

We are learning on  
**Noongar** land



THE UNIVERSITY OF  
**WESTERN**  
**AUSTRALIA**

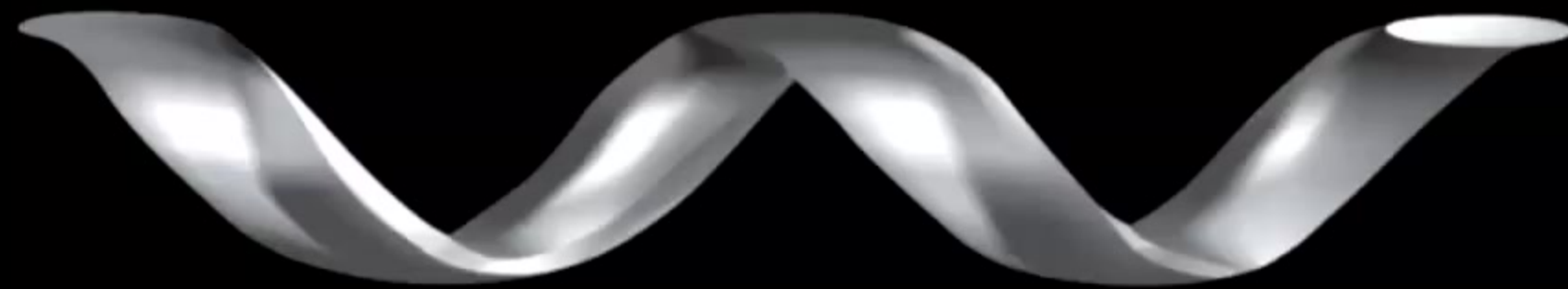


# Copyright Notice

Material used in this recording may have been reproduced and communicated to you by or on behalf of **The University of Western Australia** in accordance with section 113P of the *Copyright Act 1968*.

Unless stated otherwise, all teaching and learning materials provided to you by the University are protected under the Copyright Act and is for your personal use only. This material must not be shared or distributed without the permission of the University and the copyright owner/s.





**DR BRENDON D. JOYCE**

B.D.Sc. (W.A.) G.C.D. (ADEL.) D.C.D. (PROS.) (MELB.)

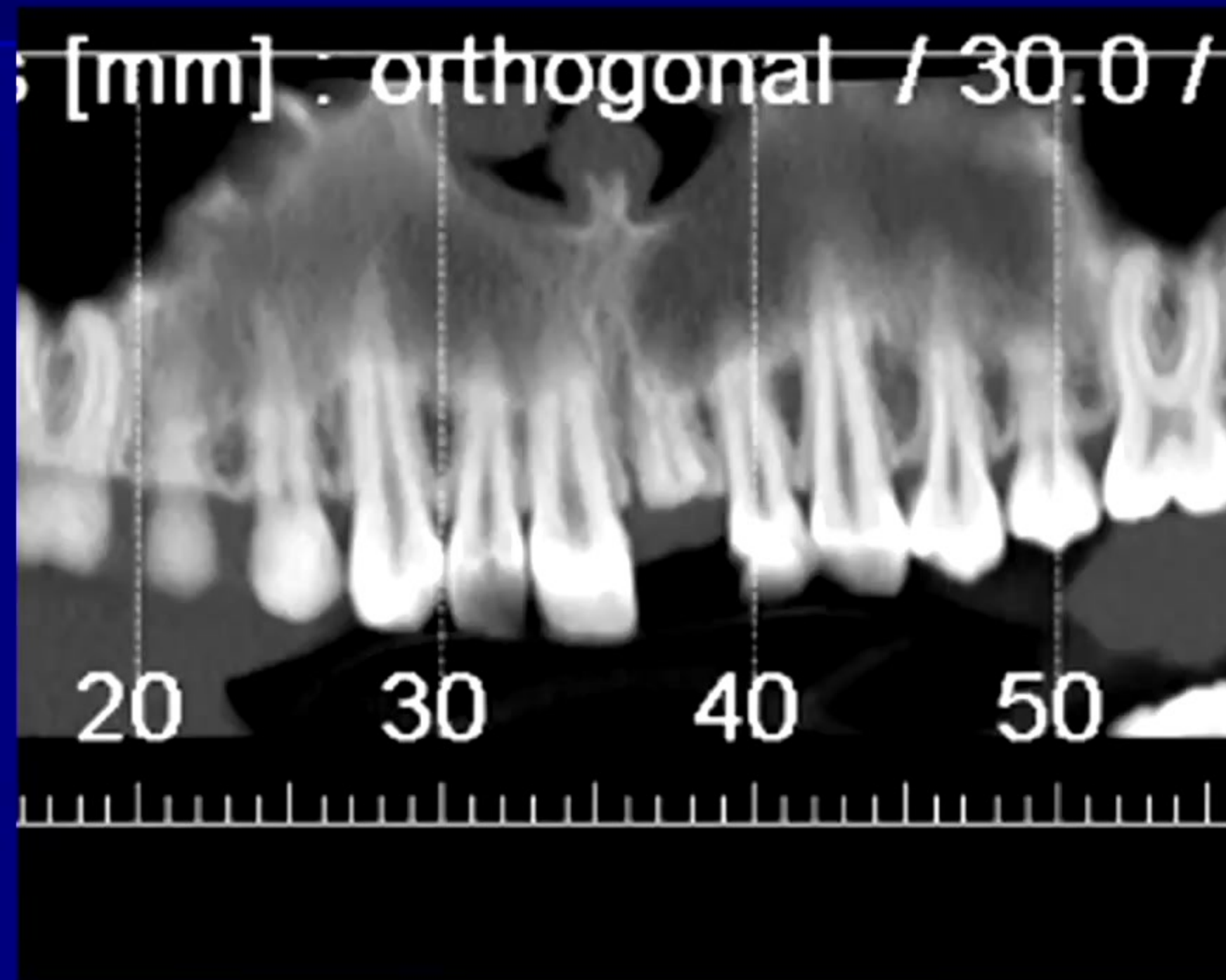
PROSTHODONTIST

[bjoyce@westperthpros.com.au](mailto:bjoyce@westperthpros.com.au)



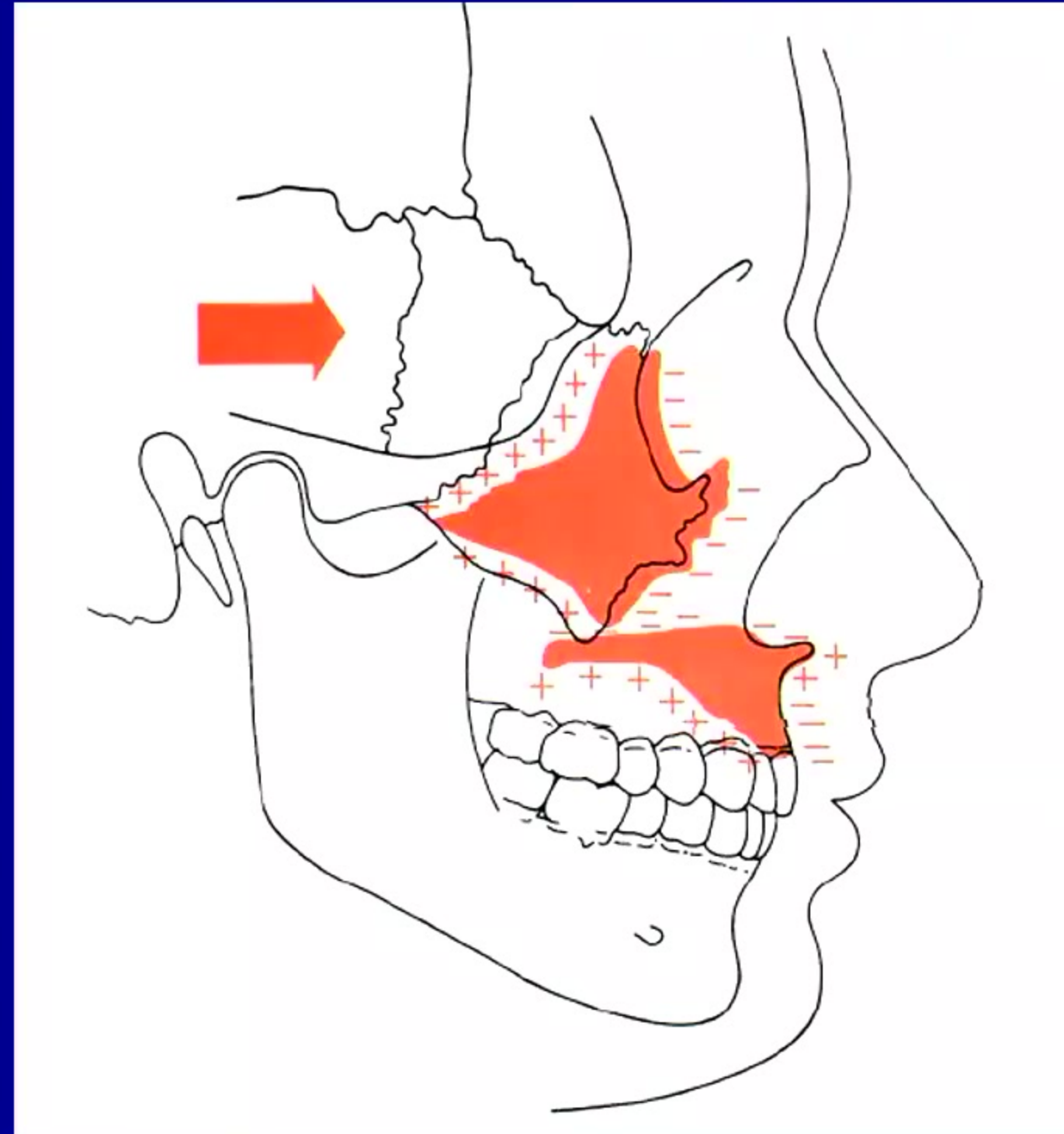


[ F ] [ 020Y ]



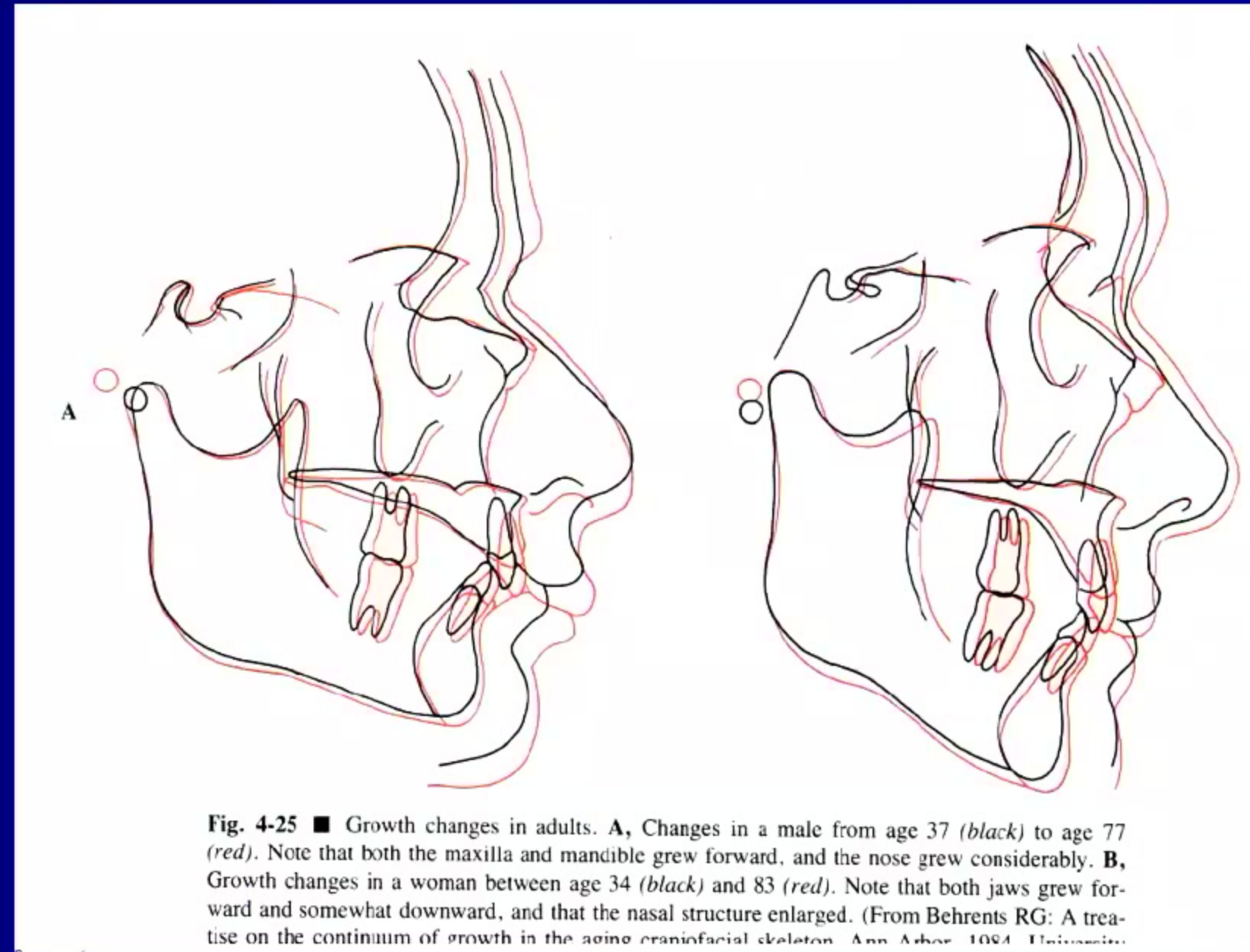
# Developmental Changes

1. Maxilla grows down and forward
2. Resorption of labial bone over maxillary anterior teeth



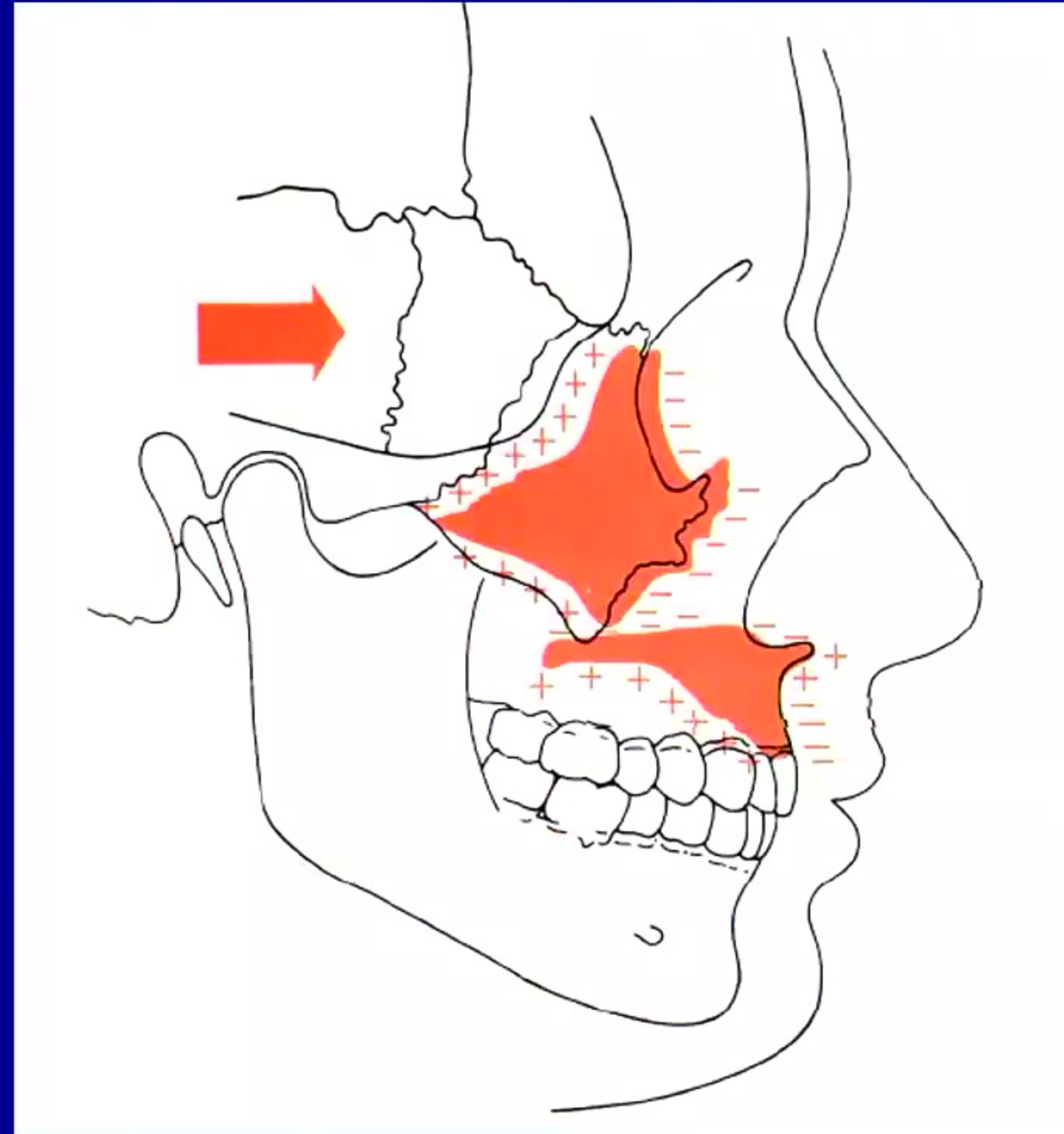
# Developmental Changes

## 3. Teeth extrude and upright



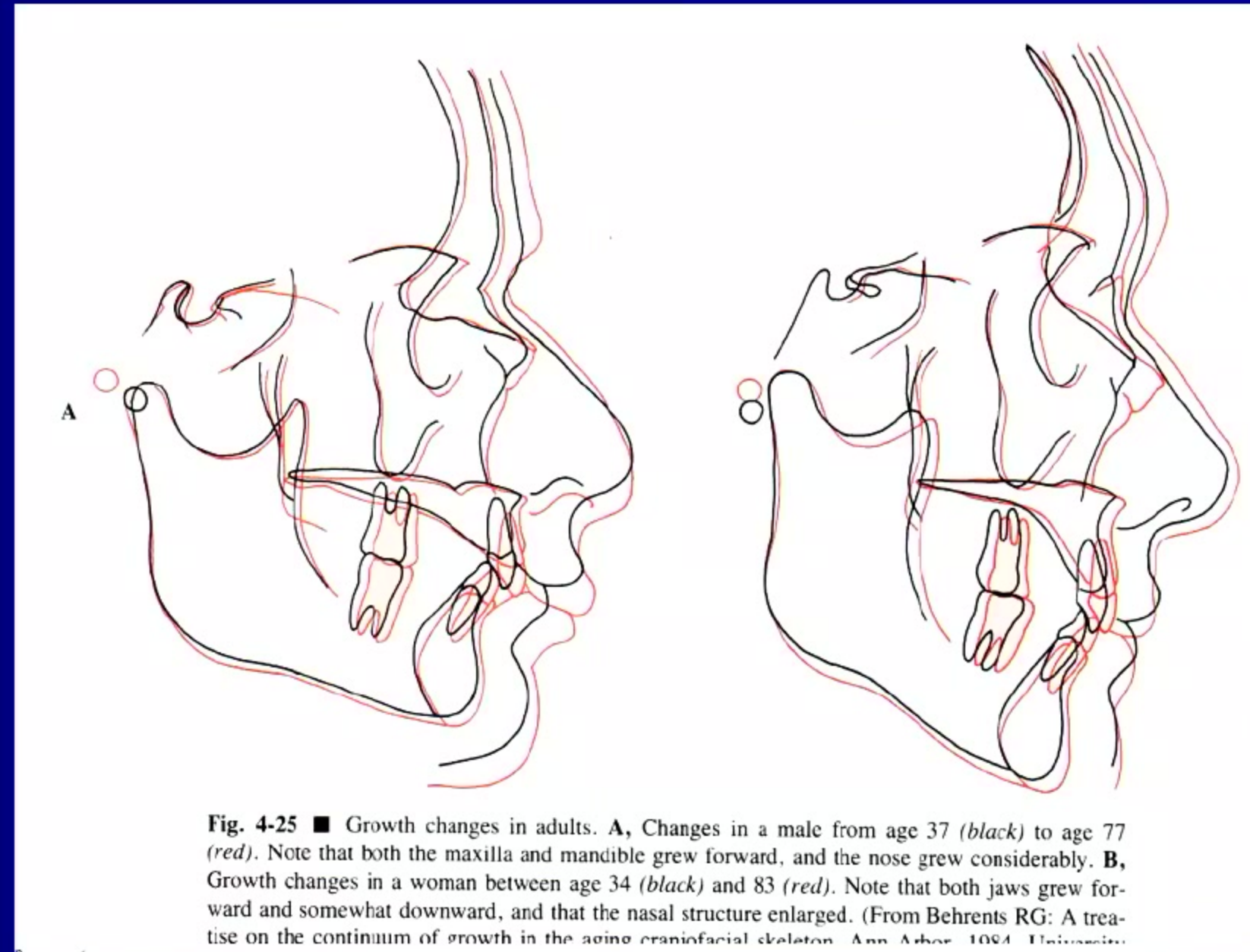
# Developmental Changes

1. Maxilla grows down and forward
2. Resorption of labial bone over maxillary anterior teeth



# Developmental Changes

## 3. Teeth extrude and upright







- Infraocclusion → shorter incisally + long apically
- Blue colouring of labial gingiva
- Collapse of labial soft tissue coverage
- Recession exposing abutment / implant
- Lack of papilla especially D
- Protrusion relative to natural teeth

# Results

In anterior maxilla of a young adult, risk unpredictable+unaesthetic side effects in LT due to ankylotic unit.

Thilander Eur J Orthod 2001;23:715-

Jemt CID+RR 2005;7:200-

**Koch et al 1996**

**Consensus conference on oral implants in young patients**

- Mandible 5-6yo
- Maxilla
  - A fixed chronological age cannot be recommended
  - Use pros that won't affect growth
  - When growth is complete
  - Can't predict when, can tell when
    - Longitudinal body height measurement
    - Hand-wrist radiograph
    - Serial (12mo) cephs

- Tx of choice is the least invasive option that satisfies the aesthetic and functional objectives
- Think lifelong

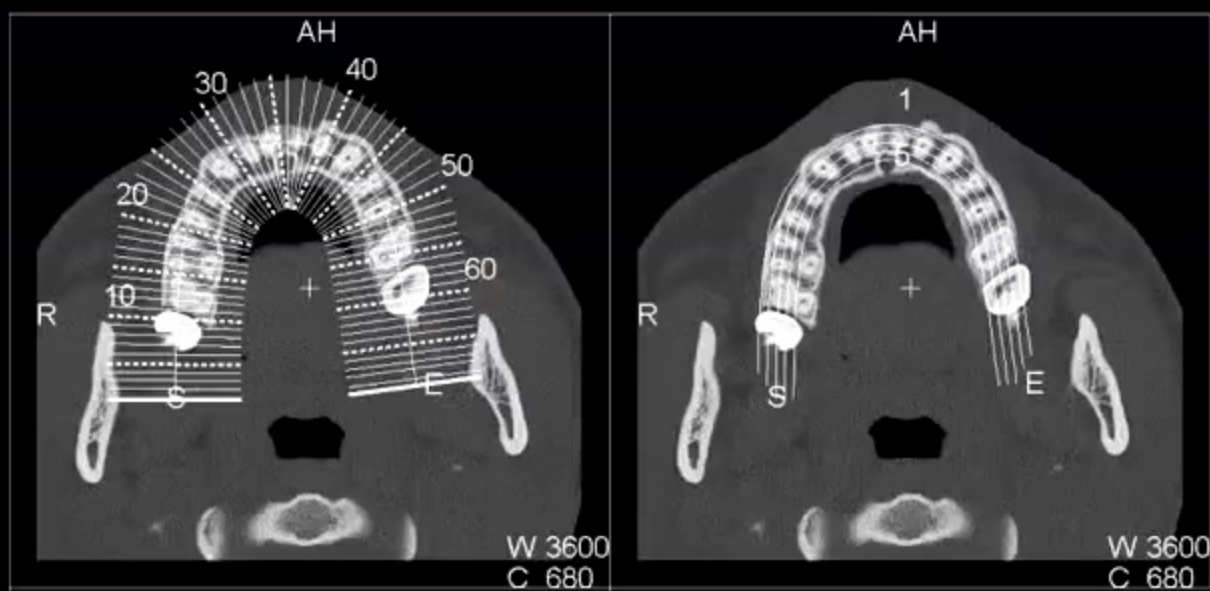




CT MAXILLA  
Se: 07/06/2023 8:35:16 AM  
Se: CT #602  
Im: 1/3

A

20Yj



R

Data acquired on 7/06/2023 8:31:55 AM at Envision Medical Imaging.

Input Images: Number / Slice Thickness [mm] : 160 / 0.40

Reconstruction Increment [mm] / Kernel : n.a. / Ur69u

Panorama: Distance / Slice Thickness [mm] : 2.0 / 3.00

Paraxial: Orientation / Length / Distance / Slice thickness [mm] : orthogonal / 30.0 / 2.0 / 1.00



|                | RBB | IMPLANT |
|----------------|-----|---------|
| Prognosis      |     |         |
| Aesthetics     |     |         |
| Procedures     |     |         |
| Treatment time |     |         |
| Cost           |     |         |
| Growth         |     |         |
| What next?     |     |         |
|                |     |         |

# The three levels of surgical wisdom

- Good surgeon - how to operate
- Better surgeon – when to operate
- Best surgeon – when not to operate

## 3 Ways To Replace Teeth

- (No treatment)
- (Space Closure)
- (Autotransplant)
- Removable
- Implant
- Bridgework – Tooth supported (RBB)

# RBB

## ■ Treatment of choice in some situations

- lower incisors
- maxillary laterals
- occasionally other teeth with risk

## ■ Posterior RBBs

- low success
- aesthetic problem in mandible

## ■ Assessment of tooth substrate

- Need Enamel to bond and seal

# Alloy Choice=Non Precious

## ■ What does this mean

- Ni-Cr
- CrCo
- NP<sub>2</sub> non Be
- Rexillum=Be containing Ni-Cr

## ■ Properties

- Rigid→RBB good
- Less accurate to cast / polishing challenging
- Grey oxide layer=bonding
- Ni Sens possible

# Surface Treatment

- Air abrade (Sandblast) 50  $\mu\text{m}$   $\text{Al}_2\text{O}_3$  + ultrasonic

- Roughens
- Inc. SA
- Cleans
- Improves wetting

- History

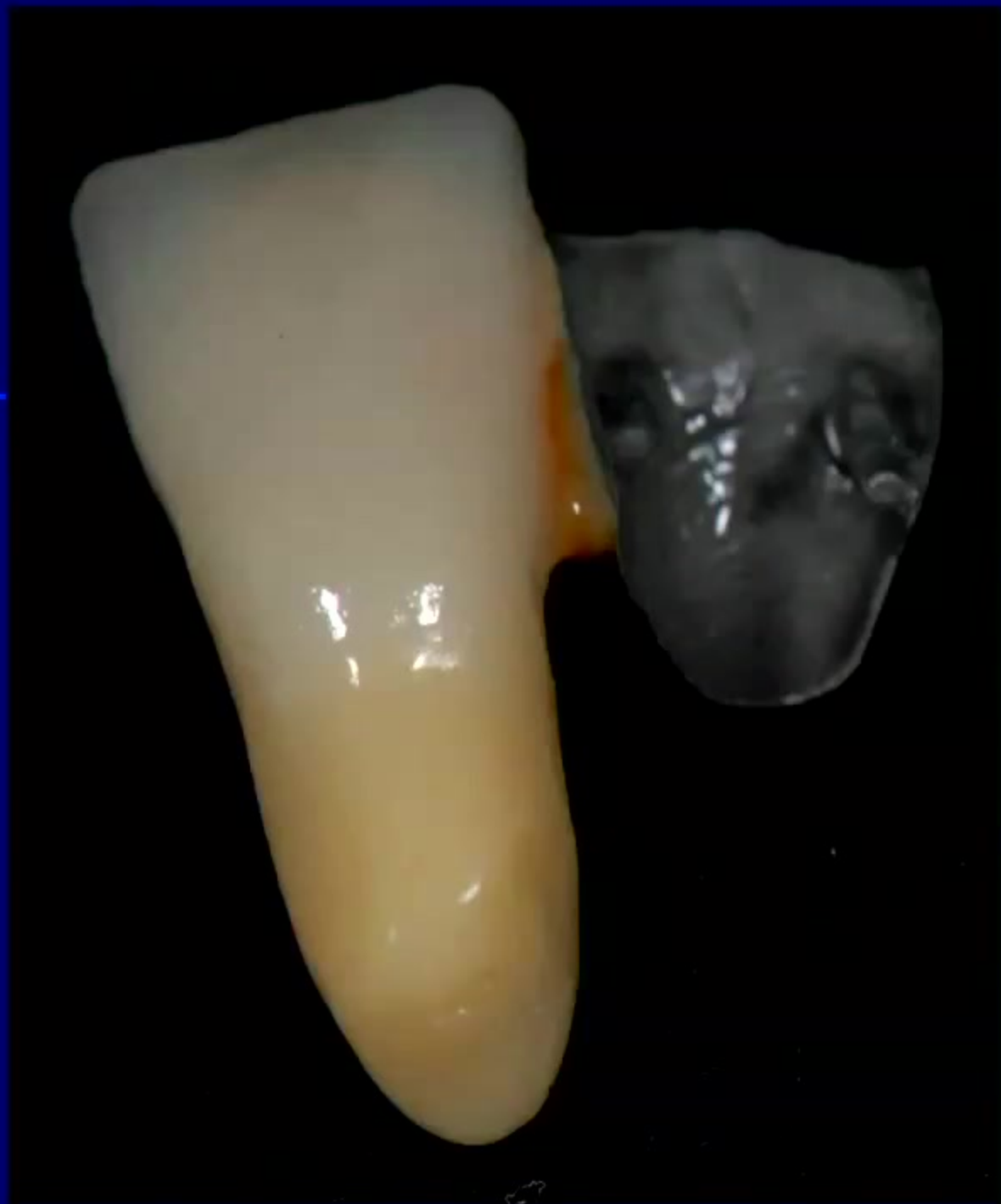
- Rochette  $\rightarrow$  macromechanical
- Electrolytic etch  $\rightarrow$  micromechanical
- Silanation/silicoating via Silcoater or Rocatec  $\rightarrow$  chemical bond to alloy
  - 0.5 micron layer of  $\text{SiO}_x\text{-C}$  (hybrid silica) added (this is already in porcelain)
  - Then silane coupling agent
  - Then unfilled resin

# Resin Cement=Panavia

- Silanated quartz
- Methacrylate resins (not BISGMA)
- MDP
  - Phosphate ester / adhesive functional monomer
  - Chemical bond via metal oxide









# Always Opaque Panavia

- Avoid grey show through
- Can try in with opaque paste (no catalyst)





# Resultant Metal-Resin-Enamel Complex

- Overall Strong bond=40MPa

- Components

|                 |          |                                        |
|-----------------|----------|----------------------------------------|
| – Tooth-tooth:  | Cohesive |                                        |
| – Tooth-resin:  | Adhesive | Weak                                   |
| – Resin-resin : | Cohesive | Weakest**failure is cohesive           |
| – Resin-metal:  | Adhesive | Stronger**high bond (2-3x tooth-resin) |
| – Metal-metal:  | Cohesive |                                        |

- No need to improve on resin-metal interface
- Need to improve TS of cement

\*\*\*THIS IS THE REASON FOR TOOTH PREPARATION\*\*  
WANT R+R TO DECREASE TENSILE F ON RESIN

# Preparation

- **Precise mesial and distal grooves**
  - Mechanical retention
  - Decrease tensile forces on resin cement
- **Retraction**
  - Often electrosurge
  - 2 cords

# Resultant Metal-Resin-Enamel Complex

- Overall Strong bond=40MPa

- Components

|                 |          |                                        |
|-----------------|----------|----------------------------------------|
| – Tooth-tooth:  | Cohesive |                                        |
| – Tooth-resin:  | Adhesive | Weak                                   |
| – Resin-resin : | Cohesive | Weakest**failure is cohesive           |
| – Resin-metal:  | Adhesive | Stronger**high bond (2-3x tooth-resin) |
| – Metal-metal:  | Cohesive |                                        |

- No need to improve on resin-metal interface
- Need to improve TS of cement

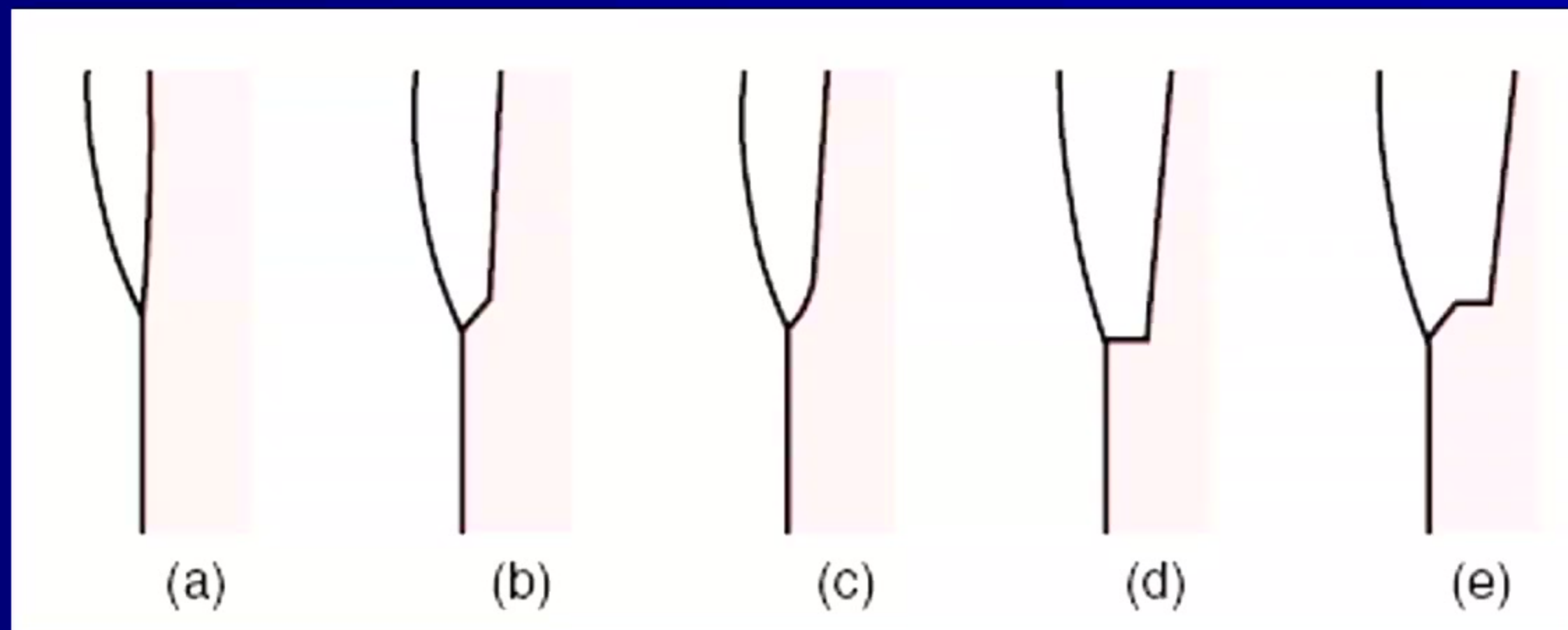
\*\*\*THIS IS THE REASON FOR TOOTH PREPARATION\*\*  
WANT R+R TO DECREASE TENSILE F ON RESIN

# Preparation

- **Precise mesial and distal grooves**
  - Mechanical retention
  - Decrease tensile forces on resin cement
- **Retraction**
  - Often electrosurge
  - 2 cords



# Margin configurations









<http://www.smiledesigncenter.com/docs/publications/publication-qdt.pdf>



[http://www.scribub.com/files/limba/engleza/health/177\\_poze/image040.jpg](http://www.scribub.com/files/limba/engleza/health/177_poze/image040.jpg)



# Bur

- Thin tapered fissure TC
- Sharp=NEW



- (Halas p 82 Section 7 Fig. H23L)
- TH 23L 314 010

# Provisional

- Provisional
  - Cavit grooves
  - RPD / Suspension bridge











## Cases

- Maxillary laterals
- Mandibular incisors
- Occasionally other teeth (with risk)
- Diastemas?
- Enamel
- Occlusion on pontic to be avoided
- Space for retainer
- Cantilever
  - may reduce stress on cement
  - certainly avoids caries when one side debonds
- Prepare tooth-low TS of cement
- Sand-blasted non-precious alloy
- Opaque Panavia

- Metal-ceramic (PFM)
- Etchable ceramic
- Non-etchable ceramic

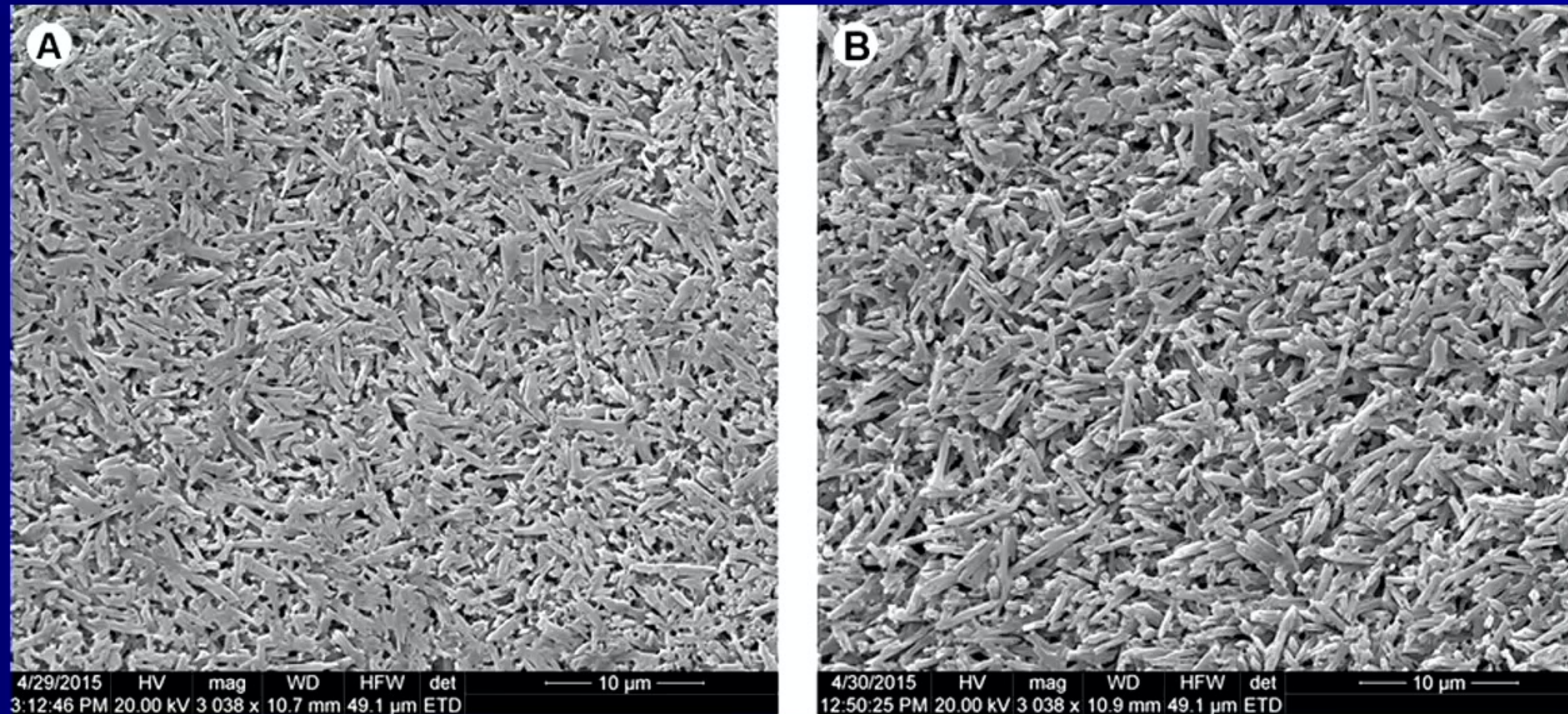
# Glass Ceramics

- Silica based
- HF selectively dissolves glass
- Silane
- etc

# Lithium disilicate ceramic

Pre-etch

HF etch















# Li Disilicate Indications

- Veneers ( $\geq 0.3$  mm)
- Inlays and onlays
- Occlusal veneers, partial crowns
- Minimally invasive crowns ( $\geq 1$  mm)
- Implant superstructures
- Hybrid abutment solutions
- Three-unit bridges up to the second premolar as the terminal abutment

[https://www.ivoclar.com/en\\_us/products/metal-free-ceramics/ips-e.max-lithium-disilicate](https://www.ivoclar.com/en_us/products/metal-free-ceramics/ips-e.max-lithium-disilicate)



# Li Disilicate Indications

- Veneers ( $\geq 0.3$  mm)
- Inlays and onlays
- Occlusal veneers, partial crowns
- Minimally invasive crowns ( $\geq 1$  mm)
- Implant superstructures
- Hybrid abutment solutions
- Three-unit bridges up to the second premolar as the terminal abutment

[https://www.ivoclar.com/en\\_us/products/metal-free-ceramics/ips-e.max-lithium-disilicate](https://www.ivoclar.com/en_us/products/metal-free-ceramics/ips-e.max-lithium-disilicate)

# Li Disilicate Indications

- Not indicated for RBB due to connector fracture risk
- But if connector size...bulky
  - 3mm vertical
  - 2mm horizontal



- Metal-ceramic (PFM)
- Etchable ceramic
- Non-etchable ceramic

# Zirconium oxide

- Can't etch non-silica based ceramic
- No glass! (HF dissolves glass)
- Try
  - Silica coat
  - “Hot bond” etchable glass
  - ACP

# Zirconium oxide (Y-TZP)

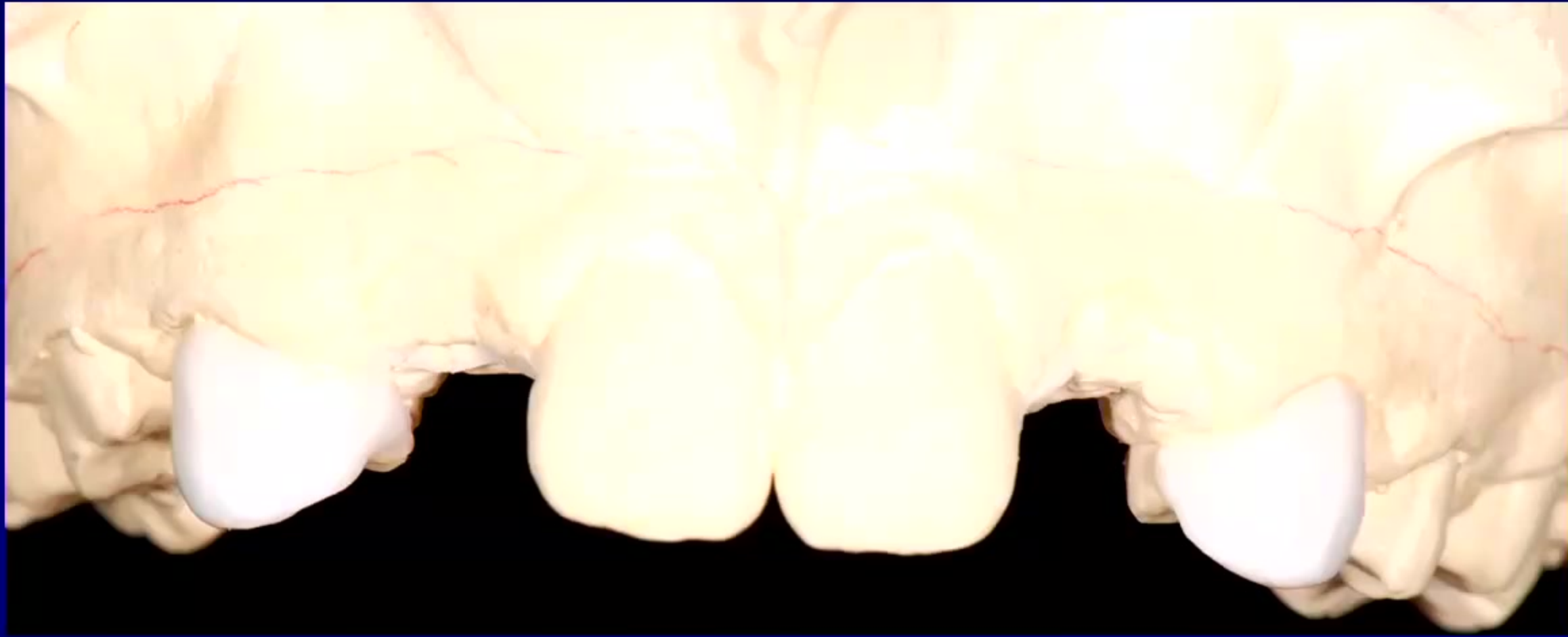
## ■ APC concept

- Blatz et al Compendium 37(2016);9:611-
- A=Air-particle abrasion aluminum oxide (50um 1-2 bar)
- P=Zirconia primer (MDP)
- C=Composite resin

- Adhesive phosphate monomer=MDP can be in the primer or adhesive
- Eg. Panavia 21 (MDP)

- Rocatec plus **50 micron** particles (Silica coated alumina) under pressure of 2 bar
- Use of phosphate containing primer, ideally Clearfil ceramic primer (higher MDP content compared to rest of the product) if not Monobond plus
- Panavia



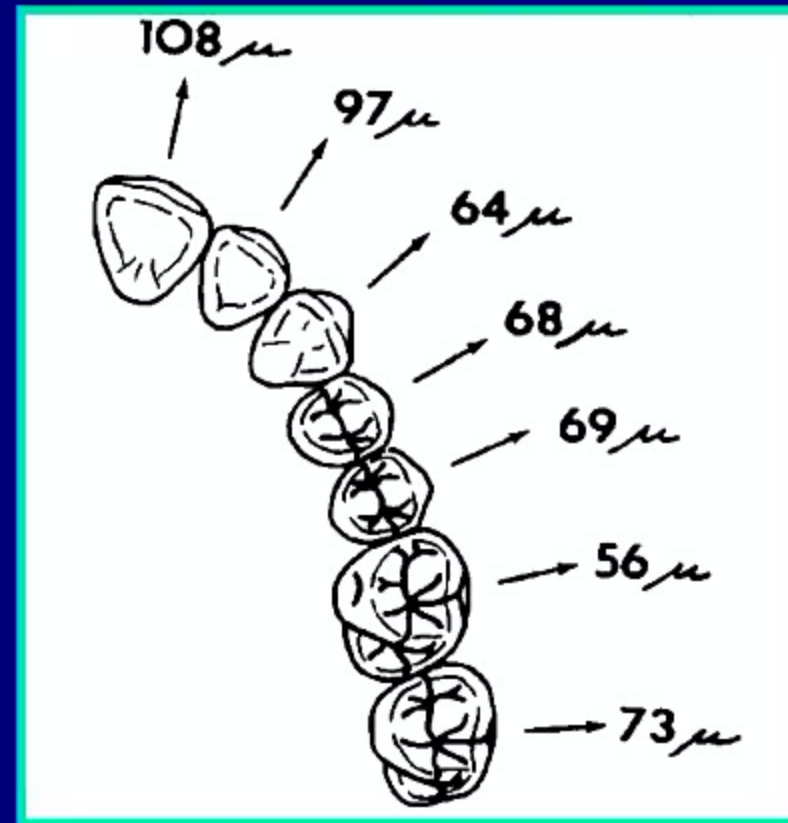




# Zirconium oxide (Y-TZP)

- *Kern et al J of Dent 65(2017):51-*
- Ten-year outcome of zirconia ceramic cantilever RBB's
- 108 bridges in 87 pts
- Mean observation 92mo=7.6 yrs
- 8 bridges lost to follow up
- 6 debonded (but were recemented)
- no connector failures
- Conclude "10 year survival rate of 98.2%"
- Attn to:
  - 30mm<sup>2</sup> SA, sound E
  - 0.7mm retainer (occ needs to allow)
  - 3mm high x 2mm wide min connector
  - air abraded with alumina-->cleaned alcohol
  - Panavia 21 etc

# Cantilevered



- Mesial cantilever  $\rightarrow$  tip out of occlusion

## ■ Assessment of occlusion

- contact in MIP but no excursive contacts
- retainer space to be gained (cut teeth) or is available
- Engineer to situation
  - Bruxers also need tooth replacements!
  - Class II div II also need tooth replacements!
  - Research often challenges dogma

- Berekally 1993 ADJ Adelaide, Australia

- 2 abutments+/-prep
- Extremely high failure rates implies technique sensitive NOT that they do not work
- Survival ~60% at 5 years, many debonded VERY early



27 yo RBB placed at 29yo

- Probster 1997 IJP Mainz, Germany

- 2 abutments+/-prep

- Survival      76% at 5 years  
60% at 10 years

## ■ Gerry Barrack 1993 IJP NYU, USA

- authors resin-bonded cast restorations from private practice
  - 11 year prospective
  - 127 restorations, 455 units(ranging 1-10 units)
  - Success=no debond
  - 92.9% over 11 years but 100% in latter 9 years(since 1983)
    - No failures since 1983 when adopted:
      - Grooves+rests+incorporating existing restorations
      - Panavia
      - Non-precious alloy sandblasted
- Barrack, Bretz IJP 1993;6(5):428-