridge work



Predicting marginal fit of CAD/CAM crowns based on the presence or absence of common preparation errors

Renne W, McGill ST, Forshee KV, DeFee MR, Mennito AS J Prosthet Dent 2012;108:310-315

The results showed a statistically significant correlation between the marginal fit of a CAD/CAM fabricated crown and the quality of the preparation. The mean marginal gap of the crowns fabricated on **ideal preparations was 38.5 μm** , those considered **fair** had a mean marginal gap of **58.3 μm** , while those categorized as **poor** averaged **90.1 μm** . The fit differences among all 3 groups were statistically significant ($P < .05$).

Within the limitations of this in vitro study, it can be concluded that **preparation quality has a significant impact on marginal gap** on crowns fabricated with a CAD/ CAM system.

THANKS

Anahita laboratory for **ESTHETIC** work

021-88618635

special smile laboratory for **ALIGNER**

051-37662426

مراکز آموزشی

آریاز سنتر و مرکز بینش

0921-3873988

برنامه های آموزشی

- زیبایی
- ایمپلنت
- آموزشهای تکنسین های دندانسازی
- دیجیتال
- اندو

0921-3873988