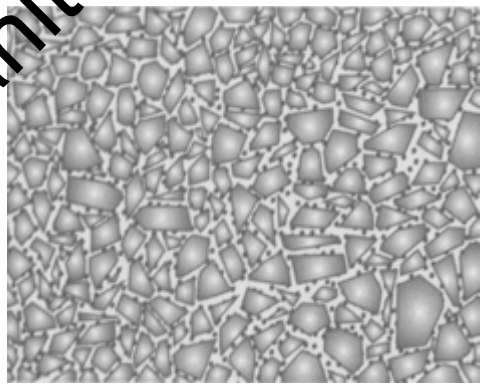
Composite
RESTORATIONS

Structure

- **Resin composite composed of five components**:
- 1. Soft organic polymer matrix (continuous phase)
- 2. Hard inorganic filler particles (dispersed phase)
- - Various sizes, shapes
- - Glass, quartz or silica
- 3. Coupling agent:
- - Bonds filler particles to the matrix
- 4. Initiator-accelerator system.
- 5. Optical Modifiers/Pigments:
- Provides opacity or translucency to make composites similar to natural tooth

Type of composites

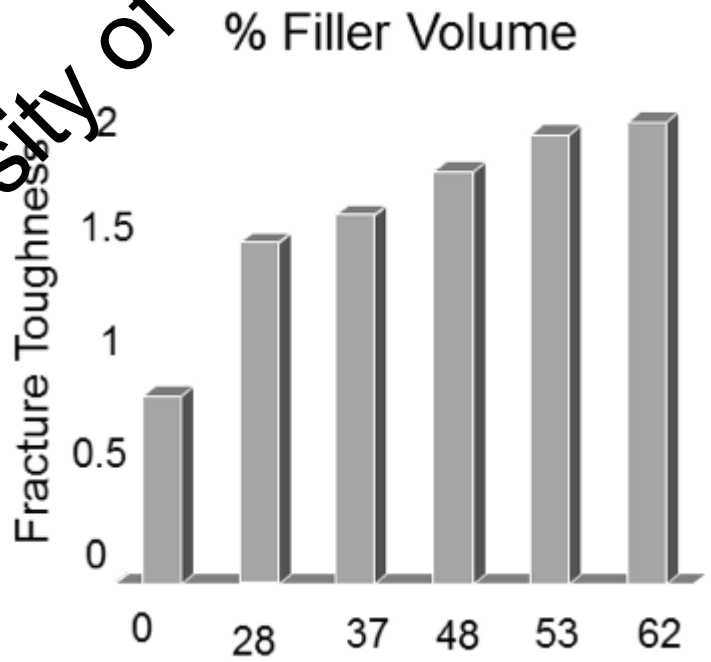
- Micro-filled Composites (1970's)
- – improved finishing,
- – more shrinkage, and
- – poor abrasion resistance
- • Hybrid Composites (1980's)
- – variable particle size
- – the basis for the current generation of composite resins
- • Flowable Composites
- - Microhybrid
- - Nanohybrid Composites
- - Nanofill Composites



Filler Particles

- Increase fillers,
- increase mechanical
- properties
- – strength
- – abrasion resistance
- – esthetics
- – handling
- • 35 to 71% by volume

- Ferracane, *J Dent Res* 1995



Types of Lights

- **Halogen** – Blue light ~470nm wavelength.
- • Heat generated – needs fan.
- **Plasma Arc** (PAC)
- **Laser**
- **LED** - Overcome problems with other lights
- • Most popular
- -High intensity lights- reduce curing time(?)
- -Some issues

Lights

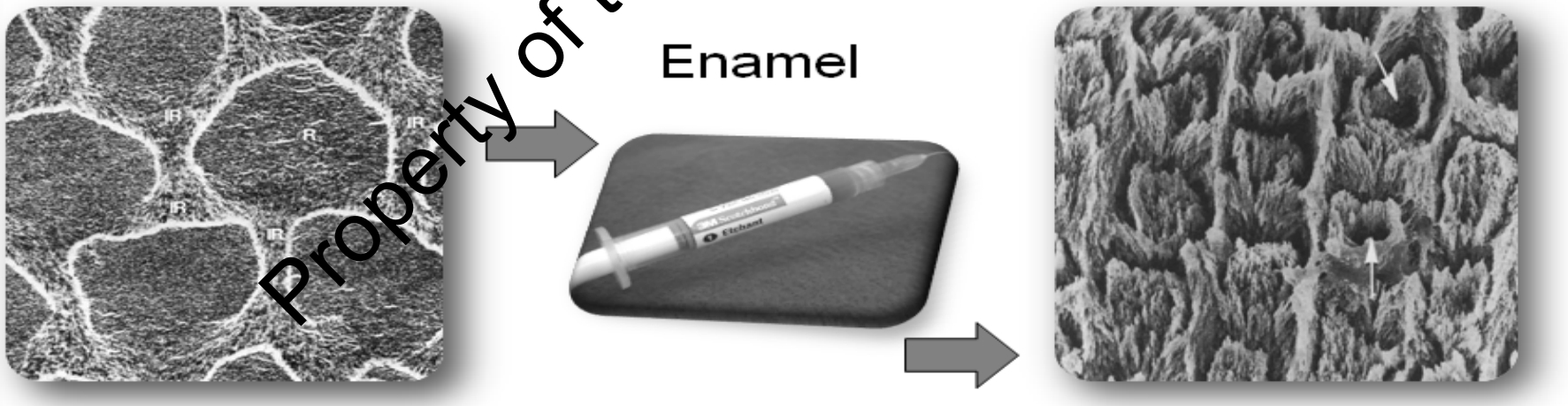
Polymerization Shrinkage

- • Significant role in restoration failure:
- – Shrinkage can cause stress fractures in enamel
- “white line”
- – Gap formation:
- • Secondary caries formation
- • Marginal leakage
- • Post-operative sensitivity
- • Counteract:
- – Lower shrinkage composites

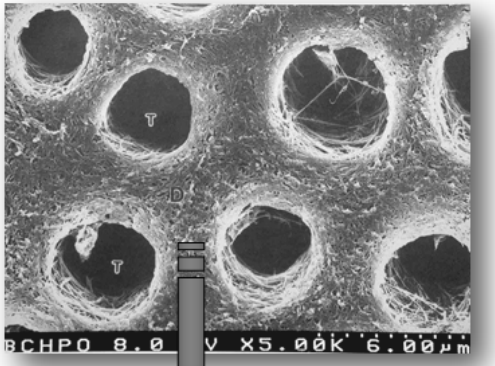
Tooth Etch Technique

- • Purpose :– To create micro-porosities on tooth surface

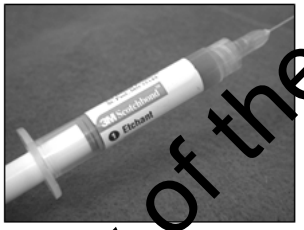
(enamel and dentin) to facilitate the attachment of a restoration to the tooth surface (bonding)

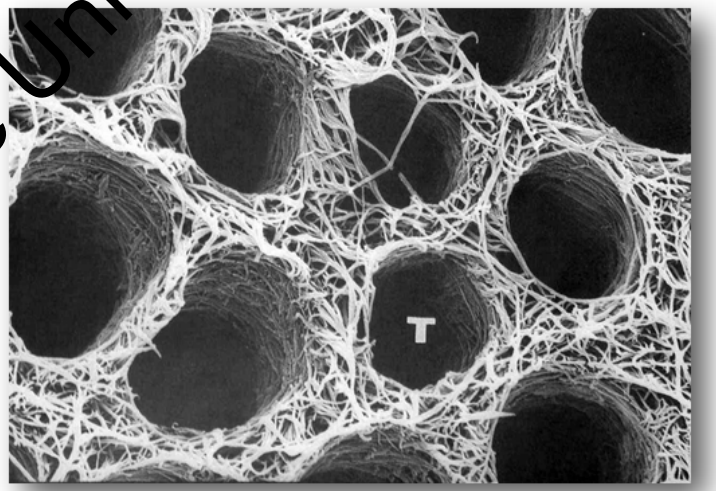


Etching



Dentin – etch removes the "smear layer" and demineralizes the surface of the dentin leaving a network of collagen fibers.



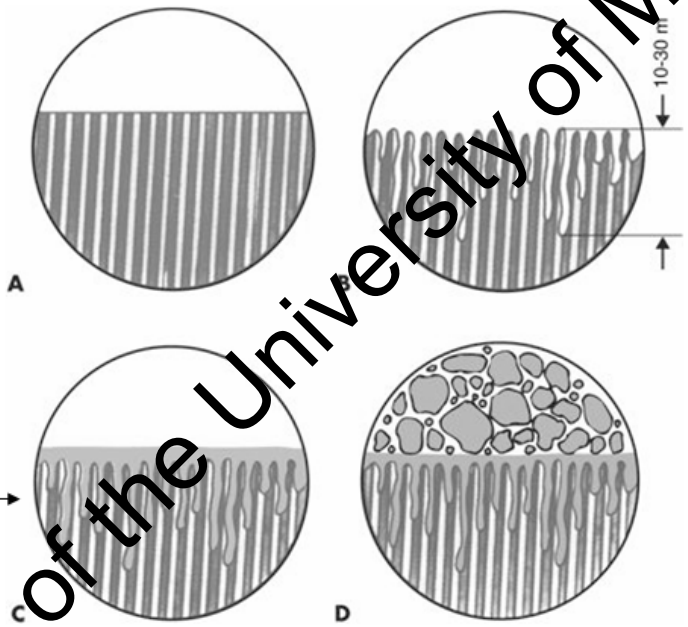


Mechanism of Bonding

- Attachment of bonding resin to etched tooth structure is mechanical in nature & is described as *micromechanical*
- Attachment of composite resin to bonding resin is *chemical* & results from continuation of the polymerization process

A. Unetched enamel

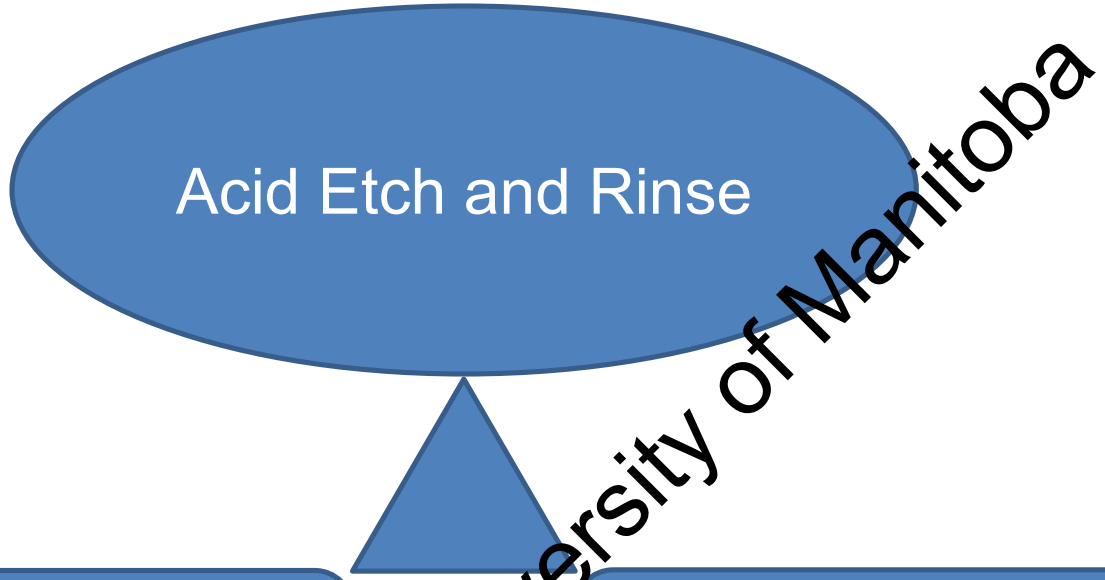
B. Etched enamel



"Resin Tags" →

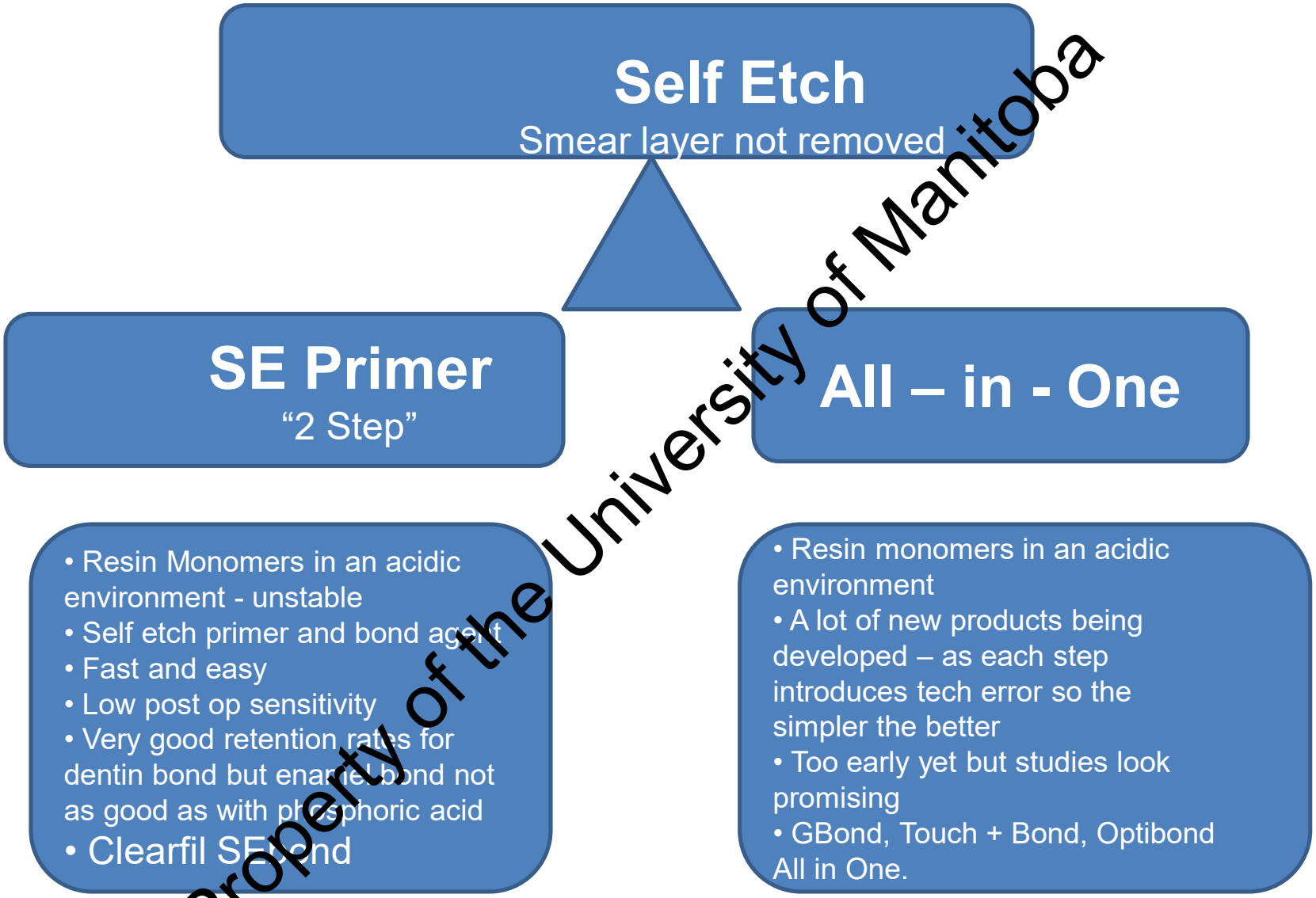
C. Bonding Agent flows into the etched enamel surface creating a *micromechanical* bond

D. Composite resin *chemically* bonds to the bonding agent



- Gold standard –
- Excellent bond/retention rates
- However, multiple steps:
- Potential for errors
- Optibond All bond2

- Dentin bond not as good as 3 step
- Generally requires moist dentin:
- Can be difficult to achieve
- Prime+Bond NT, Optibond Solo Plus



Bonding to Tooth Structure

Current Options – Two Main Philosophies:

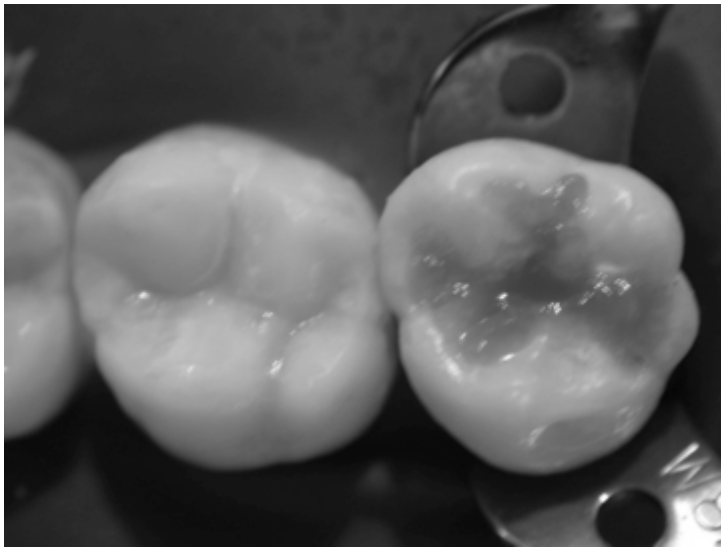
- **A. Etch and Rinse**
- 1. Three Step
- 2. One Bottle
- **B. Self etch**
- 1. SE Primer ("2 step")
- 2. "All-in-One"

Application of Acid Gel

- Application of acid gel to the area to be etched – all around periphery of preparation & extending 2mm beyond cavosurface margin.
- Apply etch to enamel first & then dentin.

Enamel 30 seconds

Dentin 10-15 seconds



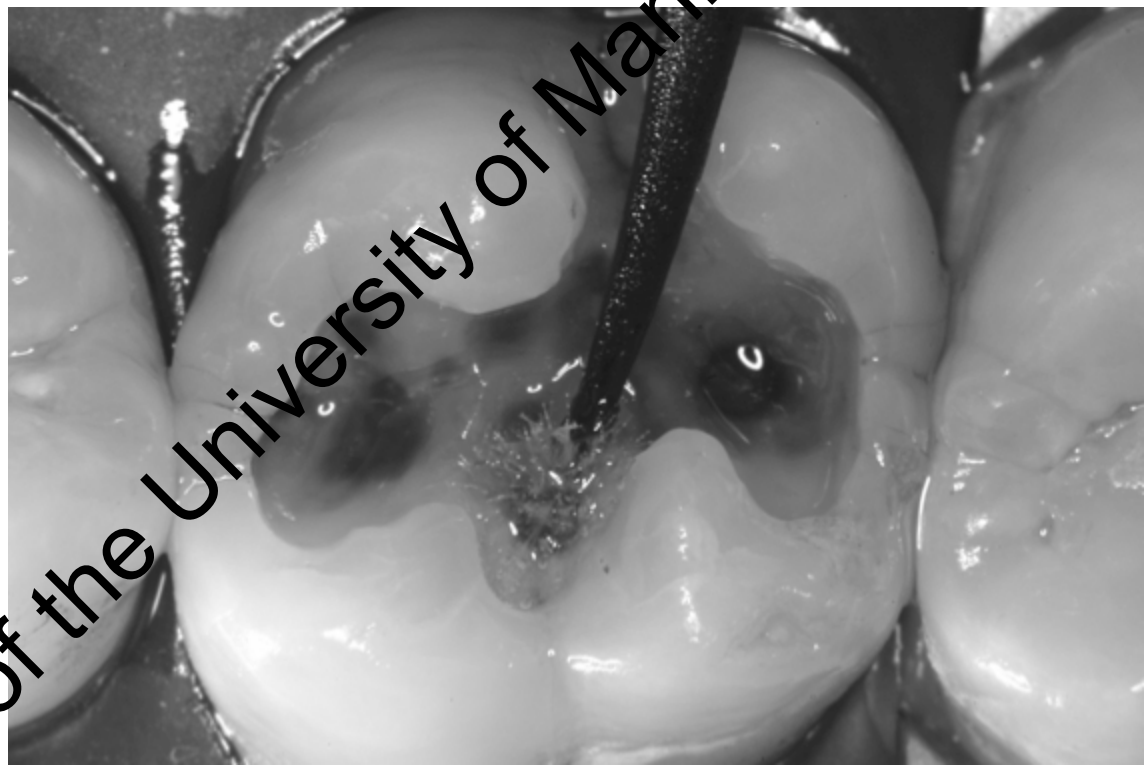
Rinsing Etch

- Wash gel & reaction products with copious amounts of water for 15 seconds
- After etching & washing is complete, tooth surface is gently air dried – clinically NB not to over dry the dentin

9

Bonding Technique

ROPERTO (images)



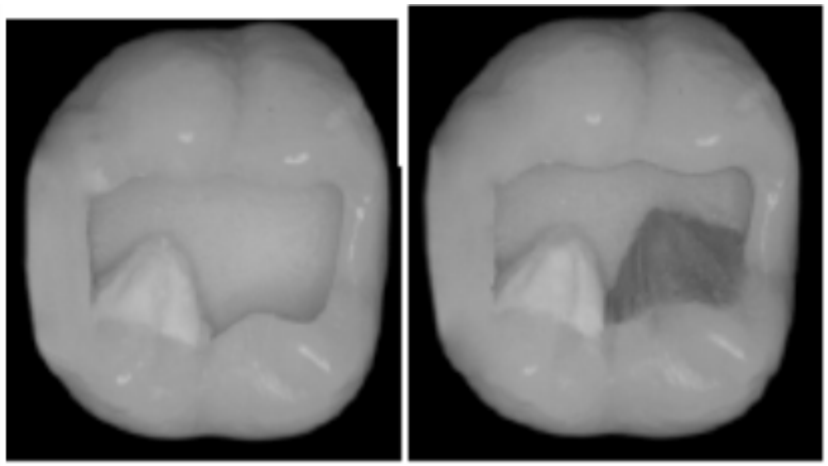
•• Bonding resin is applied & light cured

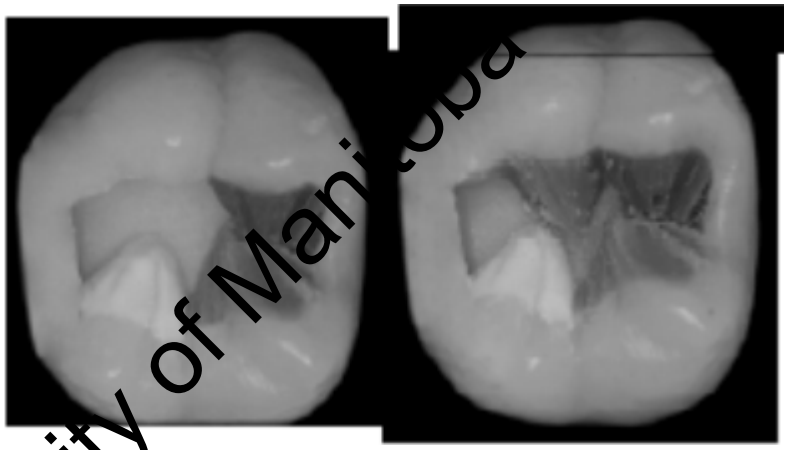
Thin layer of bond on all walls of preparation

• No pooling

• Want all dentin & enamel covered – should look shiny

CLASS I and II





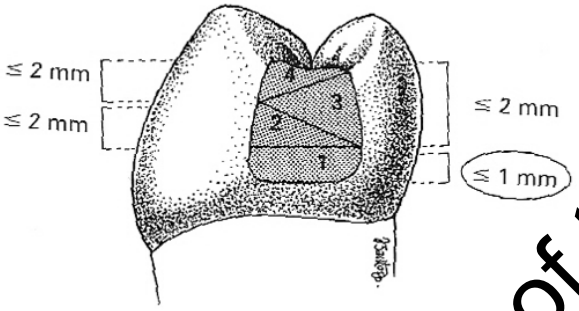
Incremental placement:

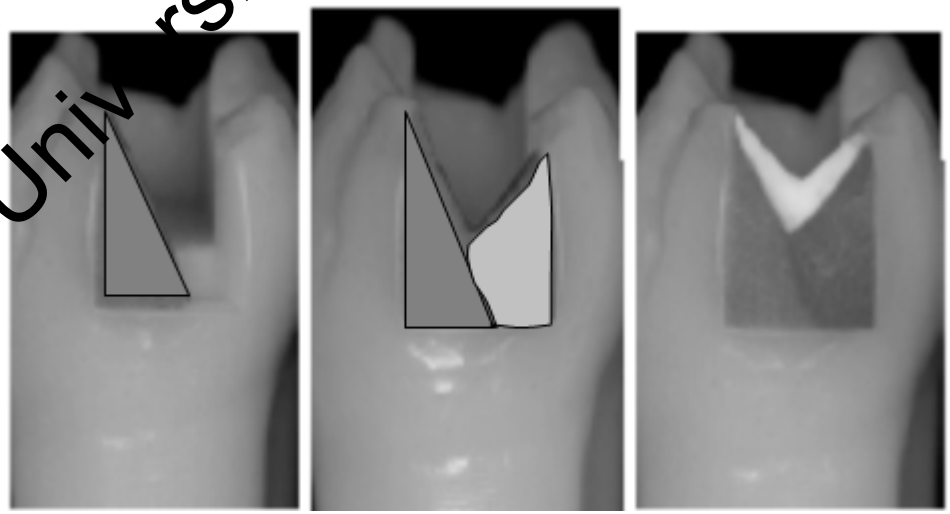
- Decreases stress from polymerization shrinkage
- Allows for full curing
- Decreases voids
- Allows for creation of functional anatomy

(Anusavice, Kenneth J. Anusavice. *Phillips' Science of Dental Materials, 11th Edition*. 2003:
Elsevier, 2003. 18.4.11). <vbk:0-7216-9387-3#outline(18.4.11)>th

Incremental placement of composite in proximal box of Class II

- Anusavice, Kenneth J. Anusavice. *Phillips' Science of Dental Materials, 11th Edition*. 2003:
- Elsevier, 2003. 18.4.11). <vbk:0-7216-9387-3#outline(18.4.11)>th

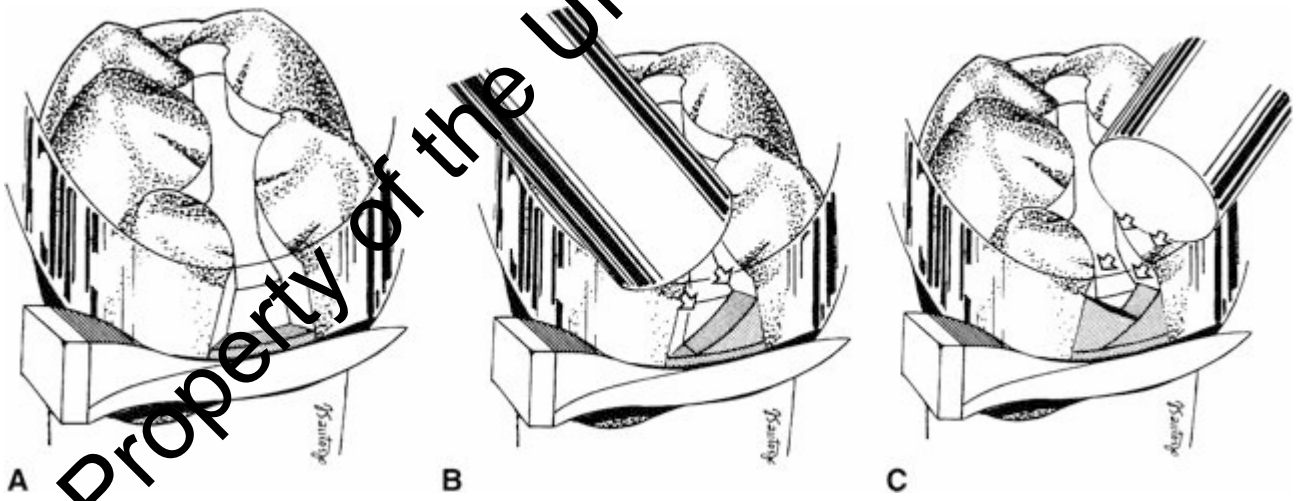




(Anusavice, Kenneth J. Anusavice. *Phillips' Science of Dental Materials, 11th Edition*. 2003: Elsevier, 2003. 18.4.11). <vbk:0-7216-9387-3#outline(18.4.11)>th

- Each increment of no more than 2mm is placed & cured for 20 seconds
- Light should be placed as close to composite as possible & at 90 degrees
- In areas where tip cannot get close to composite increment (i.e., proximal box) increase curing time
- Darker shades also need more curing time

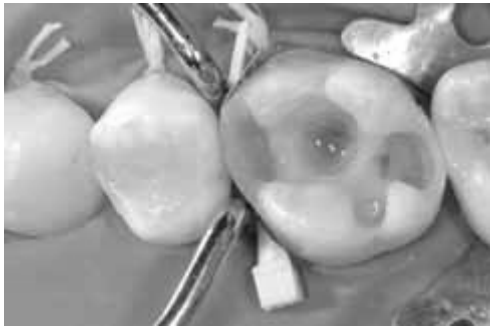
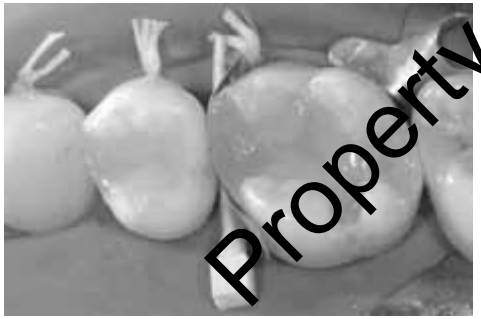
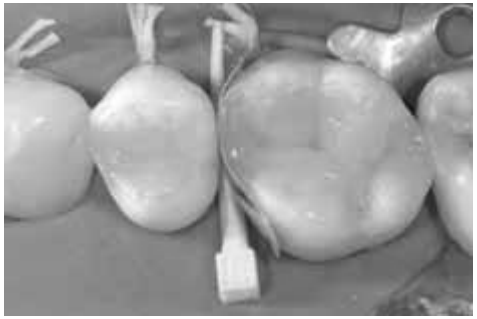
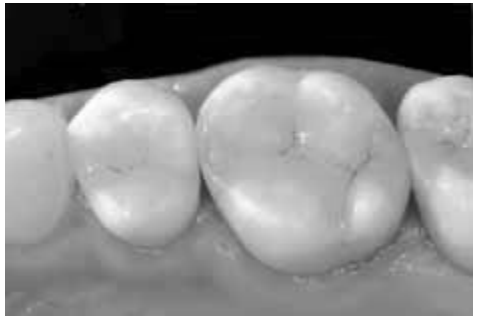
A. First incremental layer of resin composite (gray area) has been placed and cured.
B. Second increment being cured with a light source.
C. Third composite increment during curing.



Incremental filing of Class II preparation



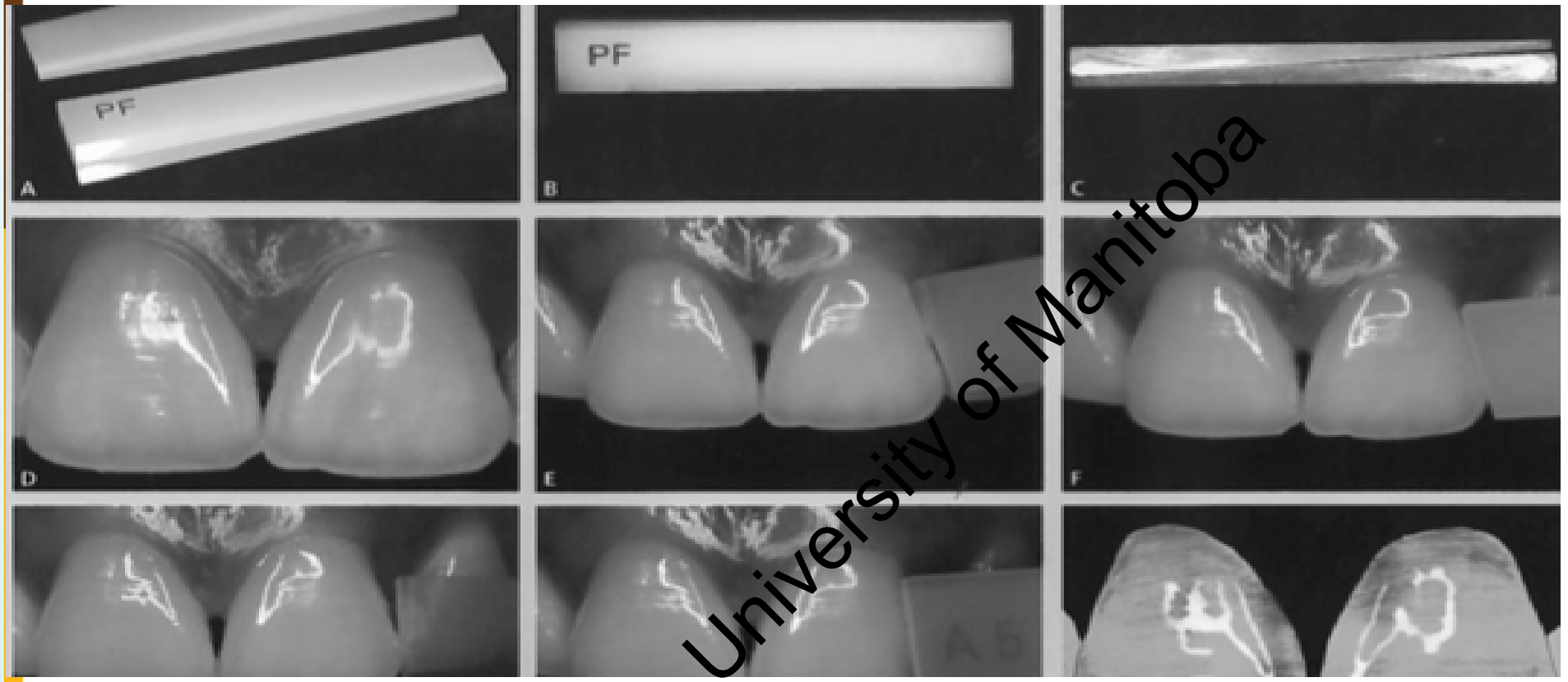


ANTERIOR COMPOSITES

Shade selection

http: //bit.ly/16f1jeC



•SHADE CHOICE:

Pre-requisites?

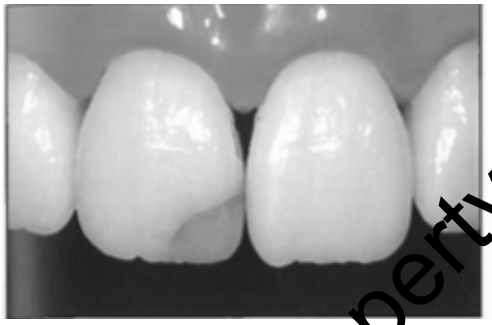
- Basic hues and saturation at thecervical region of the tooth
- Enamel central region and near proximal surface
- Blue effect near incisal edge and proximal surface
- Drawing of the teeth is fundamental

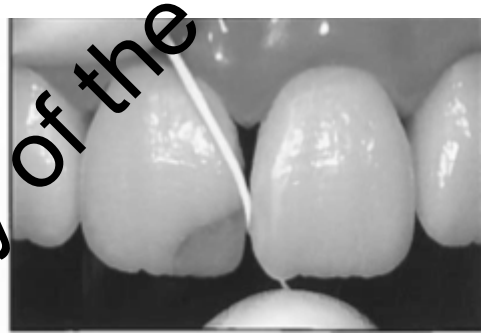
Baratieri, Araujo & Monteiro JR (2005). Composite restorations in anterior teeth: fundamentals and possibilities. Quintessence Publishing.

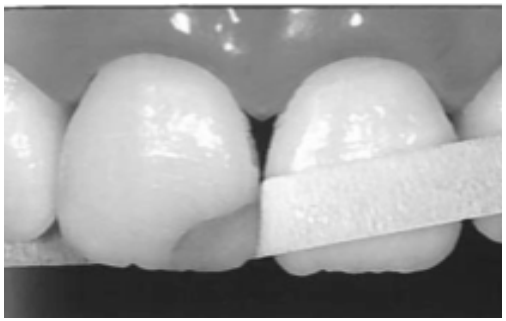
Absolute isolation in the anterior segment

- Assess pressure of regular contacts
- Assess proximal surfaces

Tight contacts or surface irregularities à Adjust with interproximal abrasive strips



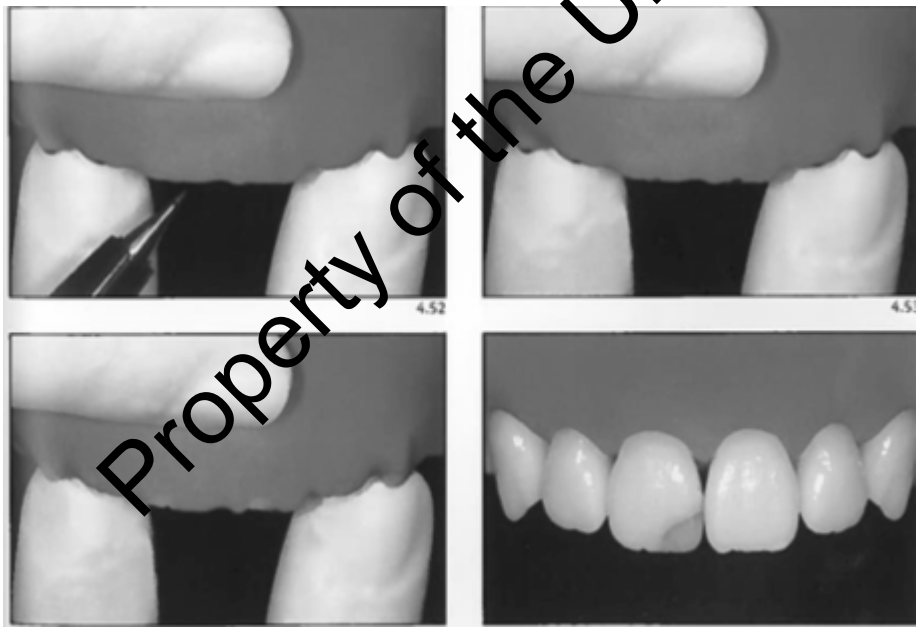




- Baratieri, Monteiro Jr, Melo et al., (2014). Routes for excellence in restorative
- dentistry

Absolute Isolation In The Anterior Segment

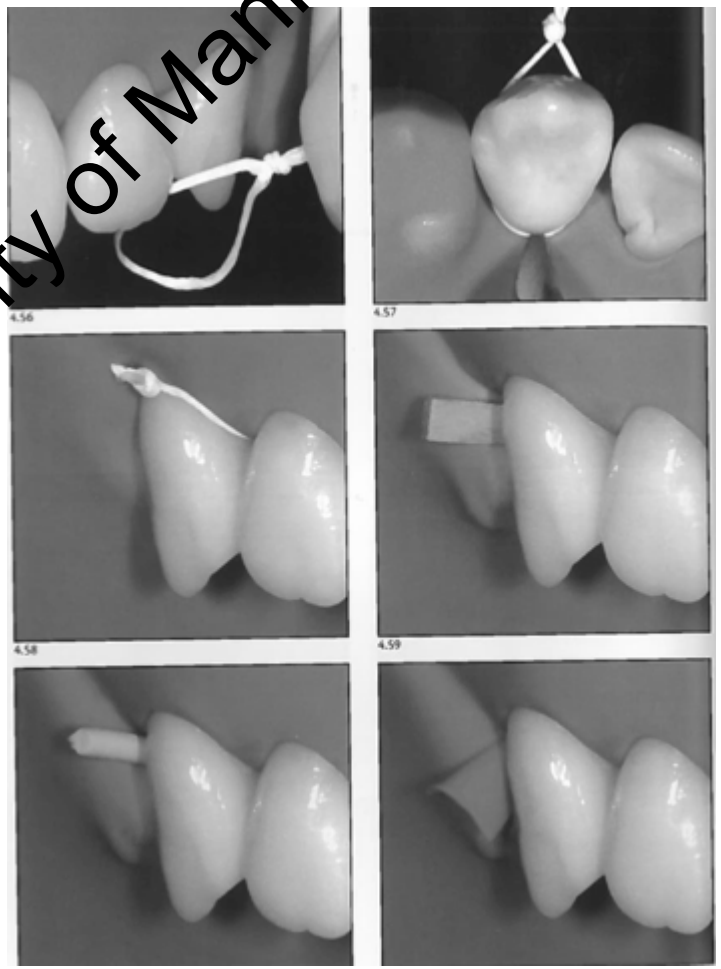
- Adapt RD to the frame and mark the positions planned for the punches with a felt tip pen.
- The sheet is perforated
- If not using clamps, the punches are both ends should be made with the smaller diameter of punch
- Baratieri, Monteiro Jr, Melo et al., (2014). Routes for excellence in restorative dentistry



Isolation in the anterior segment

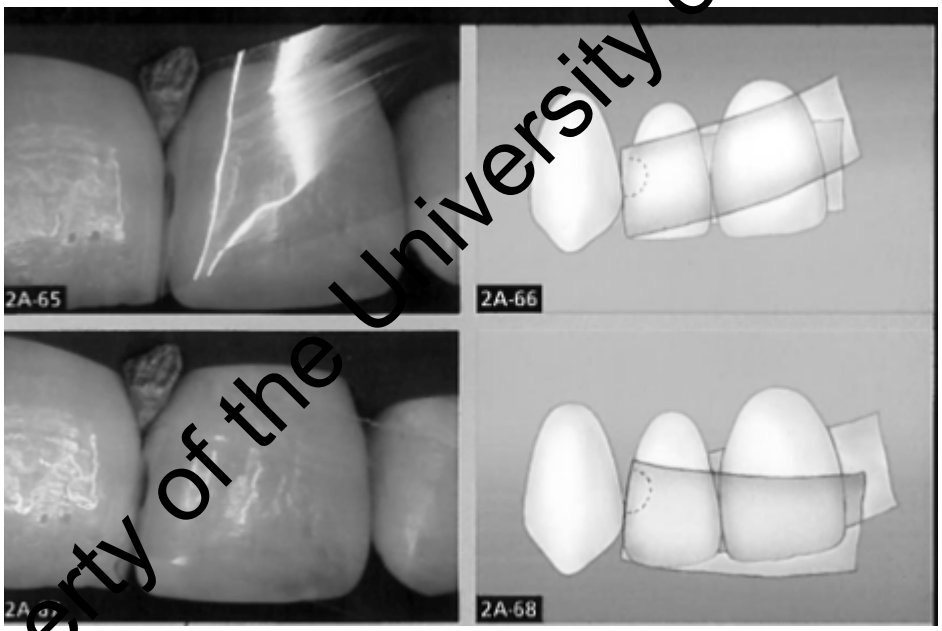
Position, invert RD in the Cervical

Stabilize sheet: loops of dental floss, wedge, RD piece



Correct matrix placement

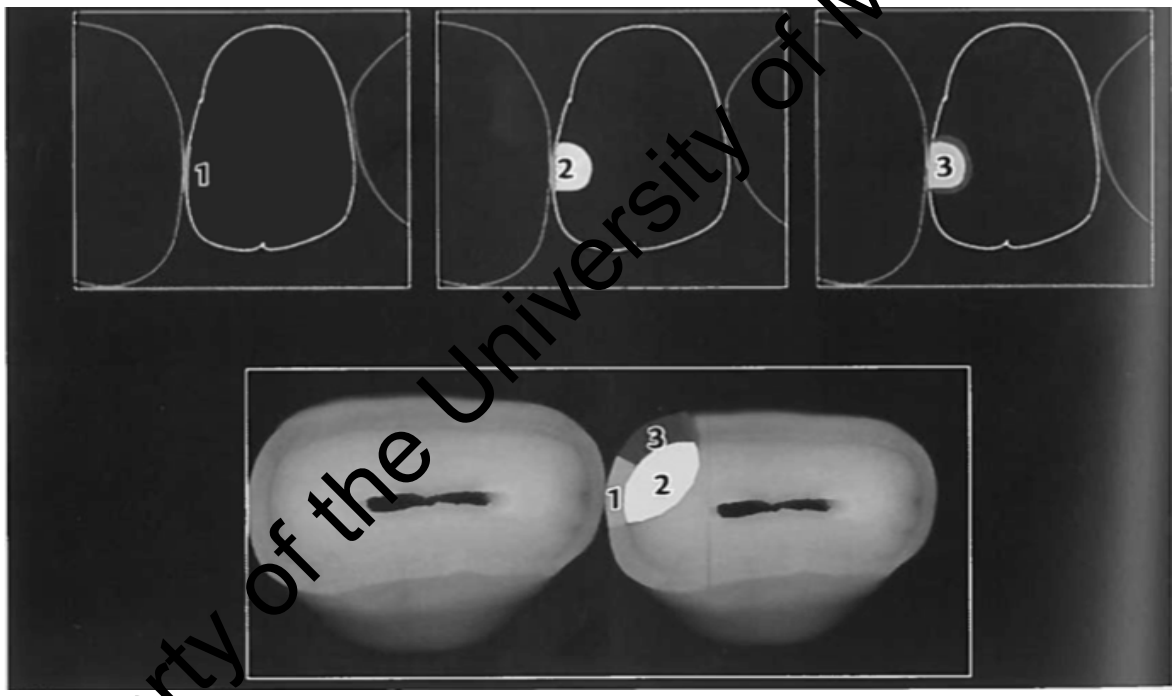
Traction of the matrix towards the incisor to bring the excess of restorative material in this area, where it will be easier to remove



- Baratieri, Araujo & Monteiro JR (2005). Composite restorations in anterior teeth: fundamentals and possibilities. Quintessence Publishing

Class III restoration technique

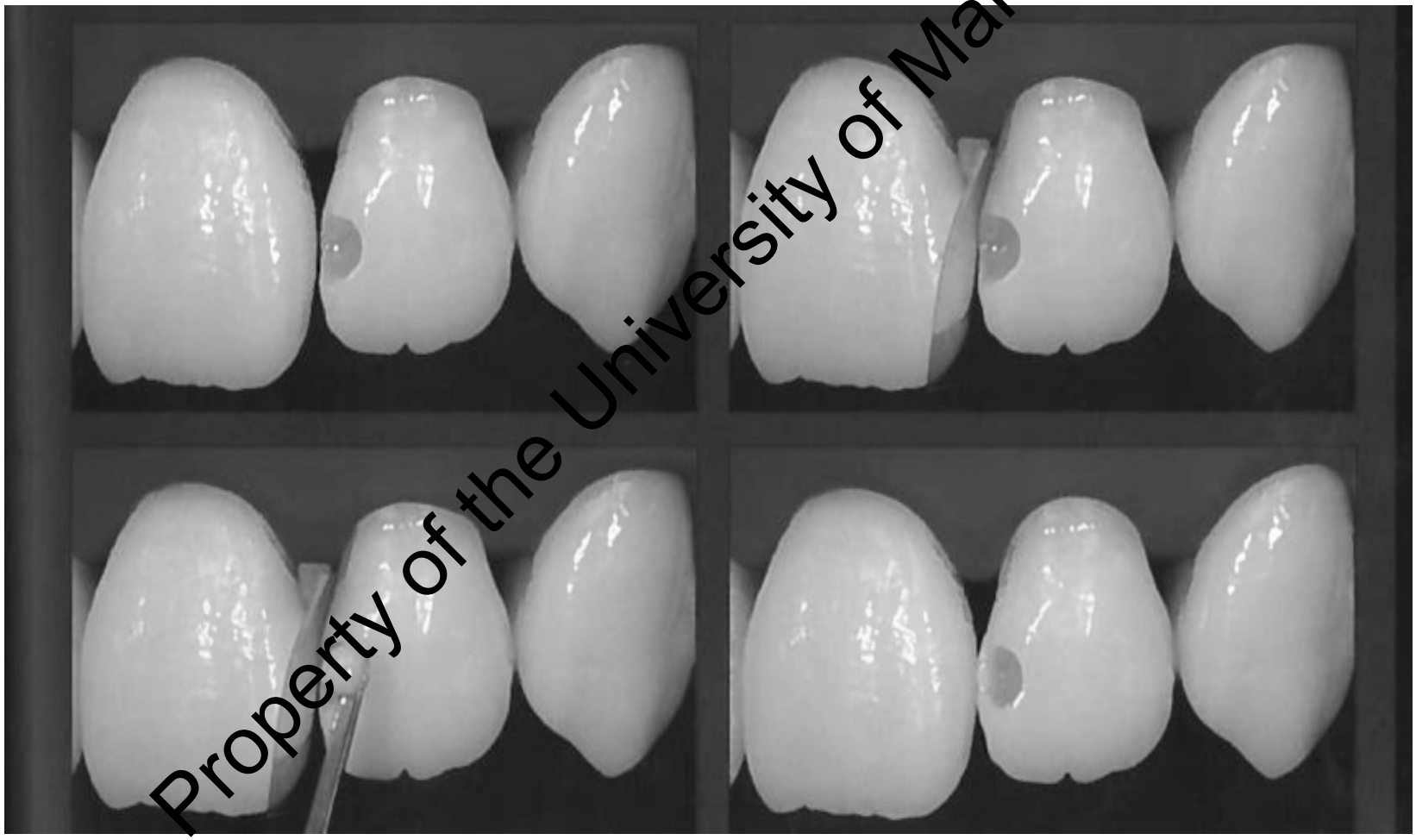
Increment sequence



Baratieri, Monteiro Jr, Melo et al. (2014) Routes for excellence in restorative dentistry

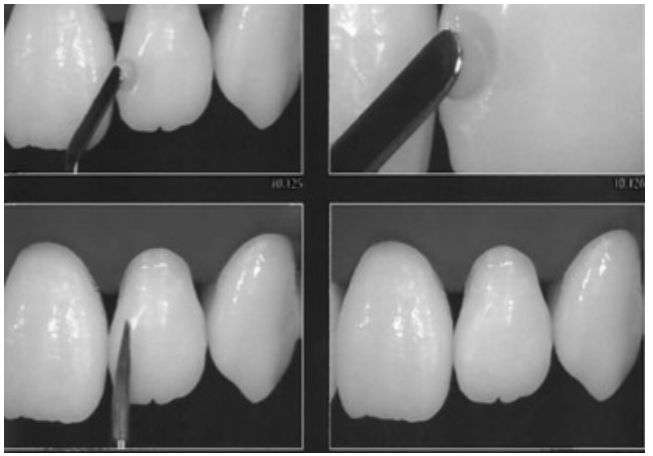
Class III restoration technique

1st increment:



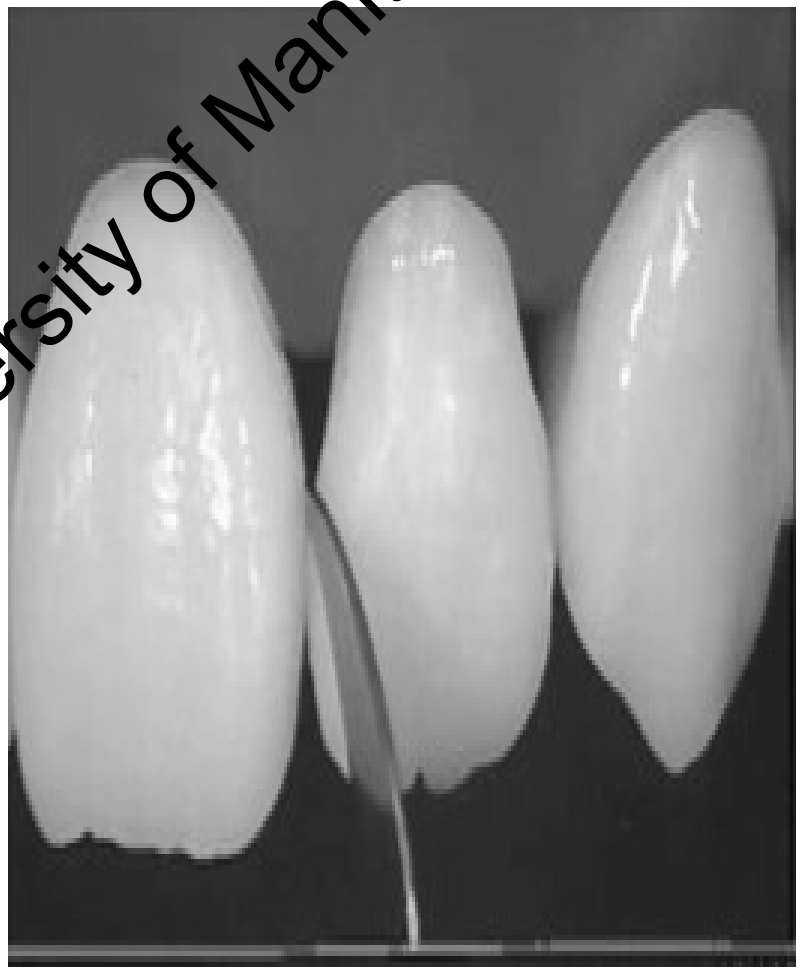
Class III restoration technique

- Subsequent increments:
- Dentin portion: less translucent and more saturated resin
- Last increment: mimics the optical characteristics of enamel (Spatulas and brushes)



Class III restoration technique

- Finishing and polishing
- Remove excess with #12 scalpel blade
- Abrasive strips: U versus S (see ppt #35)
- Flexible discs
- Polishing pastes

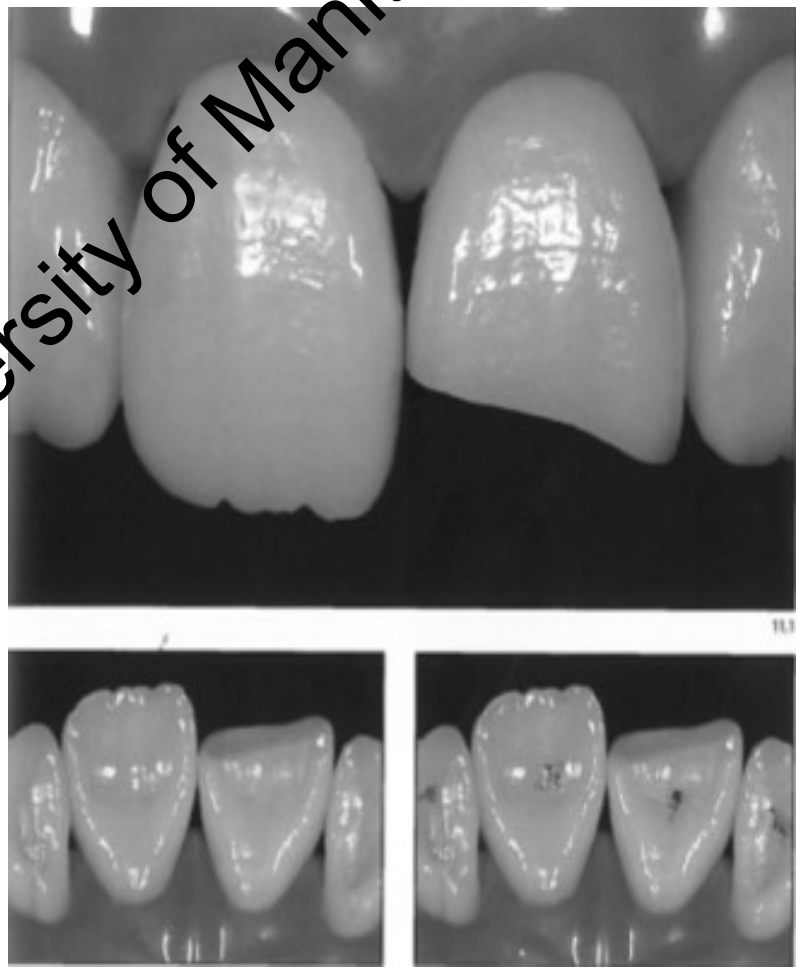


Class IV restoration technique

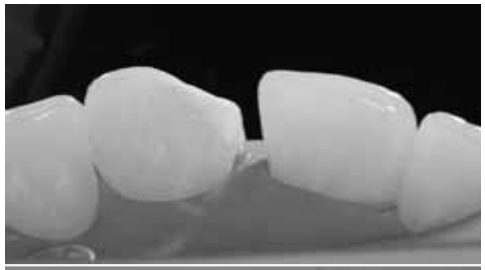
- BEFORE PLACING THE RUBBER DAM
- Check Occlusion
- Shade selection

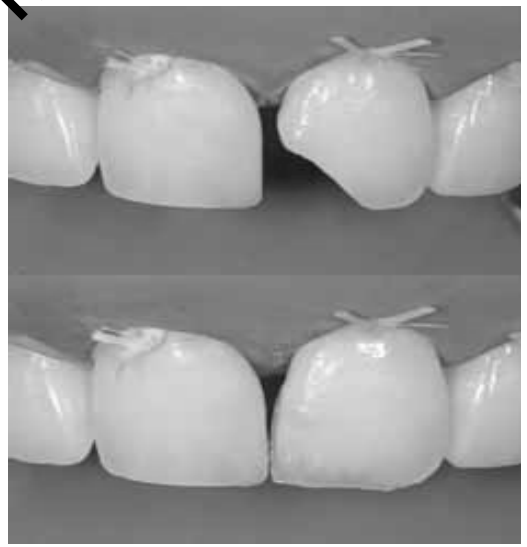
Techniques

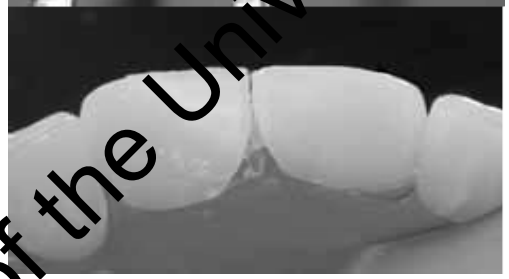
- Silicone guide technique
- Free-hand build up technique





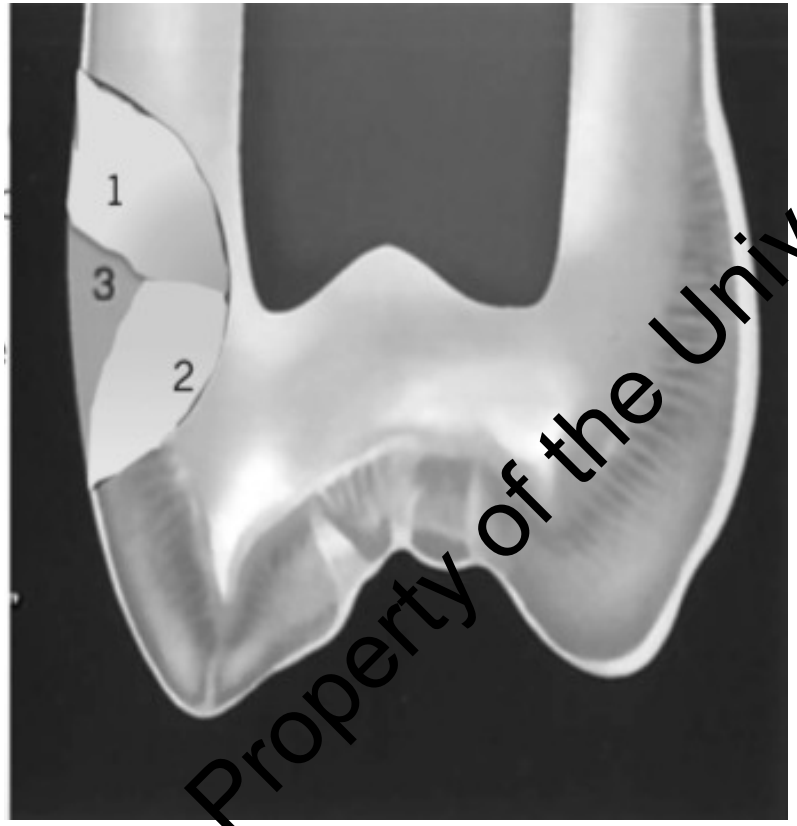




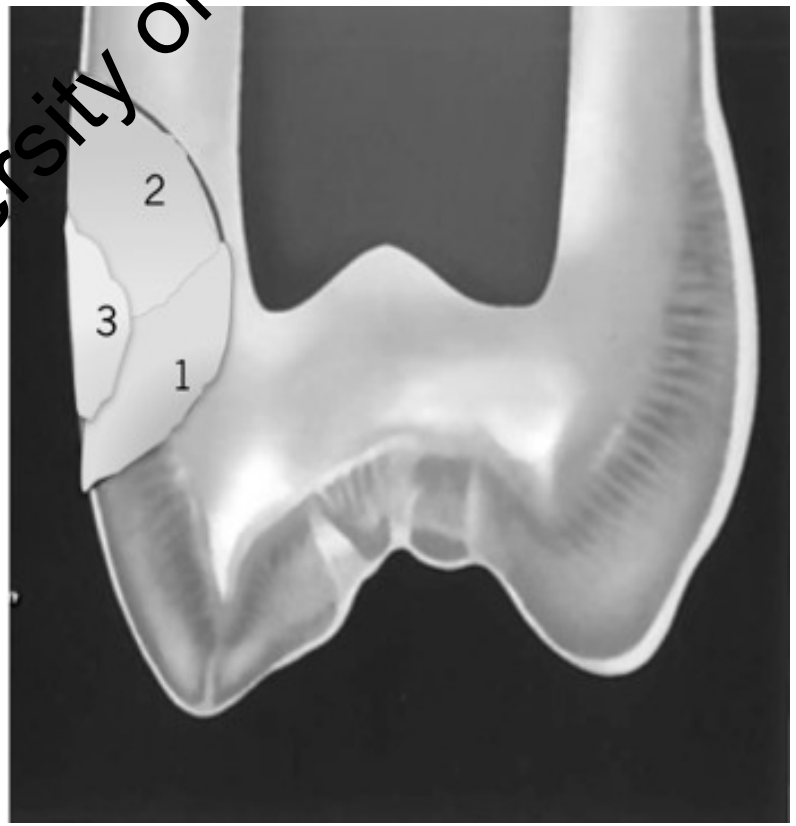

CLASS V Restoration

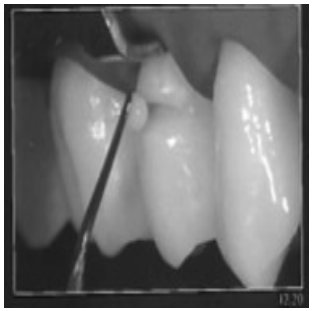
Insertion technic. 2 options

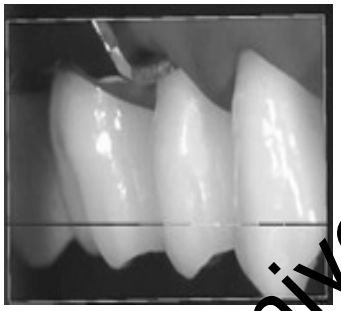
First increment in the cervical region



First increment in the coronal region





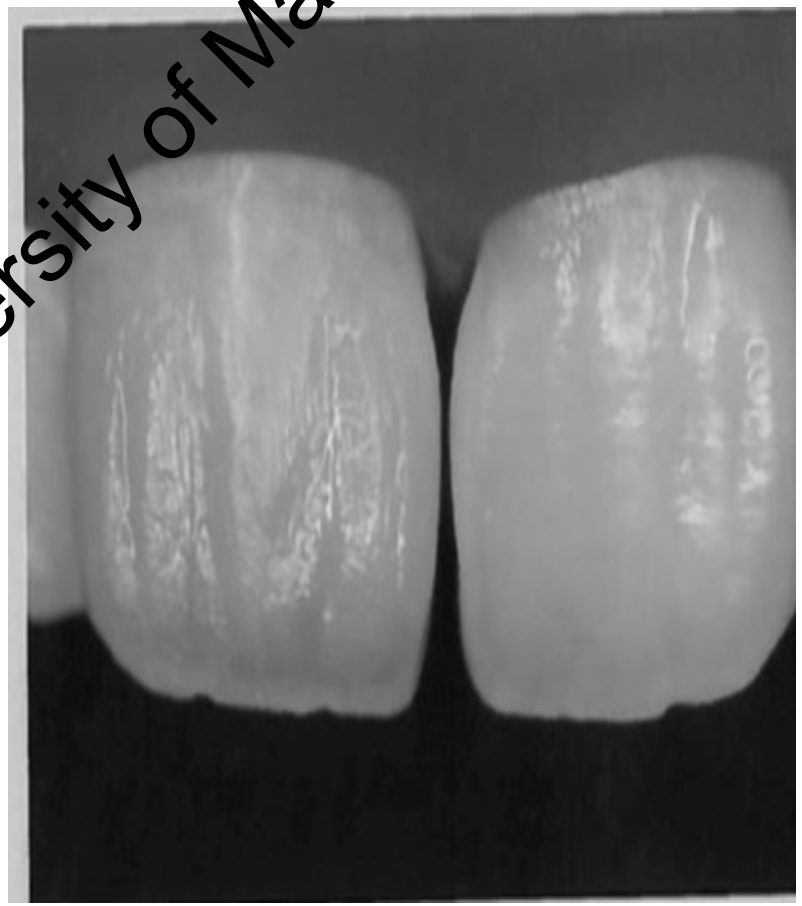


- 1st increment cervical
- 2nd increment occlusal
- 3rd increment facial

Finishing and Polishing

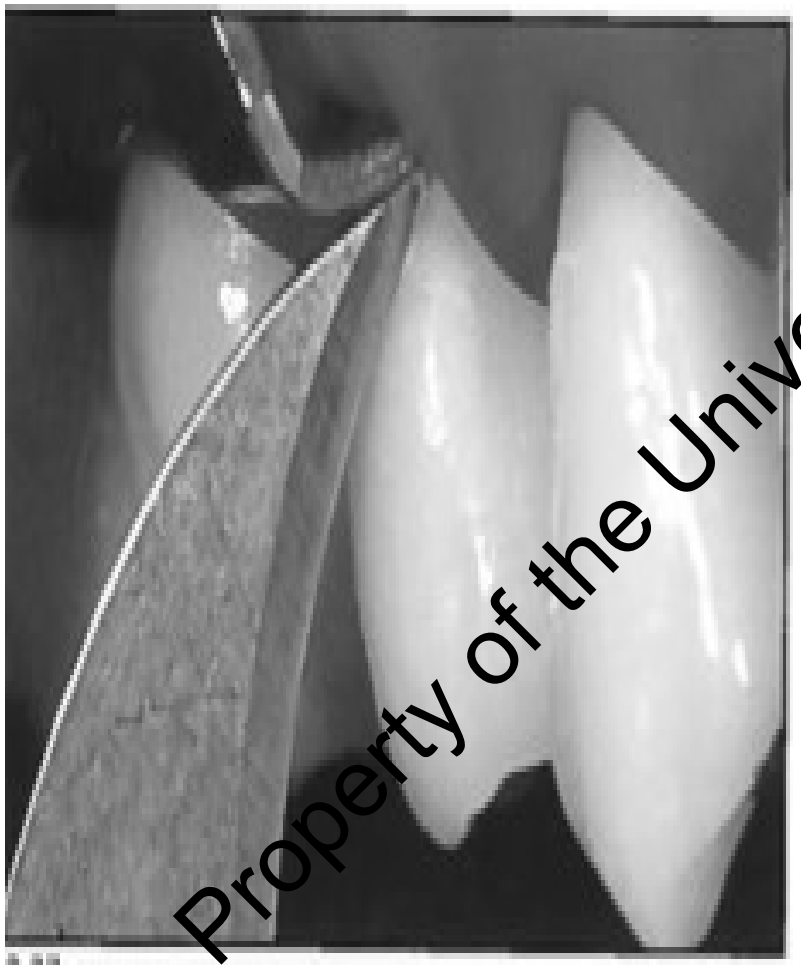
Keep it simple!

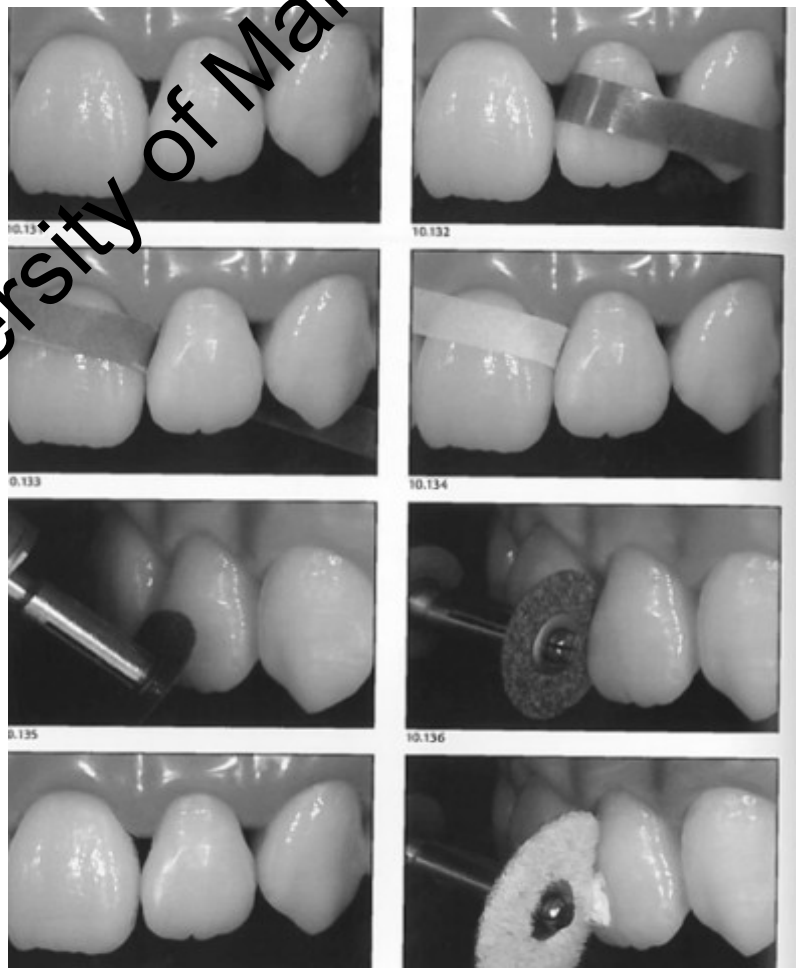
Finish contours and margins
– Flame finishing carbide bur **HIGH SPEED with WATER**



Finish contours and margins

– Softlex®disks, interproximal strips, blade #12



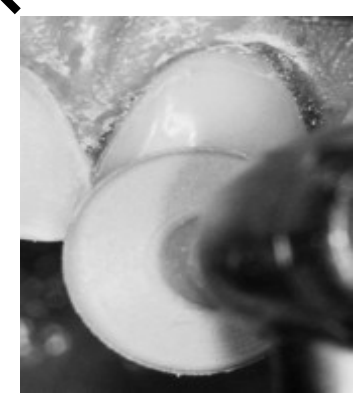


Polishing anterior restorations

- Use the flat side of the Enhance disc
- Light pressure while sweeping
- Vertically
- From gingiva to the incisal edge.
- Luster will begin to appear in Seconds
- Decrease pressure to a feather-like touch to bring out the highest luster

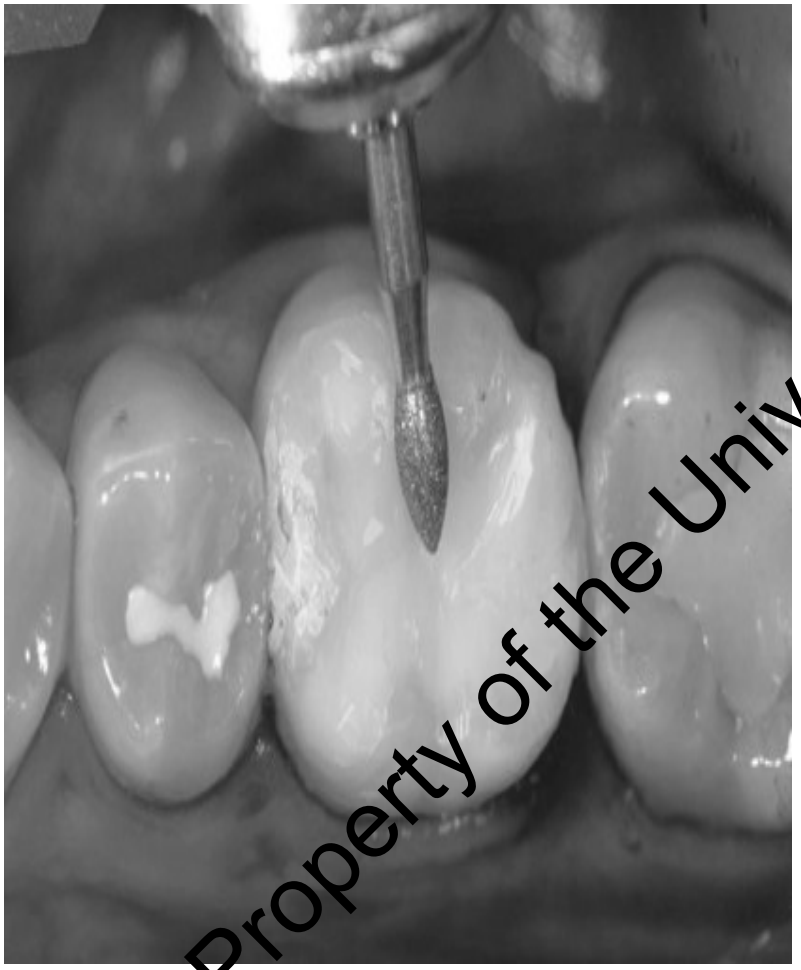
Gingiva

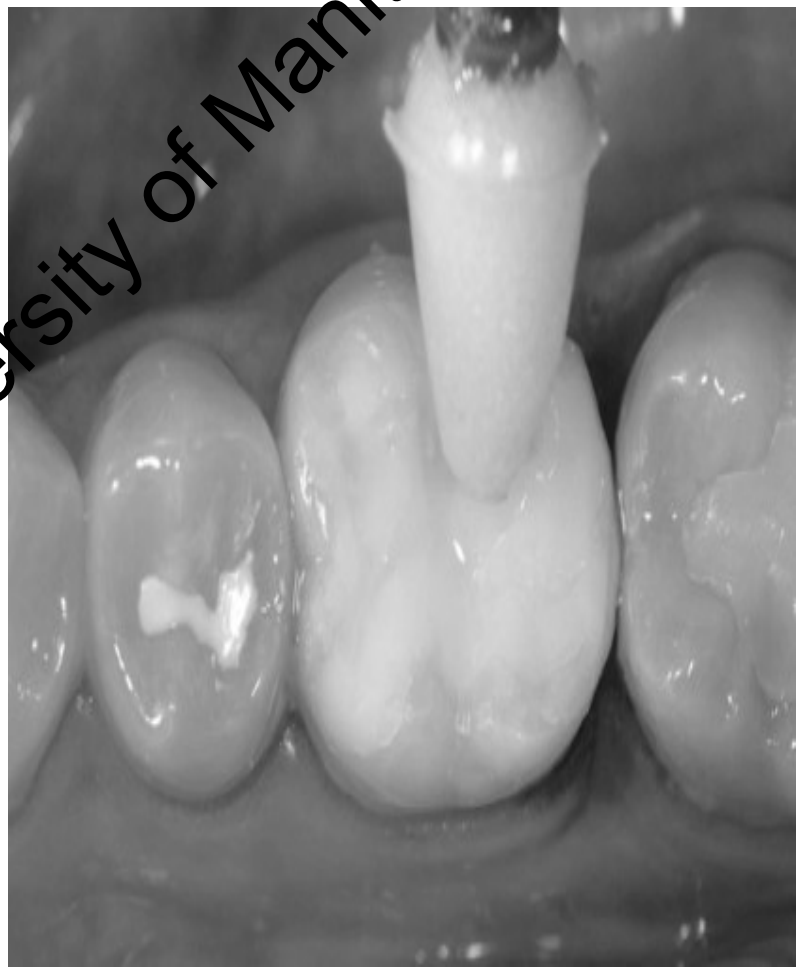
Incisal Edge



Polishing posterior composites

www.dentsply.com





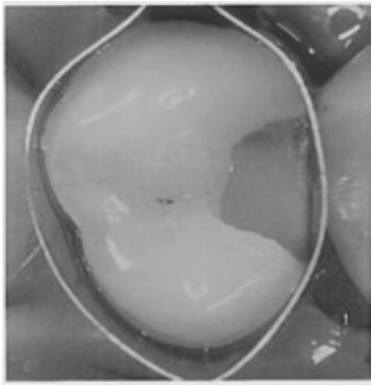
Final shine!

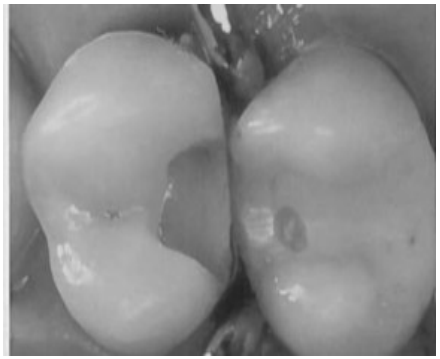
Trouble shooting

- Deficiencies
- Flash
- Bubbles
- No contact point
- Polish (over or under)
- Contour (over or under-contour)

Contact point

- Matrices
- Metallic matrix band
- Transparent matrix band
- Sectional matrix
- Combination of matrix (#2 then sectional)
- Use a “Contact Pro”





Contact point

- Wedges
- Anatomical wooden wedge
- Custom wedge
- Reinforced wedge with block-out resin (*Ultradent LC Block-Out Resin*)
- Elastic wedges

ProFin by Dentalus

- *https://dentatus.com/dental-products/profin*

QUESTIONS ??