Lecture 11: Clinical Steps

By Dr Cheryl Fu

Based on slides by Dr Matsubara

Questions:Occlusion

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The Relationship Between Centric Occlusion and The Maximal Intercuspal Position and Their Use as Treatment Positions for Complete Mouth Rehabilitation: Best Evidence Consensus Statement

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Abstract

Purpose: The purpose of this Best Evidence Consensus Statement was to evaluate the existing literature relative to two focus questions: How often does centric occlusion coincide with maximal intercuspal position in dentate and partially dentate populations?; and should centric occlusion or maximal intercuspal positions be equivalent for dentate and partially dentate patients undergoing complete mouth rehabilitation?
Materials and Methods: Keywords used in the initial search were: intercuspal position, centric occlusion, centric relation, maximal intercuspal position, prosthodontic rehabilitation, and occlusion. The search was then limited to Systematic Reviews, Randomized Controlled Studies, Meta-analyses and Clinical Trials.
Results: The initial search strategy related to the selected search terms resulted in more than 15,000 articles. When the subsequent search was limited to Systematic Reviews, Randomized Controlled Studies, and Meta-Analysis and Clinical Trials, 313 articles were selected for further analysis.
Conclusions: Review of the literature reveals that most dentate and partially dentate patients do not have coincident centric occlusion and maximal intercuspal position. There is support for coincidence between centric occlusion and maximal intercuspal position as the preferred occlusal relationship in complete mouth rehabilitations. The literature does not report conclusive evidence of adverse prosthodontic outcomes with complete rehabilitations in centric occlusion or maximal intercuspal position in a healthy population. However, there is support for an association between centric occlusion-maximal intercuspal position discrepancies and occlusal instability as well as temporomandibular joint disorders. Hence, it is concluded that partially and completely dentate patients requiring complete mouth rehabilitation should be restored in centric occlusion.

The Glossary of Prosthodontics Terms[1] defines centric relation as the maxillomandibular relationship, independent of tooth contact, in which the condyles articulate in the anterior-superior position against the posterior slopes of the articular eminences; in this position, the mandible is restricted to a purely rotary movement; from this unstrained, physiologic, maxillomandibular relationship, the patient can make vertical, lateral or protrusive movements; it is a clinically useful, repeatable reference position. Centric occlusion is defined as the occlusion of opposing teeth when the mandible is in centric relation; this may or may not coincide with the maximal intercuspal position.[1] Maximal intercuspal position is defined as the complete intercuspation of the opposing teeth independent of condylar position, sometimes referred to as the best fit of the teeth regardless of the condylar position.[1]

The purpose of this Best Evidence Consensus Statement is to review the literature to answer two focus questions related to CR, CO, and MIP.

Questions: Occlusion

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Google's definition

Centric occlusion refers to **a position of maximal, bilateral, balanced contact between the cusps of the maxillary and mandibular arches**. Centric relation is the most retruded, unstrained position of the mandibular condyle within the temporomandibular joint (TMJ), that is, within the glenoid fossa.

A three-dimensional comparison of condylar change between centric relation and centric occlusion using mandibular position indicator

Donald J. Rinchuse DMD, MS, MDS, PhD

"CR has always been a "condylar position," whereas CO has always been an interocclusal position. Therefore CR is not a comparable term to CO, because the former denotes condyle position and the latter denotes an interocclusal dental position"

Third edition (1968); page 452

Centric Jaw Relation—(*1*) The most retruded physiologic relation of the mandible to the maxilla to and from which the individual can make lateral movements. It is a condition which can exist at various degrees of jaw separation. It occurs around the terminal hinge axis. (2) The most posterior relation of the mandible to the maxilla at the established vertical relation.

Centric Occlusion—The centered contact position of the lower occlusal surfaces against the upper ones; a reference position from which all other horizontal positions are eccentric.

Fifth edition (1987); pages 724-725

Centric Occlusion—The occlusion of opposing teeth when the mandible is in centric relation. This may or may not coincide with the maximum intercuspation position. This is a term in transition to obsolescence. (See also *intercuspation, maximum.)*

Centric Relation—A maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective disks with the complex in the anterior-superior position against the slopes of the articular eminences. This position is independent of tooth contact. This position is clinically discernible when the mandible is directed superiorly and anteriorly and restricted to a purely rotary movement about a transverse horizontal axis. This term is in transition to obsolescence.

Questions: Posselts envelope

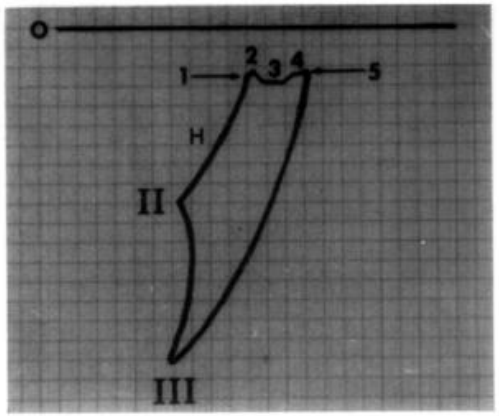
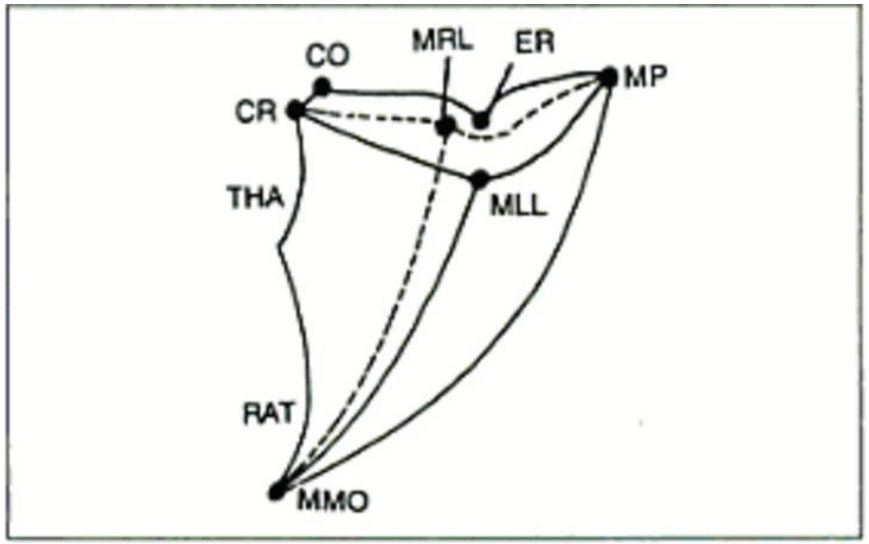
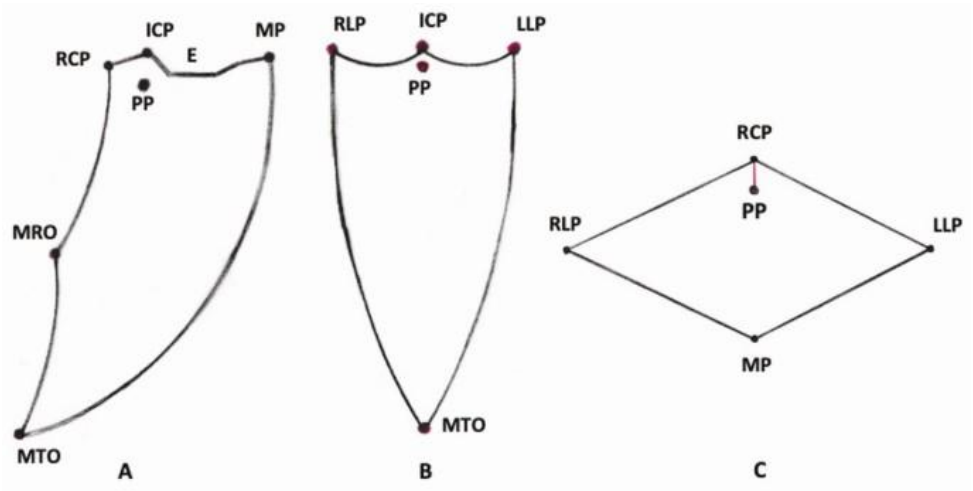
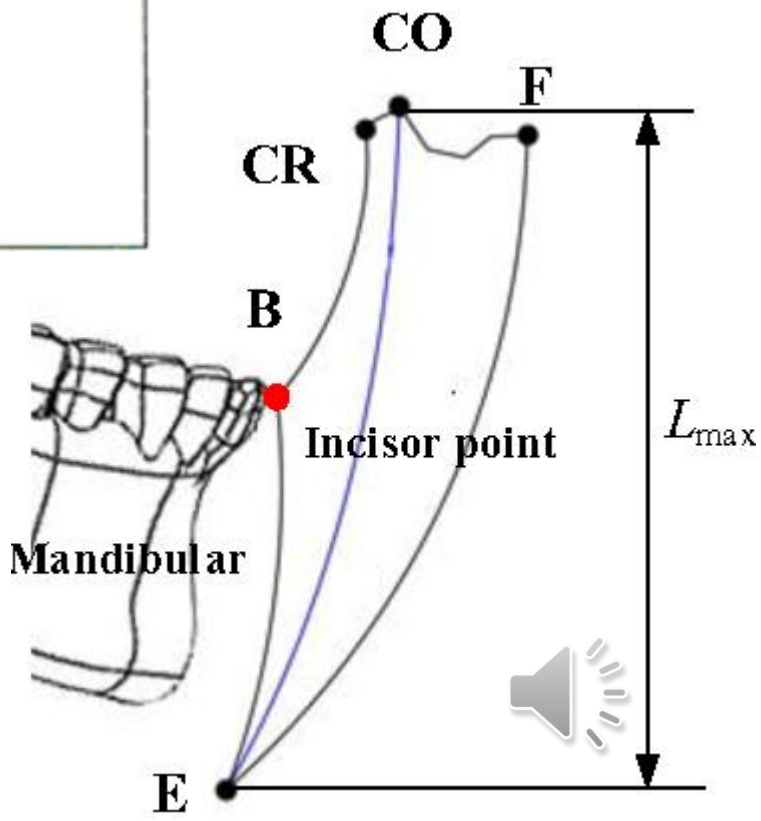


Fig. 3. Posselt's envelope of motion in the sagittal plane at terminal hinge movement *(H)*: *(1)* the retruded contact position; *(2)* the intercuspal position; *(3)* the edge-to-edge occlusion; *(4)* anterior biting to a reversed vertical overlap; *(5)* the protruded contact position; *(II)* transition from the posterior terminal hinge to a further open posterior position; *(III)* maximal opening; and *(O)* a line parallel to the occlusal plane.







Questions: Posselts Envelope

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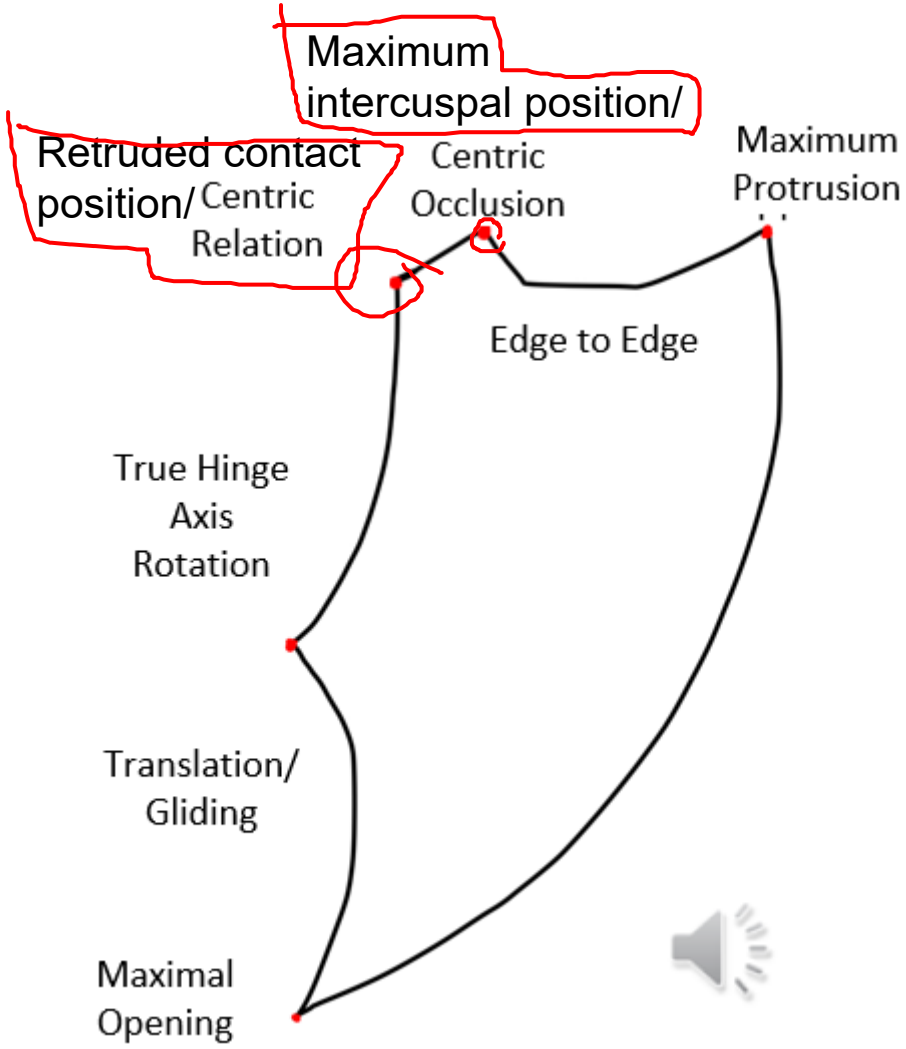

Learning Objectives

- The “big picture” of indirect restorations
- Clinical steps for treatment planning, preparation stage and insert
- Assessing the permanent crown

No reading for this lecture!

The “big picture”

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Clinical examination

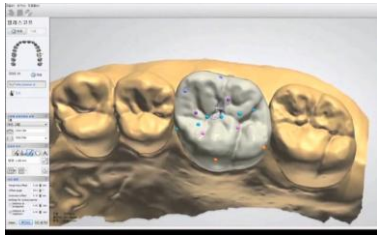
Primary Impression

Tooth preparation + Temporisation

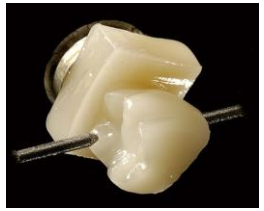
Definitive Impression

Intraoral scanning

CAD All-ceramic



Milling

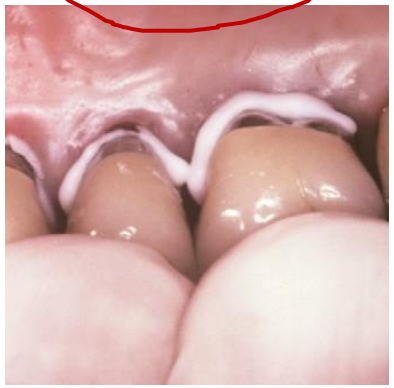


Wax up (gold crown, PFM)

Casting and veneering

Try-in

Cementation



Review

Treatment planning

- Assessing the tooth (+assessing all the dentition and the patient)

Treatment planning

- Assessing the tooth (+assessing all the dentition and the patient)

Why Does a Tooth Need a Crown?

Considerations for a crown:

- **Destruction of tooth structure**
- Aesthetics
- Plaque Control/Moisture Control
- **Retention**

Figure 3a.

Figure 3b.

Figure 3. Patients abusing methamphetamine often present with rampant caries. *(Photos courtesy of Dr. Jinus Emrani)*

Terry E. Donovan (2006) Longevity of the Tooth/Restoration Complex: A Review

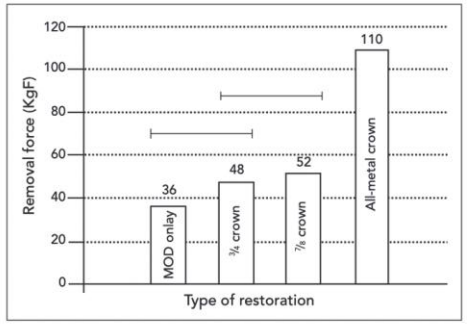


Fig 6-1 A comparison of resistance to removal forces for four types of crowns ($P = .05$).[1,2] MOD, mesio-occlusodistal.

Fundamental of Fixed Prosthodontics

Lecture 1!

Treatment planning

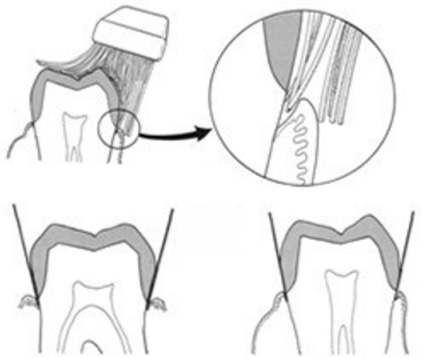
- Assessing the tooth (+assessing all the dentition and the patient)

Principles of Tooth Preparations

Welcome back!

ABUTMENT TOOTH

- Principles of tooth preparation
- Partial or complete preparation



BIOLOGICAL

- Conservation of tooth structure
- Avoidance of overcontouring
- Supragingival margins
- Harmonious occlusion
- Protection against tooth fracture

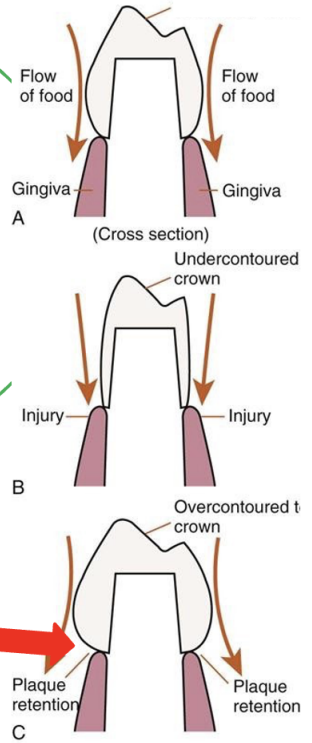
MECHANICAL

- Retention form
- Resistance form
- Deformation

AESTHETIC

- Minimum display of metal
- Maximum thickness of porcelain
- Porcelain occlusal surfaces
- Subgingival margins

Patient can't clean this!



Treatment planning

- Assessing the tooth (+assessing all the dentition and the patient)

”3 and 25% of teeth prepared for full coverage crowns will lose vital pulp functions within 15–20 years, with previously compromised teeth fairing worse than those that are more intact”

Home > Extra-Coronal Restorations > Chapter

Preserving Pulp Vitality

Chapter | First Online: 01 August 2018

Many teeth prepared for extra-coronal restoration s have already endured cycles of disease and direct restoration. They should be evaluated carefully before preparation to minimise the risks of unexpected pulp breakdown. In this case we see a prepared lower premolar with multiple amalgam restorations and a buccal composite repair that make up the core

Preparation stage

- Before patient arrives:
  - Decide on material of choice. Why is that material the best?
  - Approval of treatment plan (more on this later)
  - Wax up of tooth if any modifications require for existing tooth+ putty key
- Day of preparation
  - Bring patient in, confirm treatment with them quickly, make sure they know what's happening
  - Administer LA. (If you don't have up to date opposing model because you did other restorative work since the diagnostic model, then take new impression. If you don't have putty key, do it now)
  - Prep tooth according to guidelines for the correct materials. Check for undercuts and sufficient occlusal clearance
  - Make provisional restoration
  - Retraction cord+expasyl
  - Impressions, remove retraction cord!
  - Temporise

11

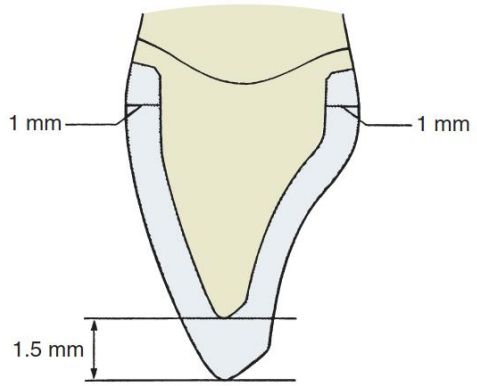


FIGURE 11-1 ■ Recommended reduction for all-ceramic crowns.

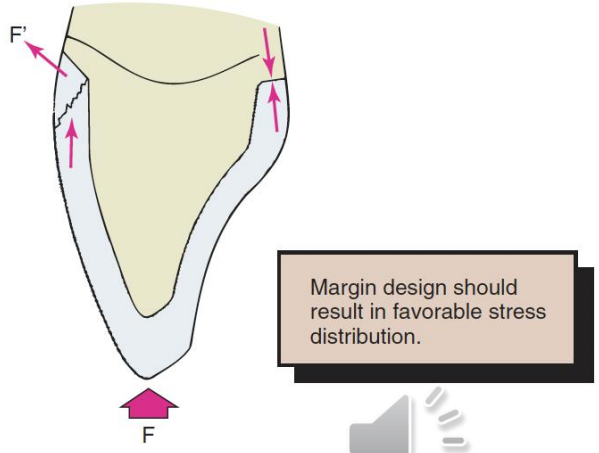


FIGURE 11-2 ■ A sloping shoulder margin is not recommended for the all-ceramic crown. It does not support the porcelain. Incisal loading leads to tensile stresses near the margin if the forces are not reciprocated *(arrows)*, which may cause brittle failure. *F,* Force.

TRY-IN PROCEDURE

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Evaluation:
Seating, fitting, contact points

Systematic approach

1. Evaluation of the crown on the die
2. Seating the crown on the prepared tooth
3. Assessment of the seated crown

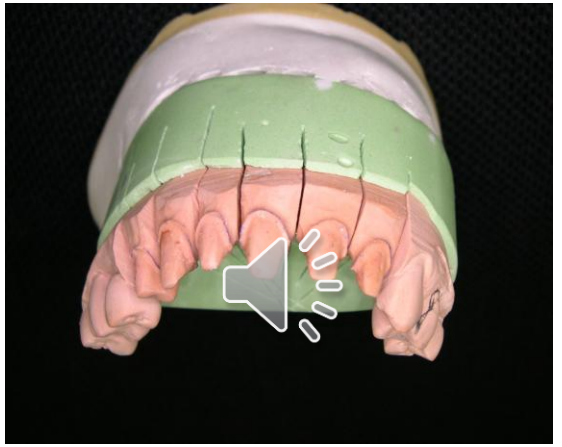
Lab steps

After the crown is returned from the lab we must check the crown.

EVALUATION OF CROWN ON THE DIE

Aims:

- Detection of fabrication errors (laboratory related) prior to the clinical appointment
- Save critical chair time
- Anticipation of problems before clinical appointment
- Consider good lighting and magnification
- In case of problem, consult with the dental laboratory



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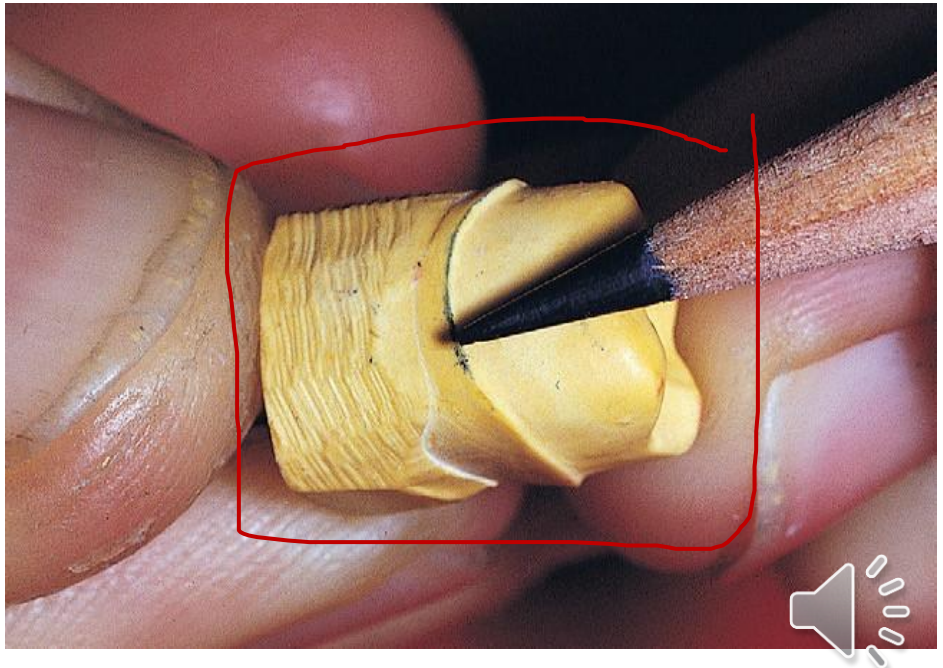
EVALUATION OF CROWN ON THE DIE

Assess the die and opposing model

- Poor pouring
- Overtrimming
- Fracture
- Scratches
- Wear



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EVALUATION OF CROWN ON THE DIE

Internal surface:

- Casting problems: air bubbles
- Casting nodules or blebs
- Ideally, the casting should touch the die at the margins only

Die spacer

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EVALUATION OF CROWN ON THE DIE

Overall fit and resistance:

- Looseness
- Excessive gap
- Proximal contact areas

Marginal fit:

- Open margins
- Overhangs or underextensions

EVALUATION OF CROWN ON THE DIE

External surface

- Appearance (restoration design)
- Contour
- Shade
- Rough or smooth (polished)

Occlusion (articulator)

- Centric contacts
- Eccentric contacts
- Interferences

Insert Appointment:

- Bring patient in, administer LA if required
- Remove temporary crown. Can sometimes wiggle it off. If not possible, carefully section temp crown and break the temporary.
- Clean off temporary cement with ultrasonic scaler
- Try-In

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SEATING THE CROWN

Remove the provisional restoration

- Excavator, sickle probe
- Hemostat, Backhaus forceps, pliers
- Crown remover:
  - Back-action crown remover
  - Automatic crown remover
  - Richwill crown remover

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IDEAL CROWN

- Easily seated
- Stable
- Accurate occlusal contact
- Adequate proximal contacts
- Accurate marginal fit
- Aesthetic

SEATING THE CROWN

- The crown should seat on the prepared tooth without forcing
- If it is not seating, possible **causes** may involve:

SEATING THE CROWN

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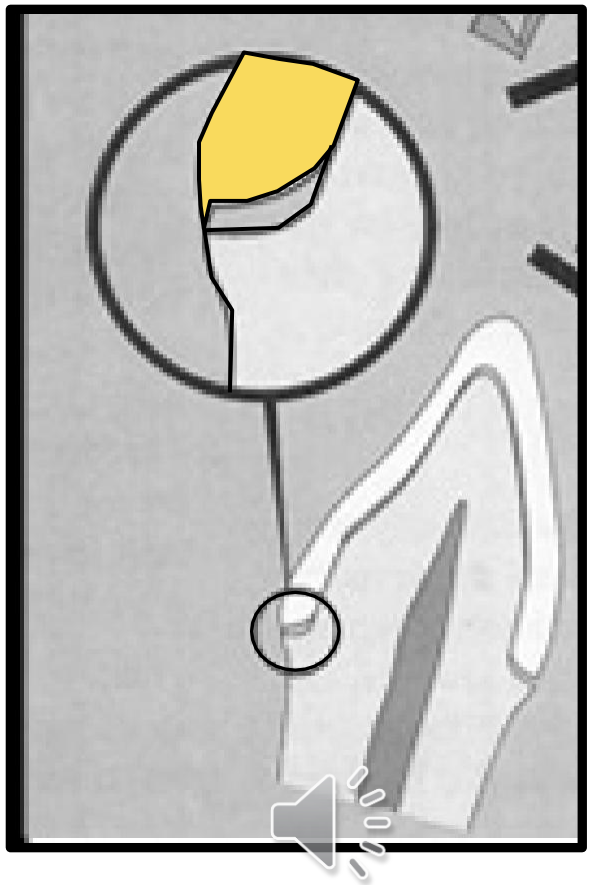
- If it is not seating, possible **causes** may involve:



Single crown

Proximal contacts

Internal fit

Inaccurate margins/ over extensions

Retained temporary cements

Trapped gingival tissue

Try-In

Order to check:

a) Proximal contact
b) Internal fit
c) Marginal fit

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SEATING THE CROWN

Proximal contacts

- Assess tightness with dental floss
- There should be some tightness but not too difficult
- Articulating paper (20 µm), marking liquid (Accufilm), spays (occlude)
- The shim stock (8 µm) should just pass through the contact
- Minor adjustment at a time
- If the contacts are open, return to the laboratory for material addition

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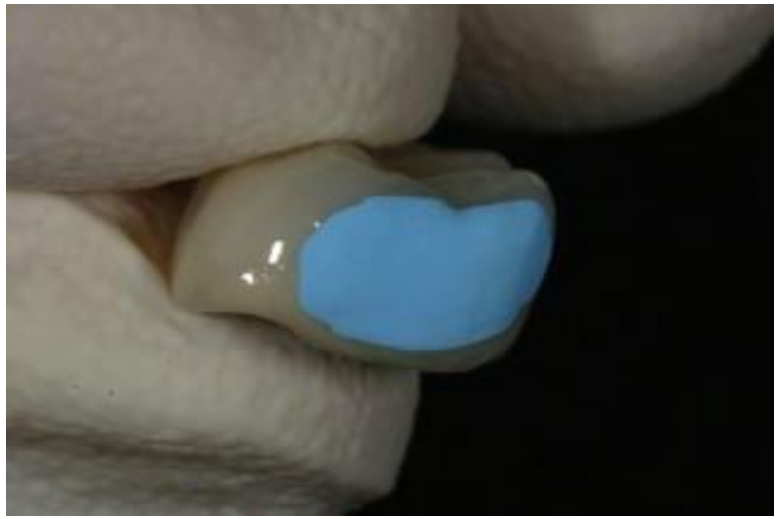
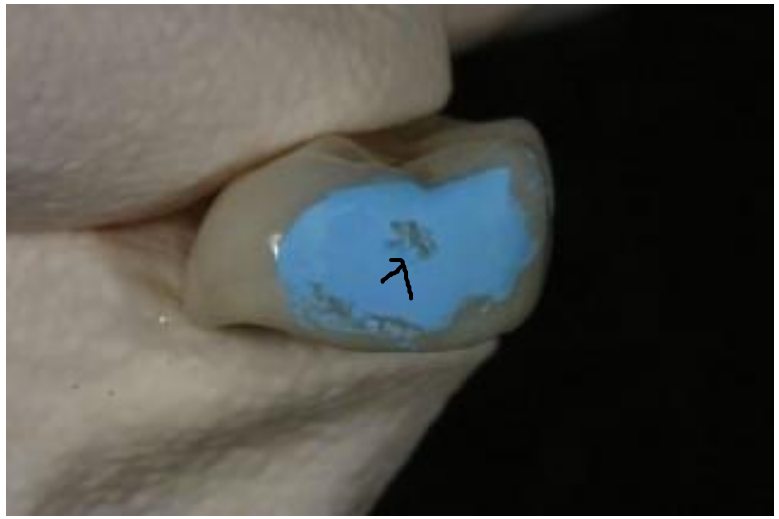
SEATING THE CROWN

Proximal contacts





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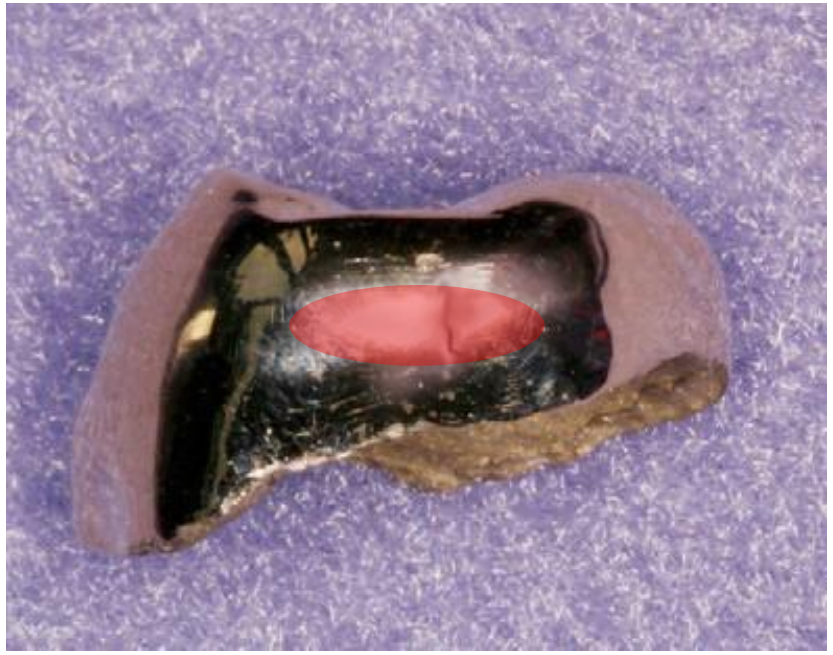
SEATING THE CROWN

Proximal contacts

Should be at the same location to the natural proximal contacts



SEATING THE CROWN

Internal fit

- The restoration should seat completely without interference of the occlusal or axial surfaces
- The fitting surface should be checked and adjusted accordingly
  - Disclosing medium (Fit Checker, LB impression material)
  - Spraying thin layer of aerosol indicator (Occlude)
- The relief can be achieved with a diamond bur

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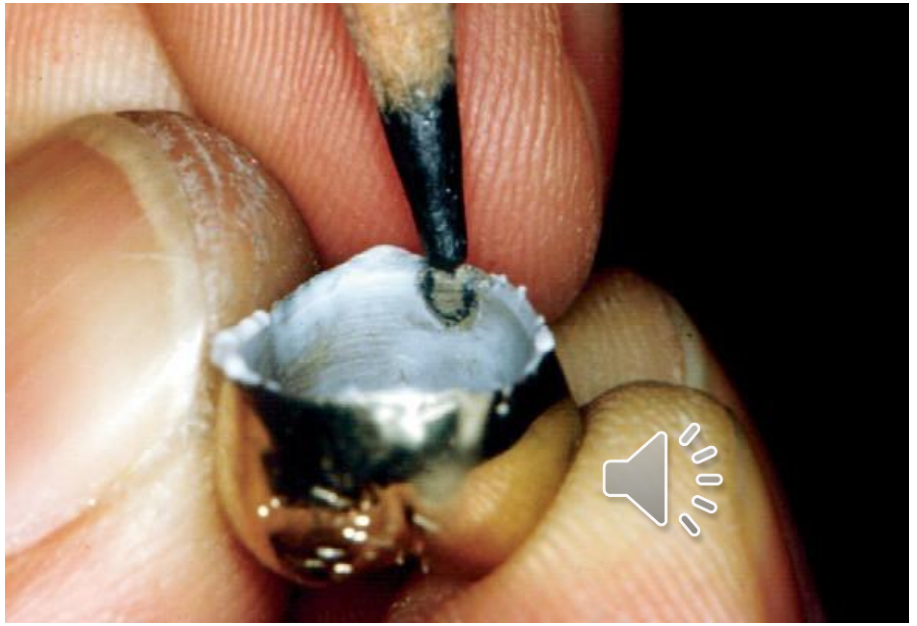
SEATING THE CROWN

Internal fit

Fit Checker application

- Penetrated areas of the medium indicate high spots
- Can be adjusted accordingly



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SEATING THE CROWN

Internal fit

If crown fits the model well but does not seat in the mouth, consider problems with impression

Caused by:

- Early impression removal
- Distortion of impression
- Latex contamination

⬇

Take a new impression

SEATING THE CROWN

Marginal fit

- Should be as accurate as possible
- Poor marginal adaptation:
  - Gap (100 micron is the borderline for acceptability)
  - Overhang
  - Under extension
  - Ledge

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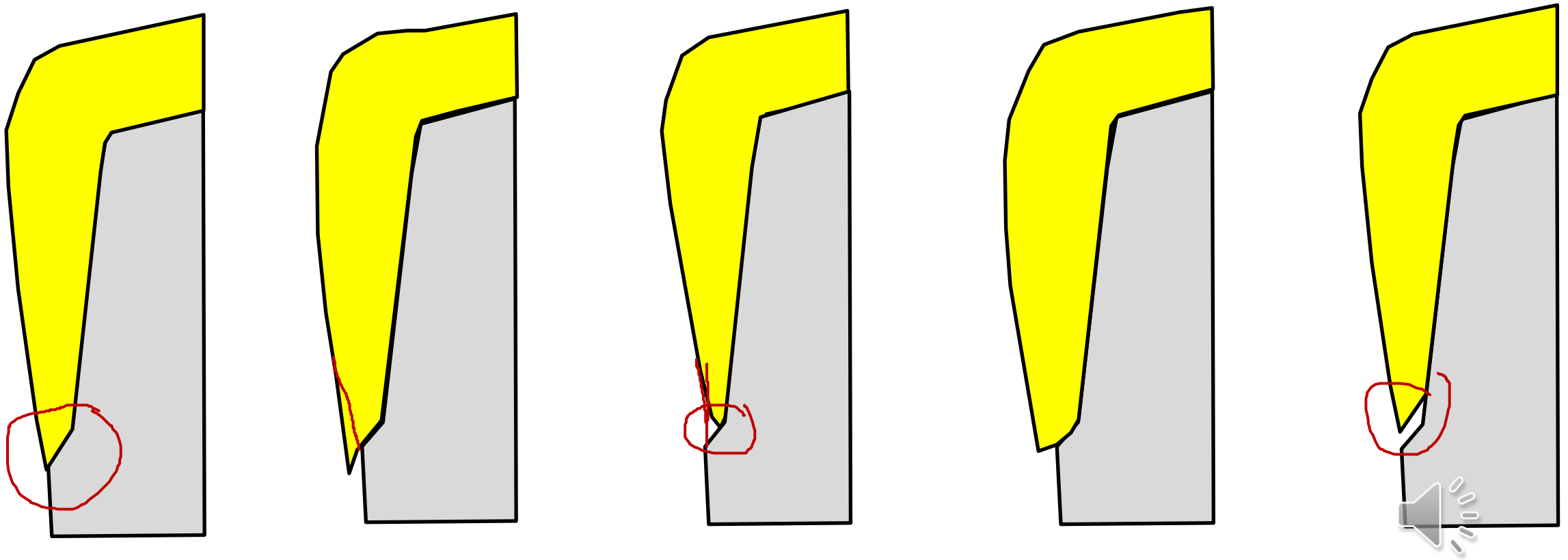
SEATING THE CROWN

Marginal fit



Ideal | Overextended | Underextended | Overhang | Open margin

SEATING THE CROWN

Marginal fit

Effects of open margins:

- Sensitivity
- Dissolution of cement
- Plaque retention
- Caries
- Gingival inflammation

SEATING THE CROWN

Marginal fit

- Poor marginal fit can be due to inability to read the finish line by the technician

Overhangs/overextension: can be adjusted
Underextention: may require remake
Gap: require remake

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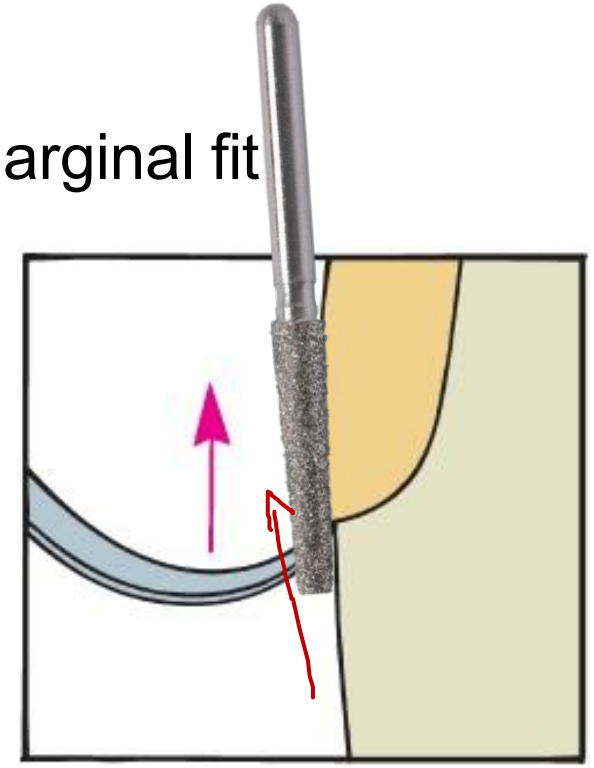
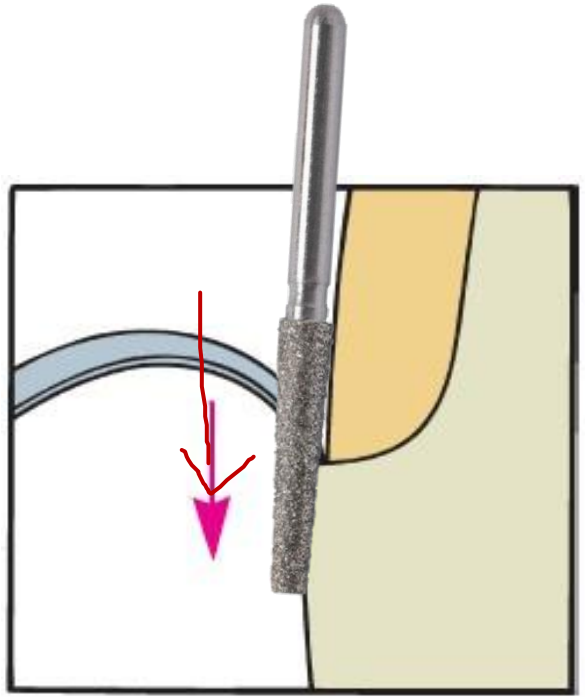
SEATING THE CROWN

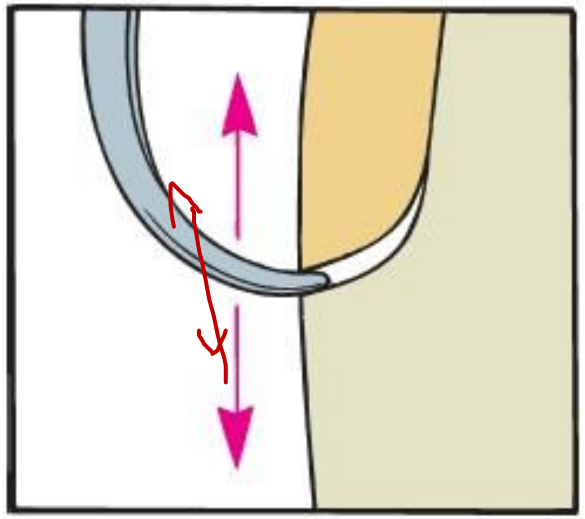
Marginal fit



Gingivo-occlusal direction



Occluso-gingival direction



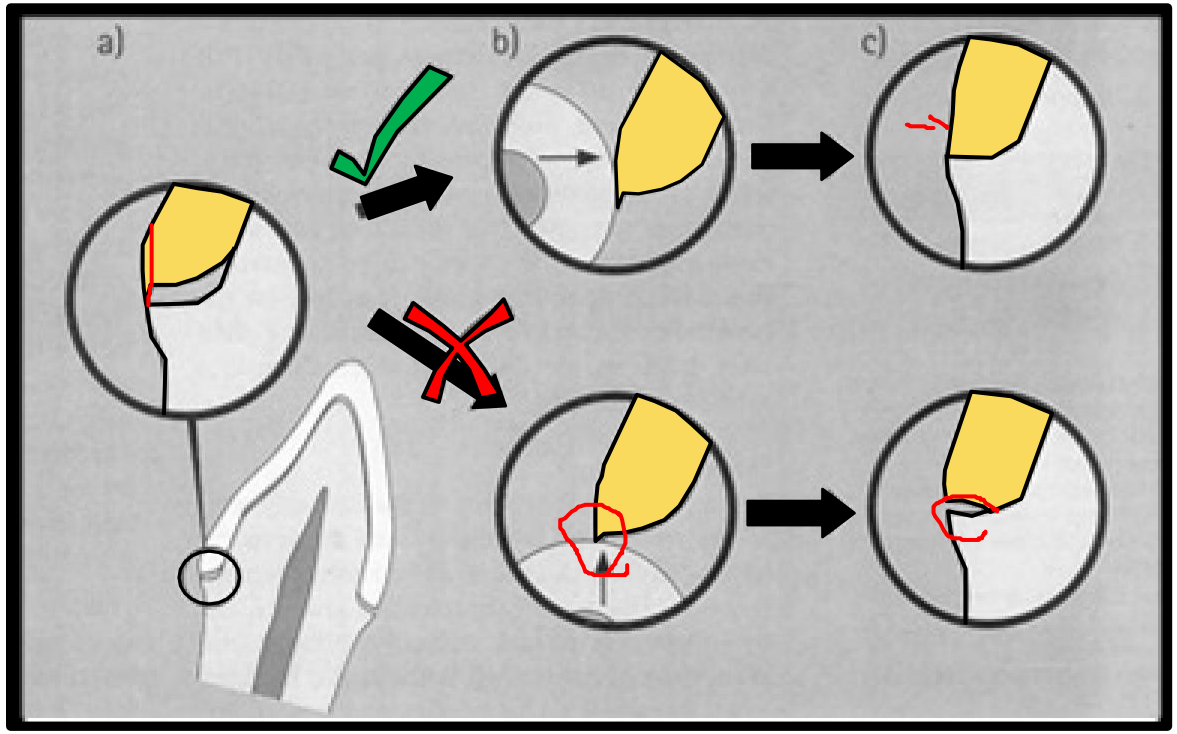
Both

New impression

SEATING THE CROWN

Marginal fit

Adjust overextended margins or overhangs from the external surface, not the fitting surface



ASSESSMENT OF THE SEATED CROWN

Aims

► Check
- Stability
- Contour
- Occlusion
- Aesthetics

► Confirm the suitability for cementation

TRY-IN PROCEDURE

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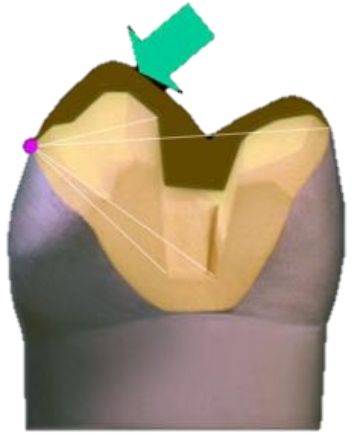
ASSESSMENT OF THE SEATED CROWN



Stability

- Restoration should not rotate when the force is applied
- Instability causes failure in function (mainly in cementation)

internal surface misfit

↓

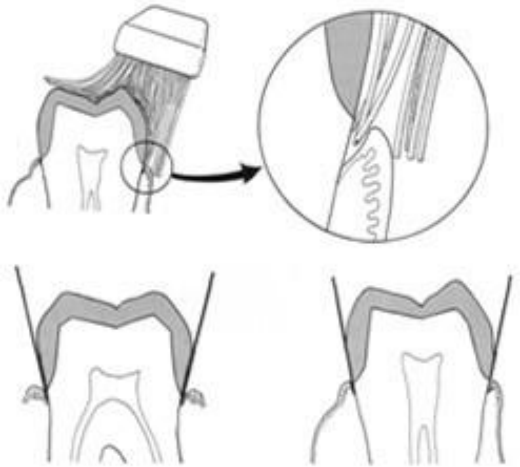
caused by distortion in impression or fabrication process

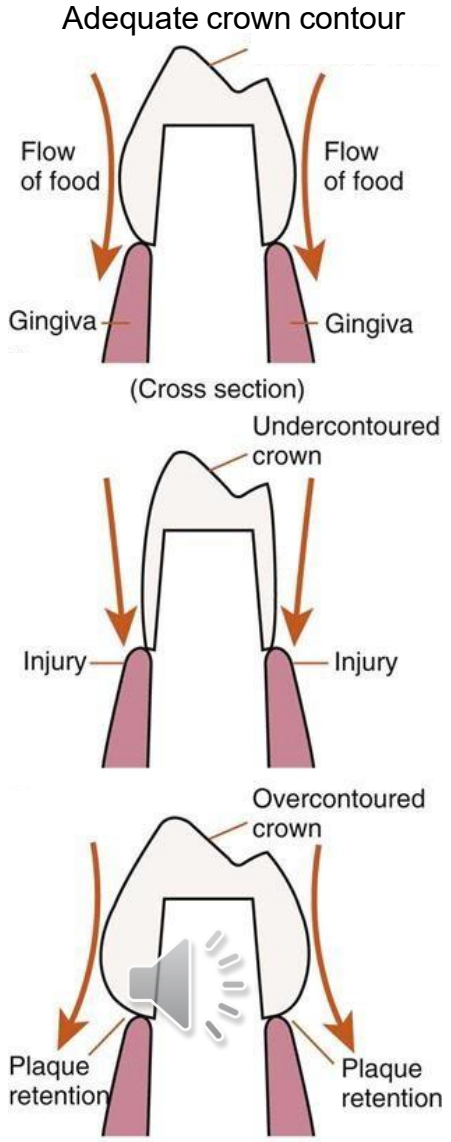
ASSESSMENT OF THE SEATED CROWN

Contour

►Improper contour may impair gingival health and affects the natural appearance

►They must be adjusted before cementation





ASSESSMENT OF THE SEATED CROWN

Occlusion

- The crown should be fully seated
- Major adjustments should be done prior to cementation
- Minor adjustments can be completed after cementation
- Inadequate occlusal contacts can be caused by
    - Poor occlusal recording
    - Poor articulation

ASSESSMENT OF THE SEATED CROWN

Occlusion

Shim stock assessment

- The shim stock will determine if an occlusal contact is present
- Assess the occlusion on all teeth with and without the prosthesis
- Assess the occlusion on the crown

8 µm thick

TRY-IN PROCEDURE

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Analysis of Active Oral Tactile Sensitivity in Individuals with Complete Natural Dentition

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Abstract

Aim: To evaluate the active tactile sensitivity in individuals with complete natural dentition, determining the smallest thickness detected by the participants, and clarifying if there is a difference between the thicknesses analyzed.

Materials and methods: Active tactile sensitivity was evaluated in 40 research participants. Inclusion criteria included participants with complete natural dentition, without active or history of periodontal disease, absence of temporomandibular disorders, bruxism, and restorations in the evaluated area. Exclusion criteria included age below 18 years. The active tactile perception threshold was evaluated by using carbon sheets of different thicknesses (0, 12, 24, 40, 80, 100, and 200 µm), which were inserted in the participants' premolars, bilaterally. The carbon sheet was inserted so as not to come into contact with the oral soft tissues. Subsequently, the participant occluded and was asked about the perception of the intraocclusal object 20 times in each occlusal contact. The collected data were tabulated considering the amount of positive and negative responses for each carbon thickness. Values of $p < 0.05$ were considered significant.

Results: The results showed that there was linearity in perception, on both sides, besides, the natural dentition was able to perceive difference in thickness from 12 µm.

Conclusion: We conclude that the 12 µm thickness is noticeable in occlusion and can be differentiated from other thicknesses in natural dentition and that there is no difference between the tactile sensitivity of the right and left sides.

Clinical significance: A better understanding of active oral tactile sensitivity will contribute to numerous clinical applications in dentistry, including occlusal adjustment in dental rehabilitation, dental implants prosthesis design, and survival of prosthetic rehabilitation.

Keywords: Active tactile sensitivity, Dental occlusion, Mechanoreceptors, Oral proprioception, Periodontal ligaments, Permanent dentition.

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8 µm thick

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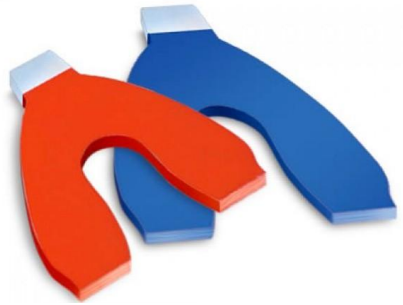
ASSESSMENT OF THE SEATED CROWN

Occlusion

Articulating paper assessment

- Mark heavy contacts or interferences in centric and eccentric
- Articulating paper will locate the contact area
- Use different colors for different movements

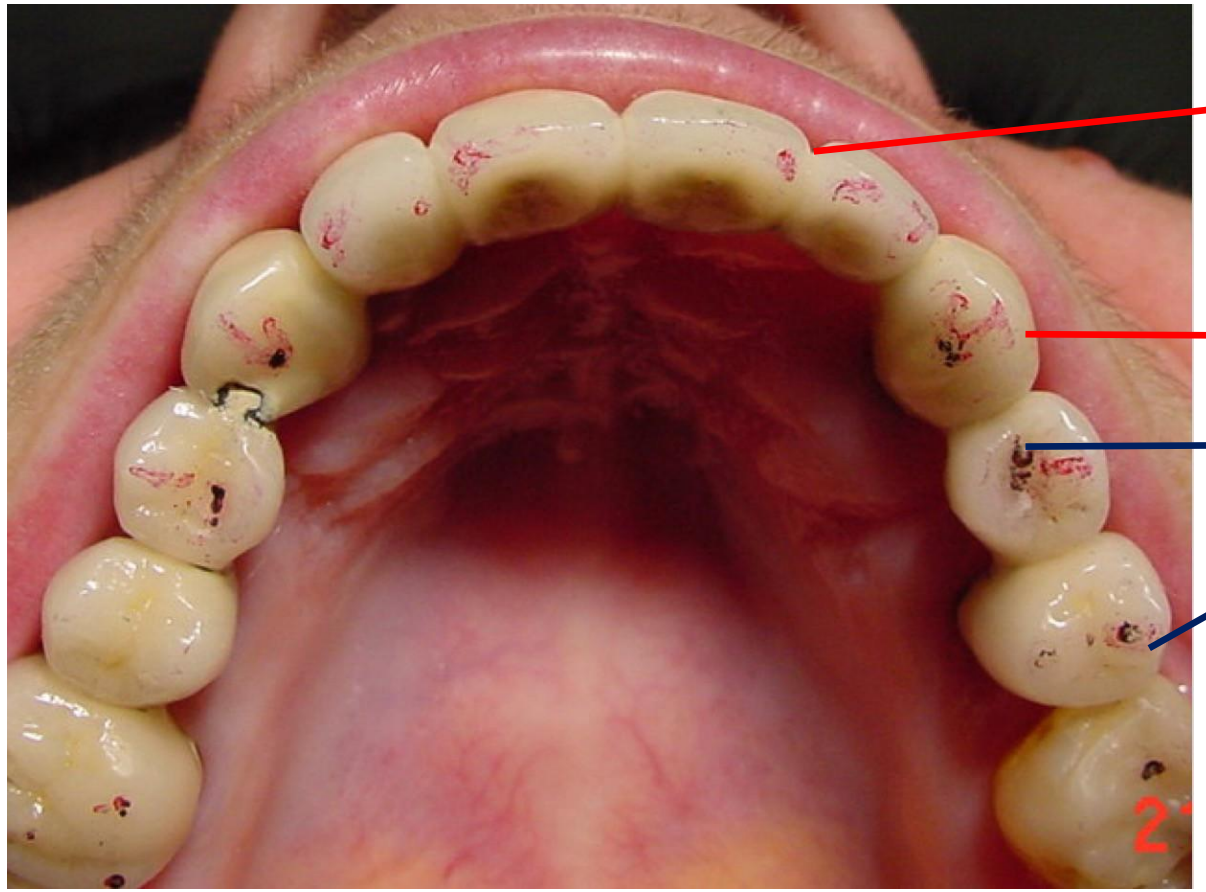


ASSESSMENT OF THE SEATED CROWN

Occlusion

►Dark articulating paper (blues) for CR or maximal intercuspation position

►Lighter articulating paper (red) for eccentric position



ASSESSMENT OF THE SEATED CROWN

Occlusion

Premature contact (centric)

- Adjust grooves or cusp inclines
- Never the tip of cusp

Interferences (eccentric)

- Adjust cusp inclines
- Tip of cusps if necessary

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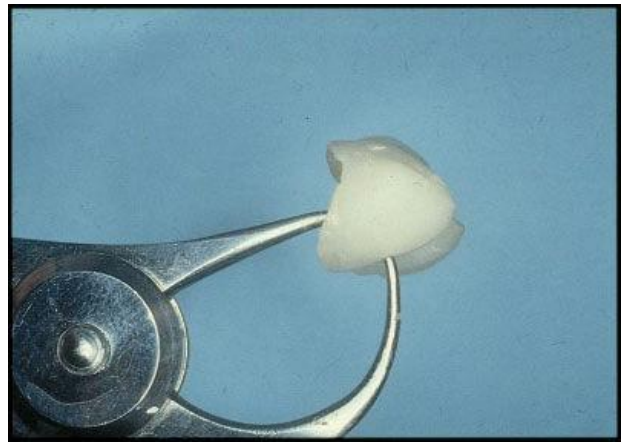
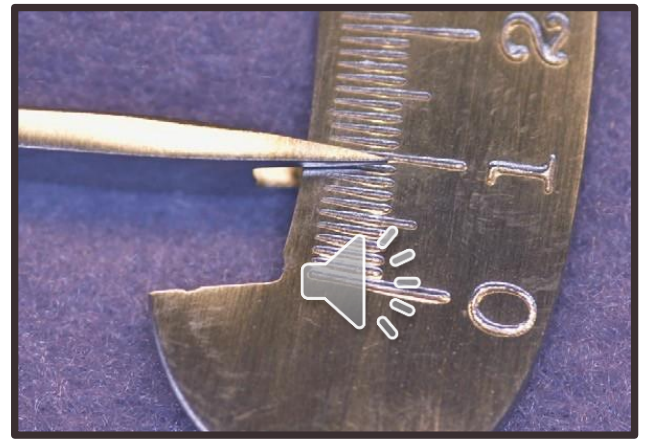
ASSESSMENT OF THE SEATED CROWN

Occlusion

The prosthesis thickness should be measured
Thickness Gauge (Svensen Gauge)
In some cases the opposing tooth can be adjusted





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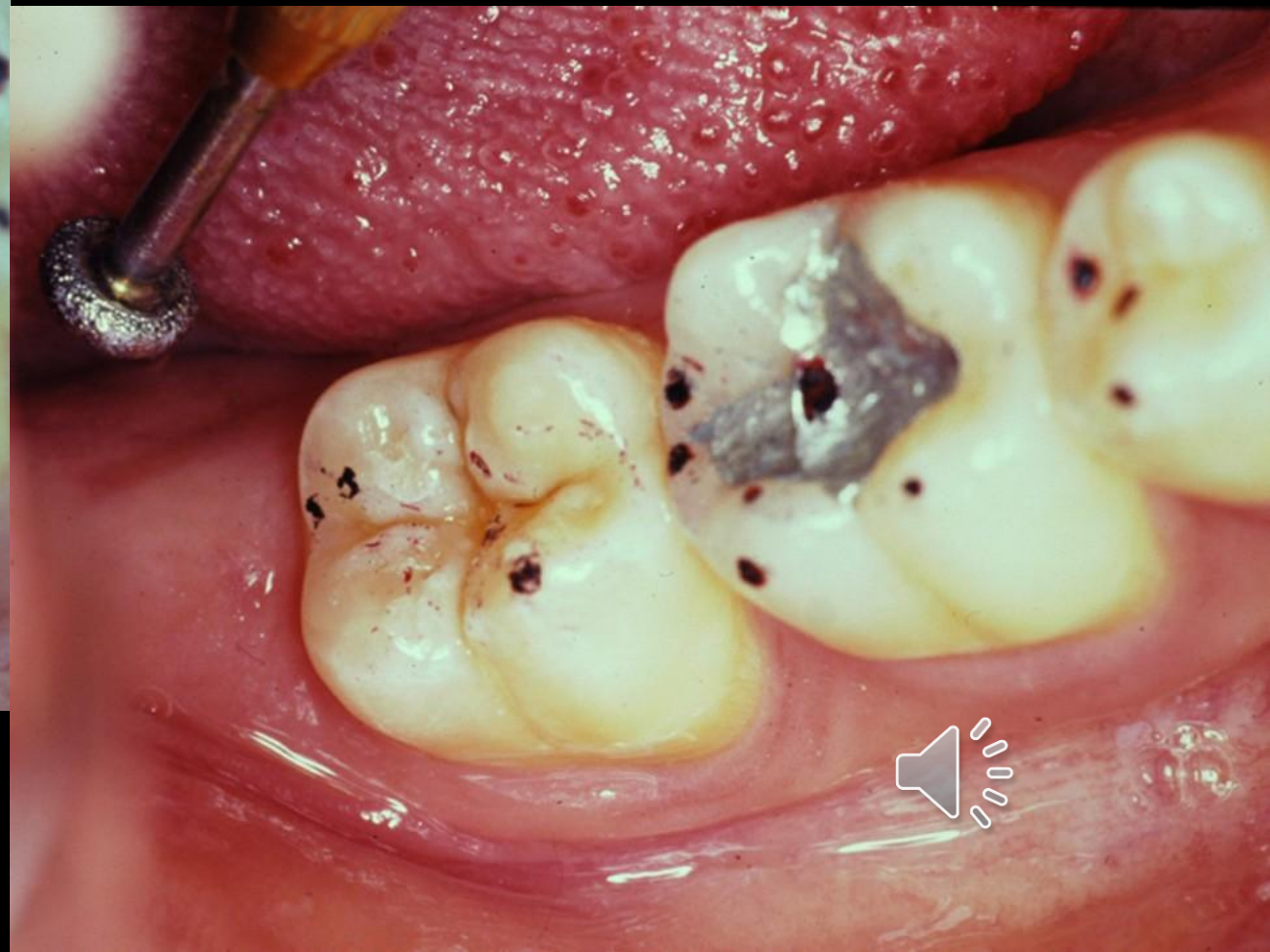

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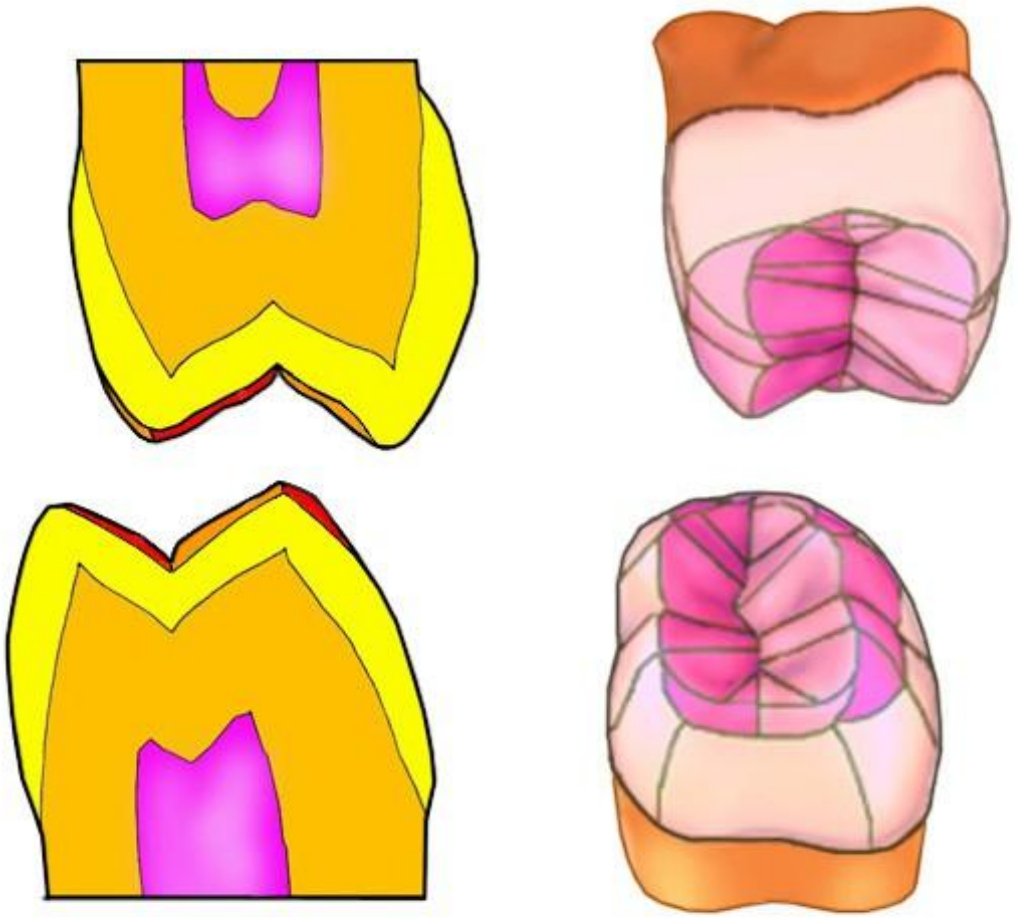

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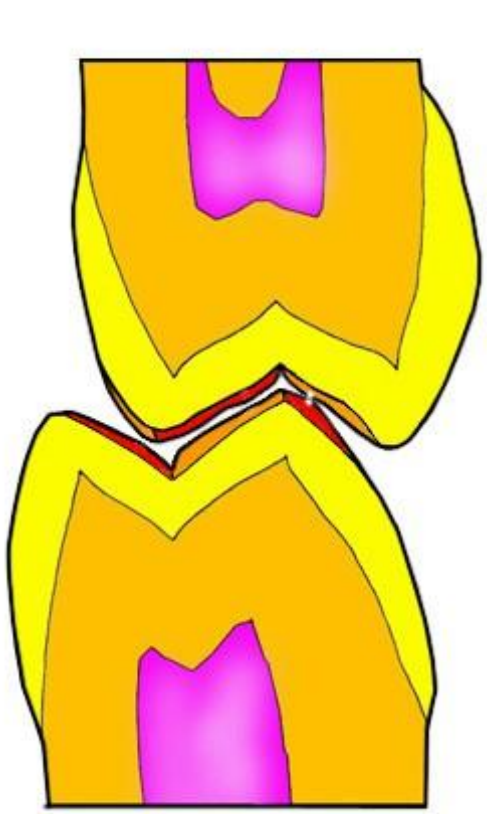

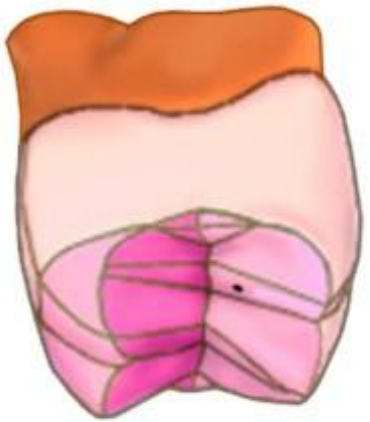

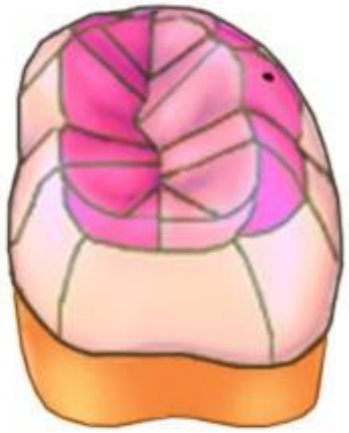

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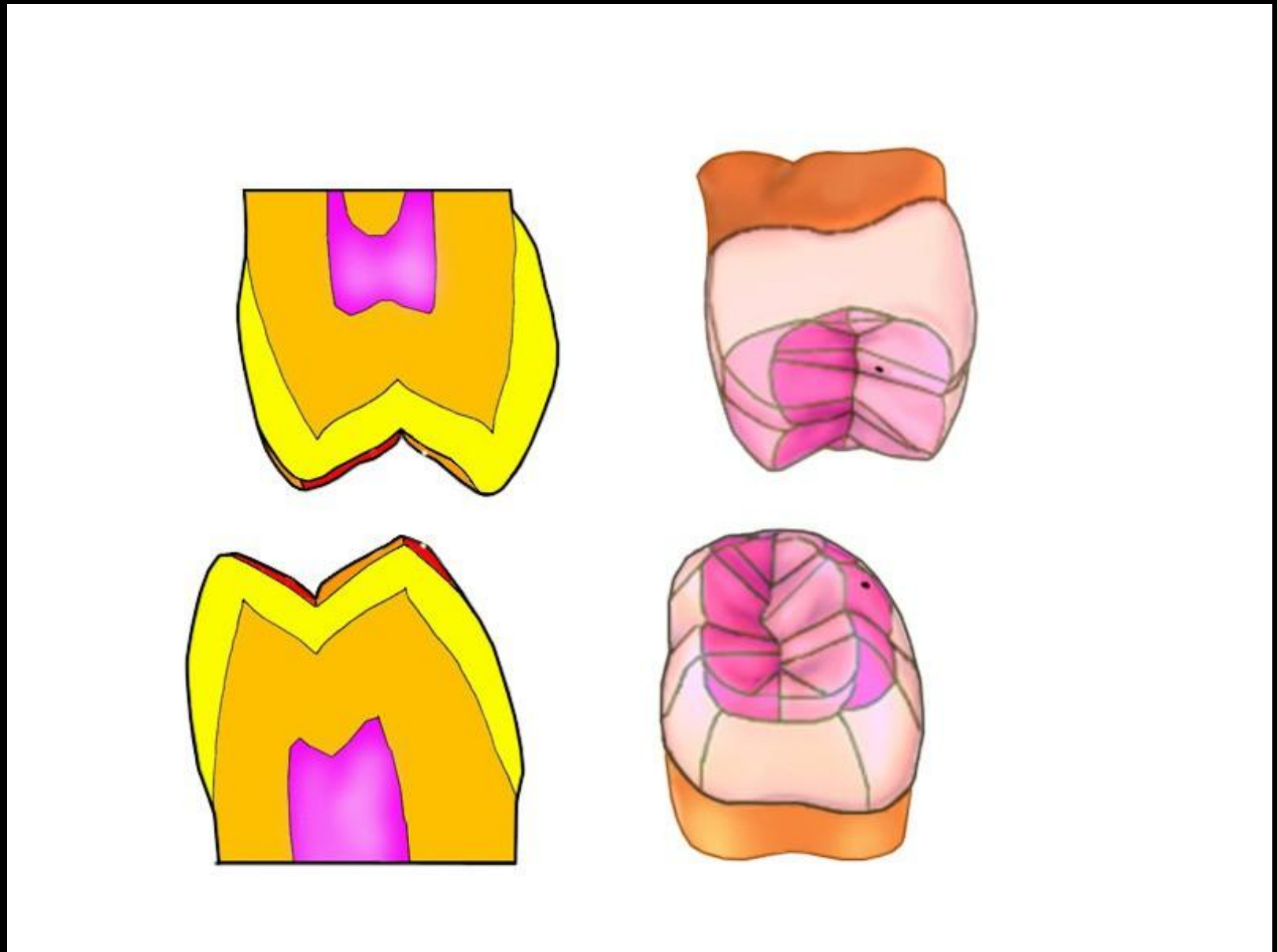

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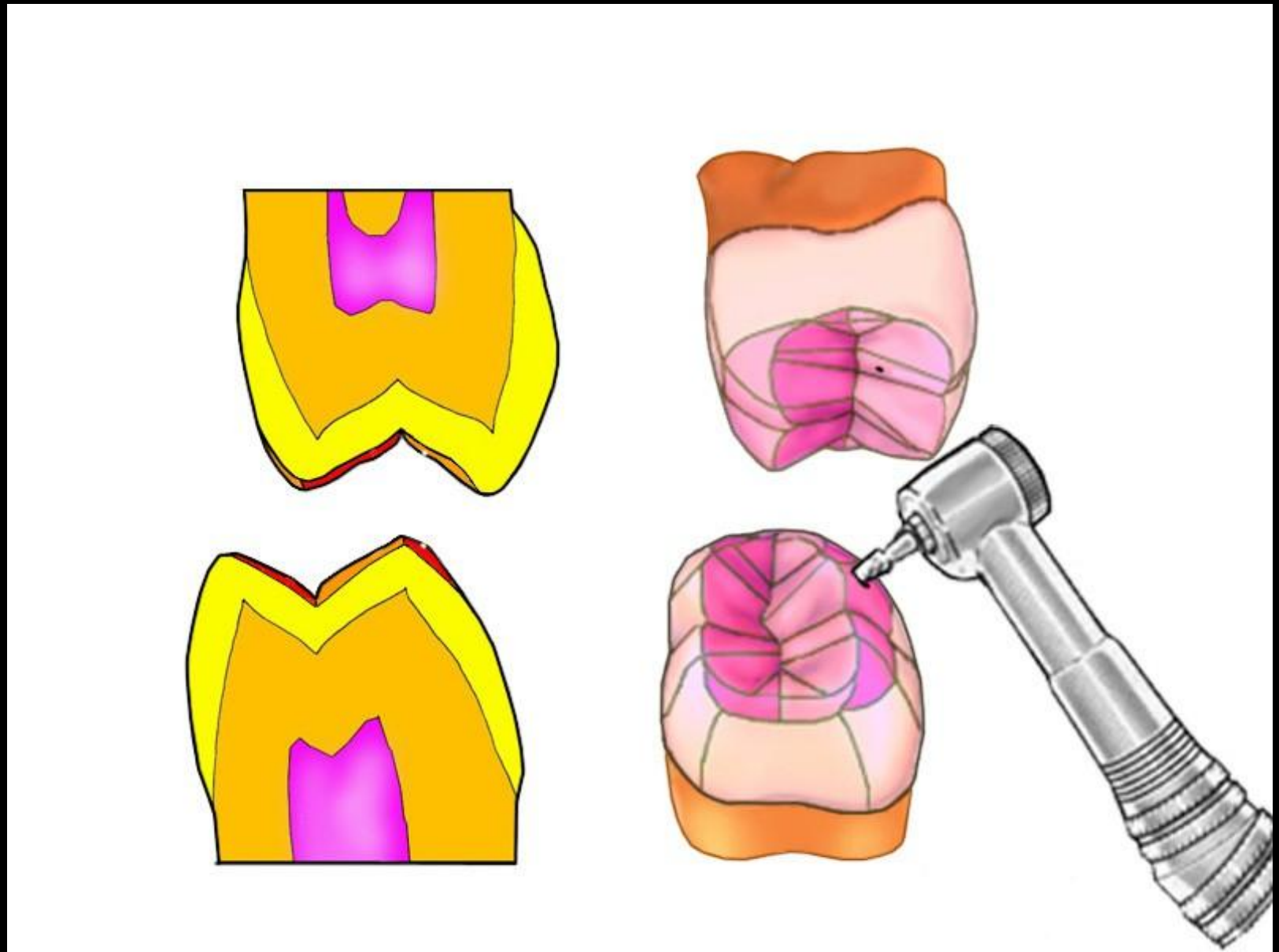

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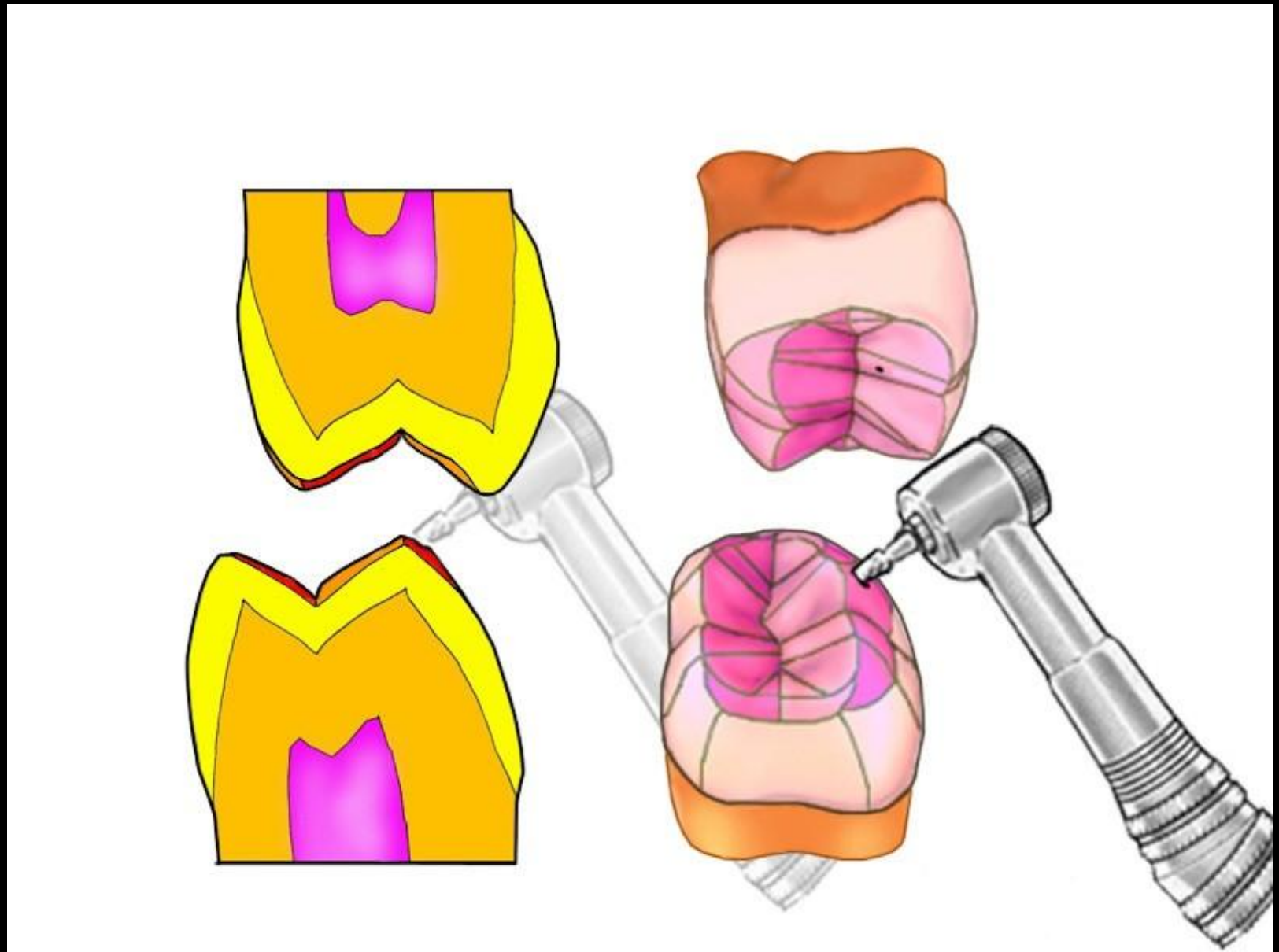

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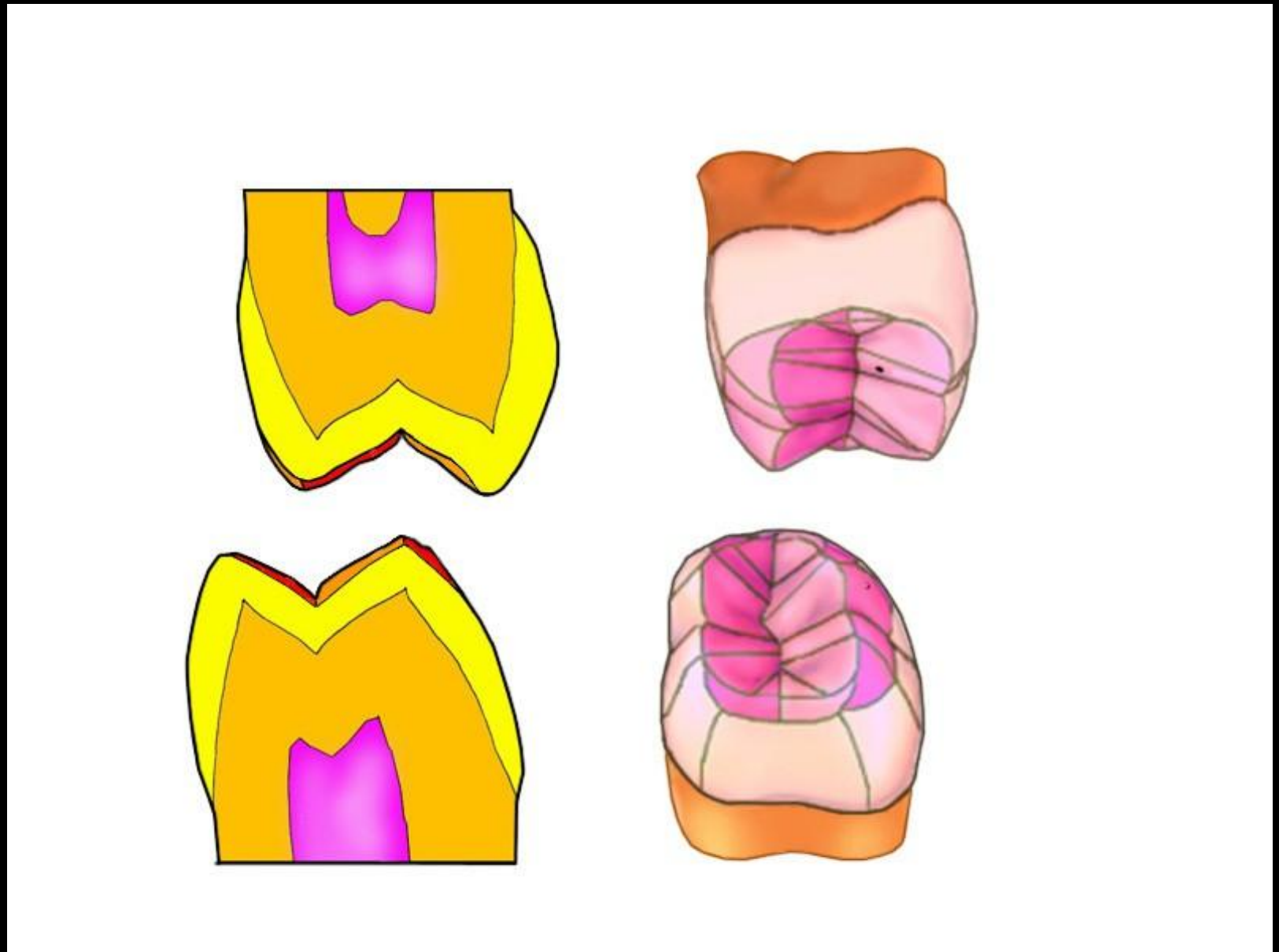

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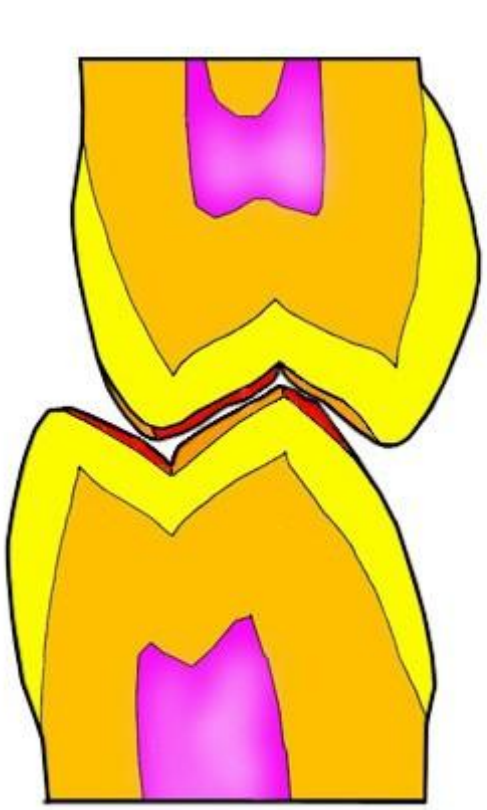

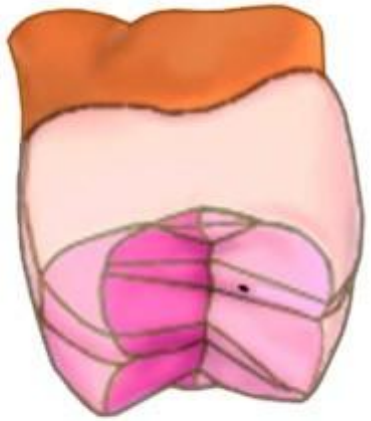

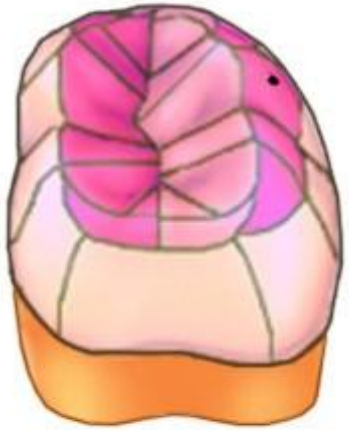

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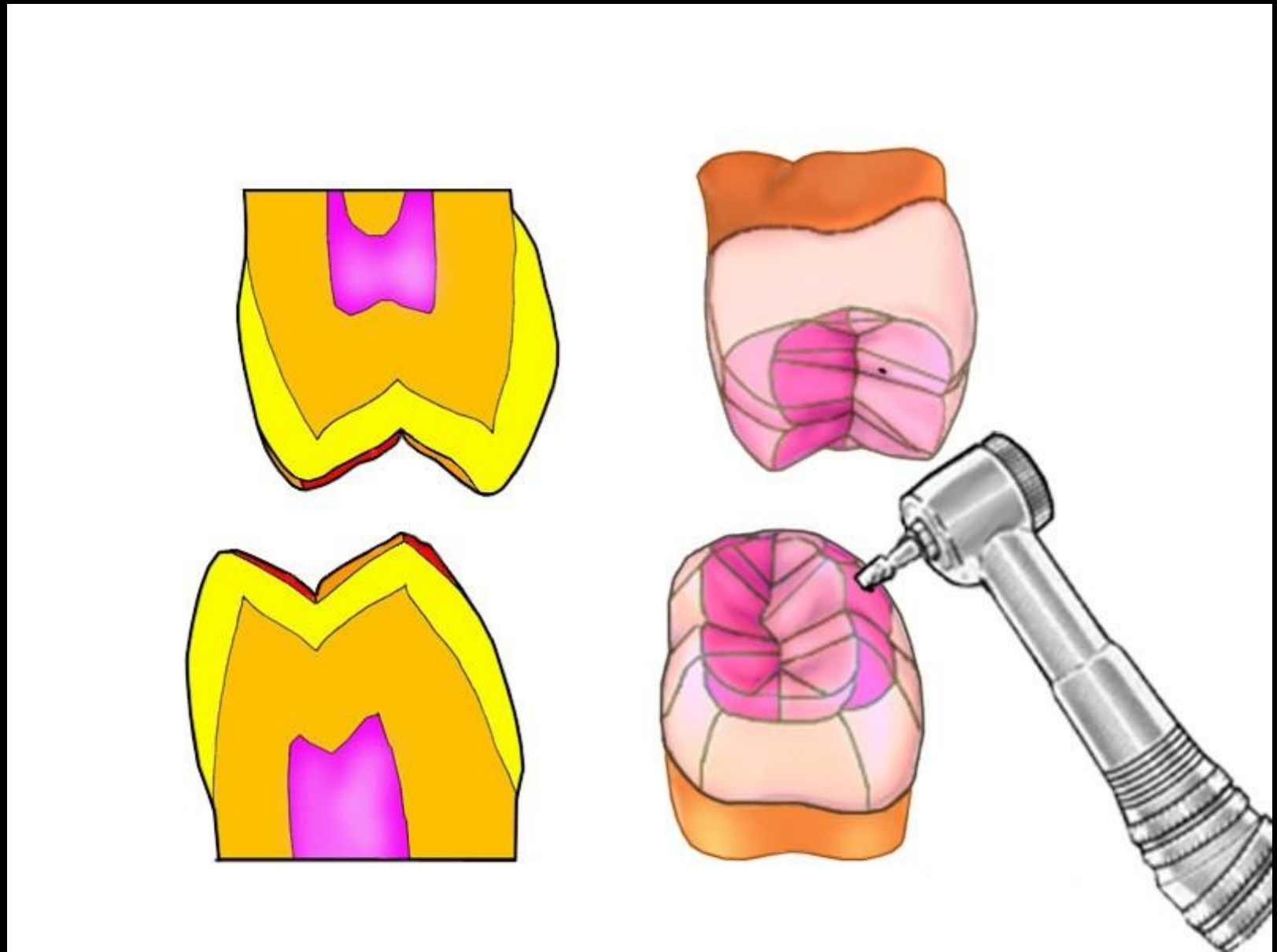

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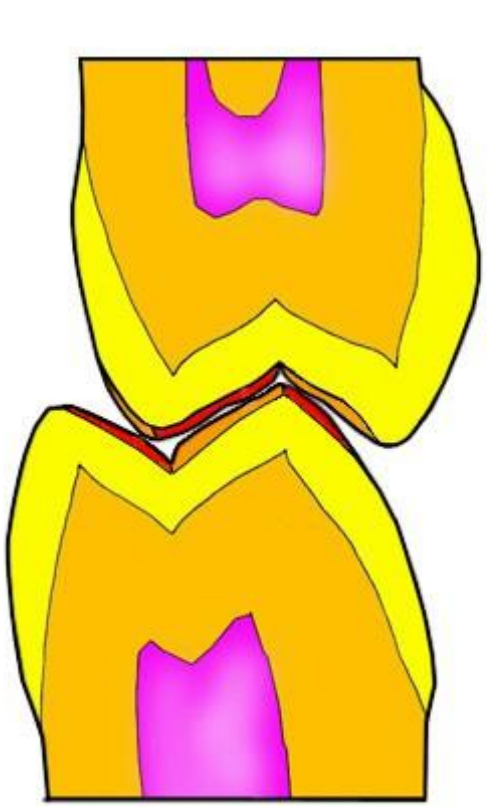

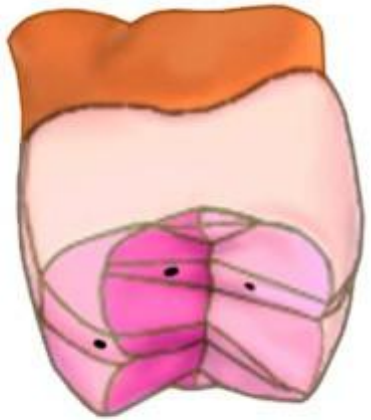

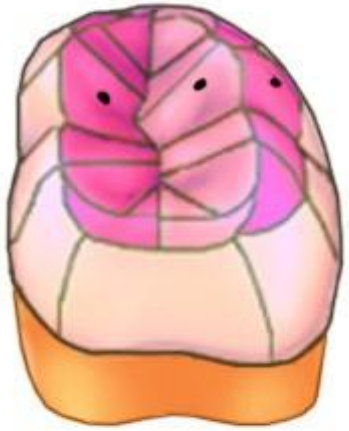

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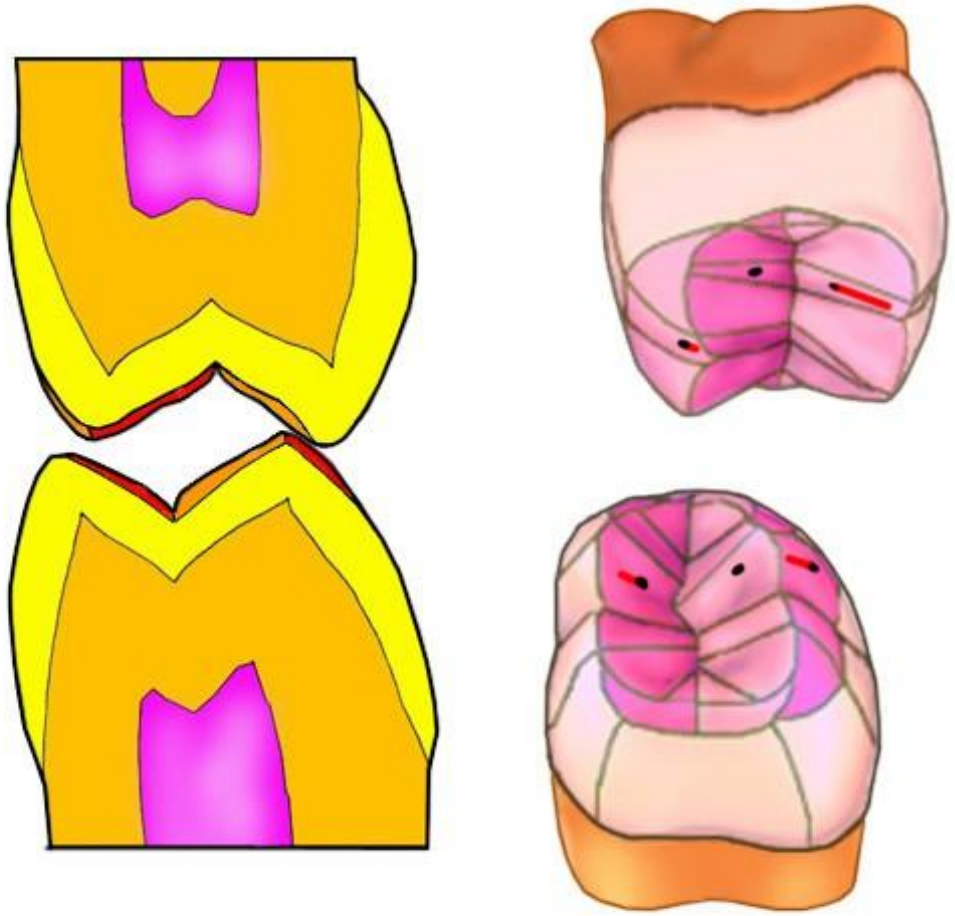

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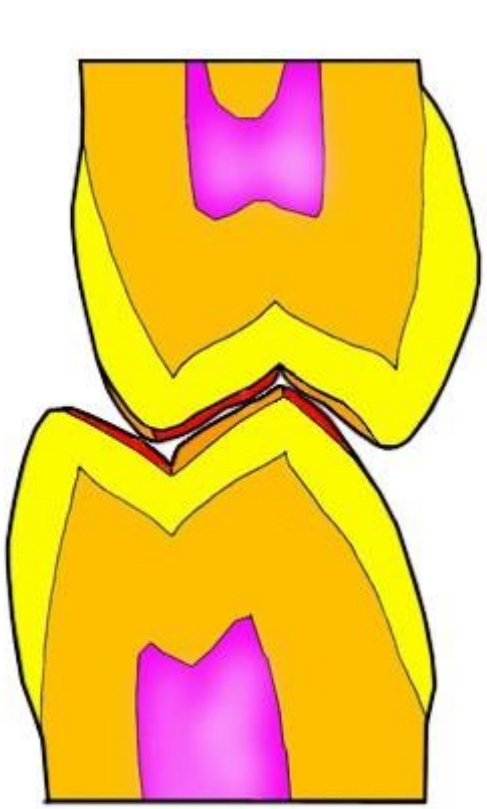

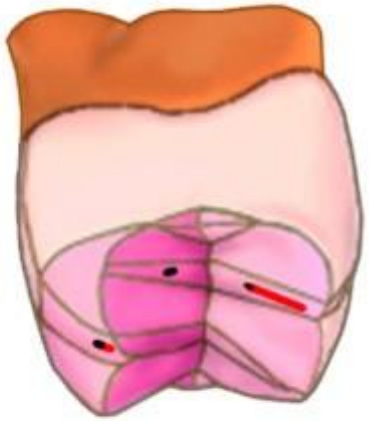

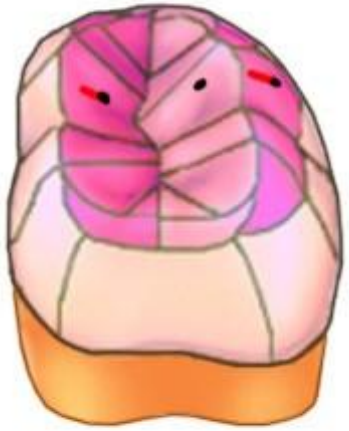

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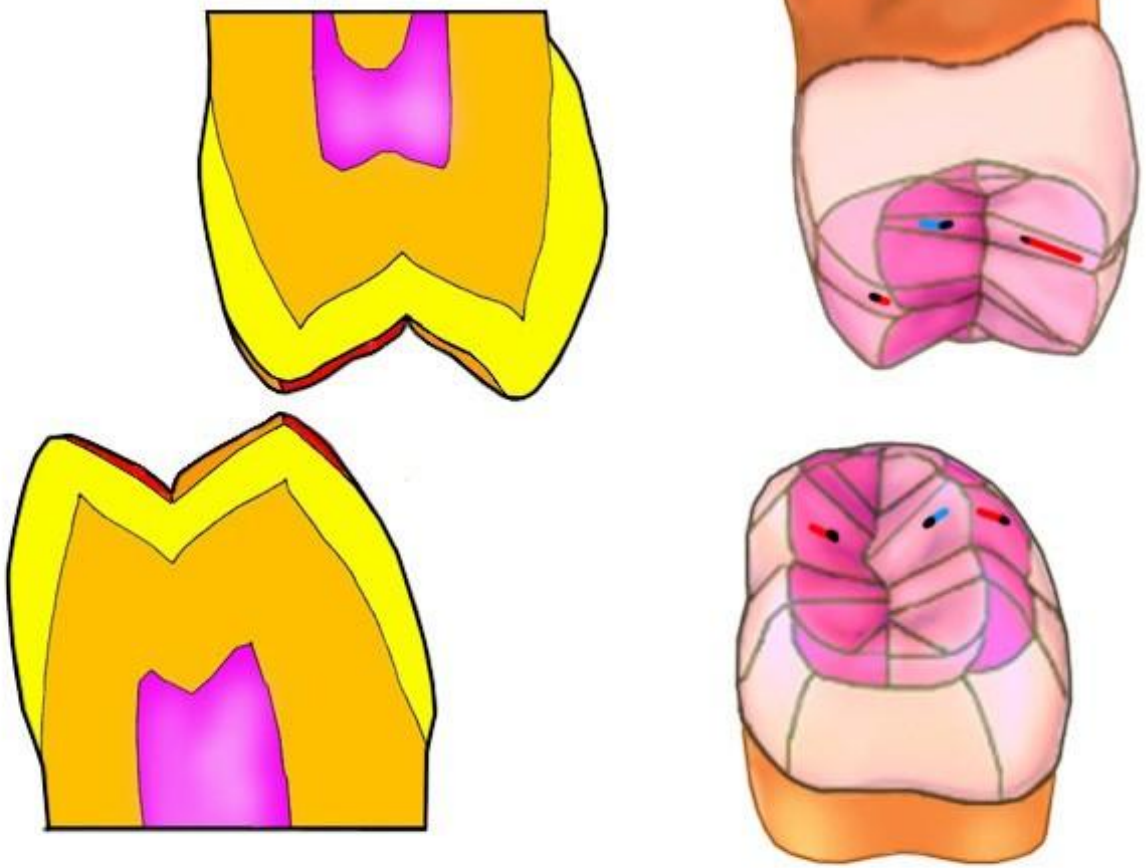

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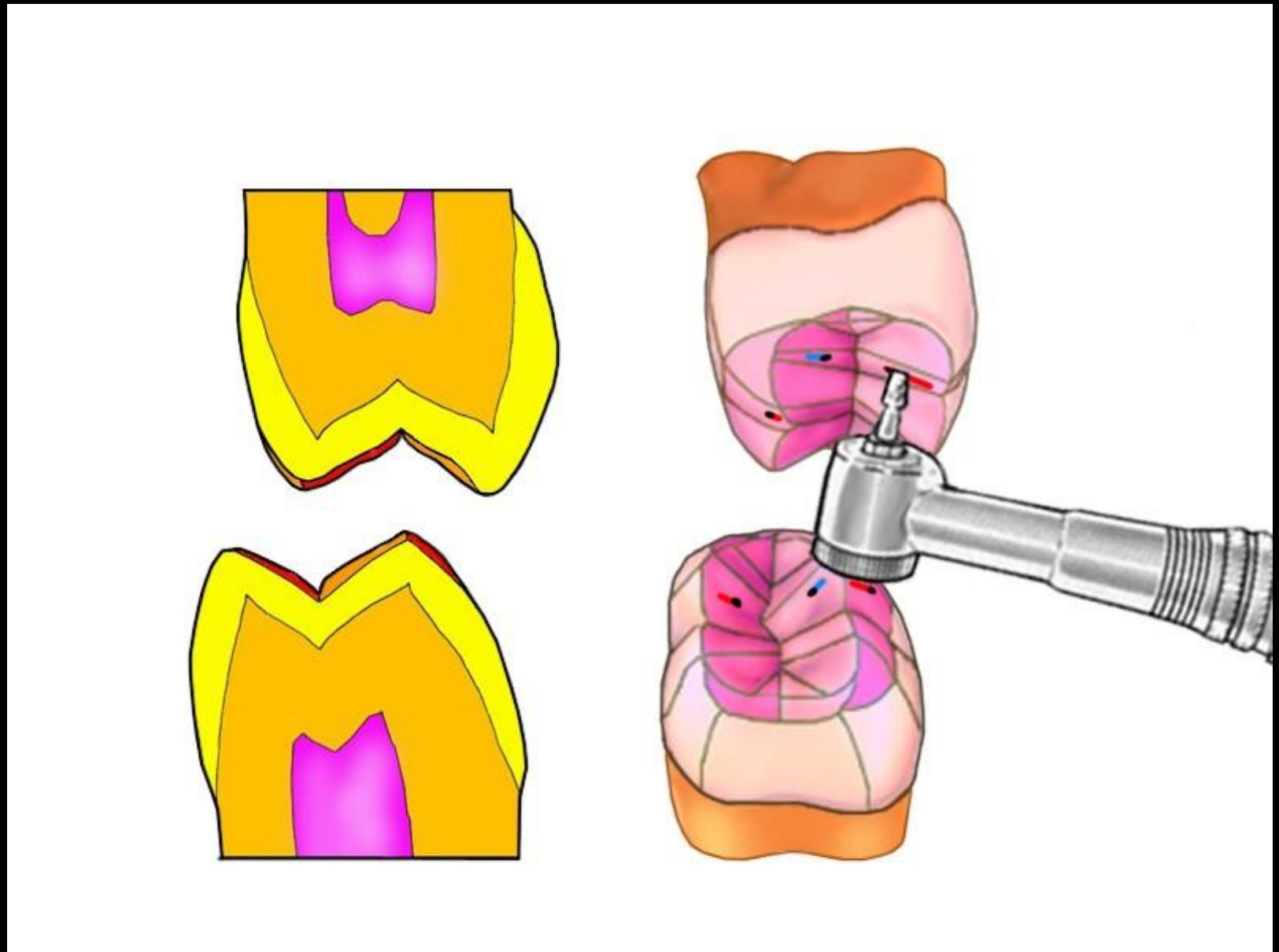

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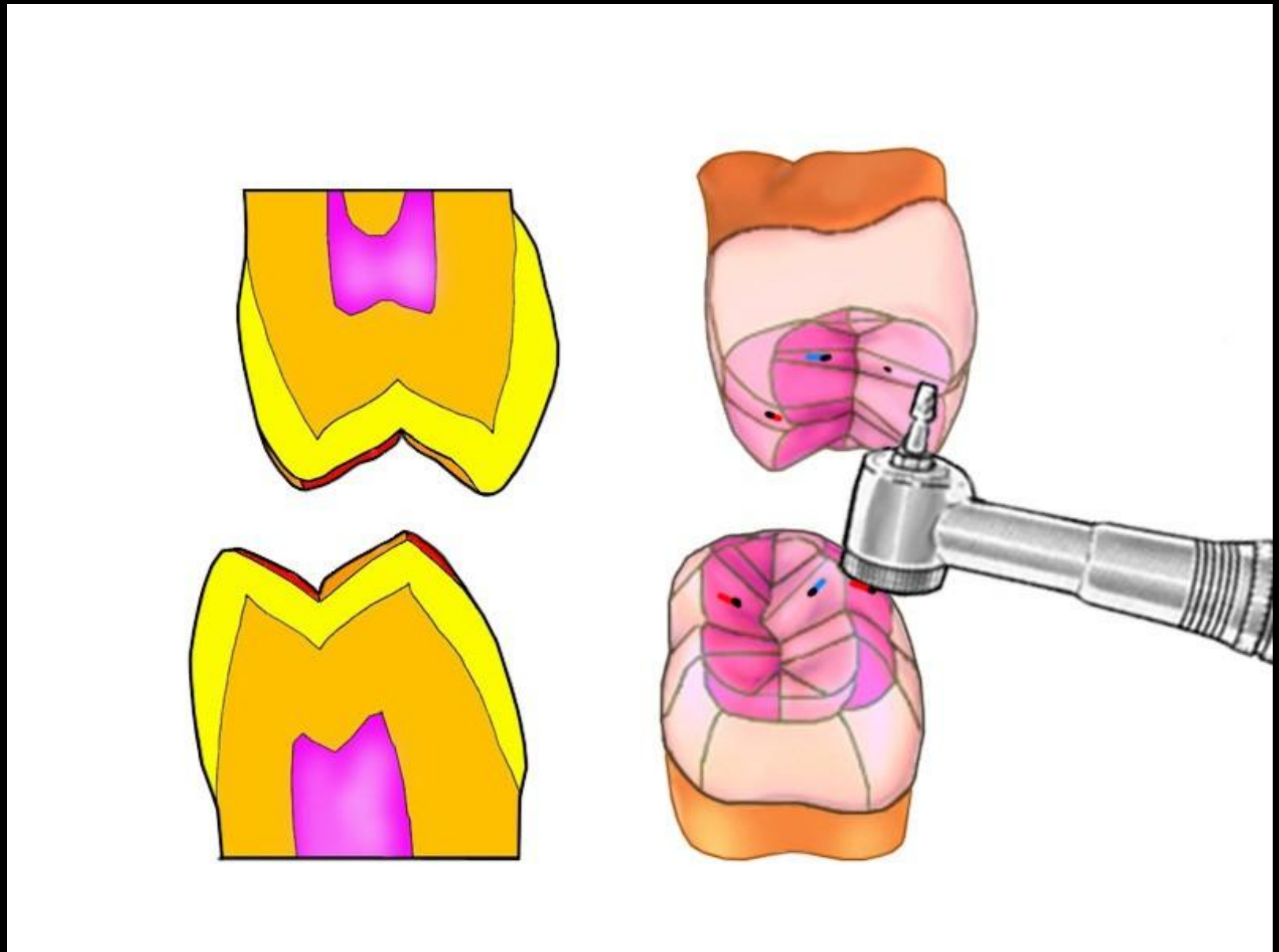
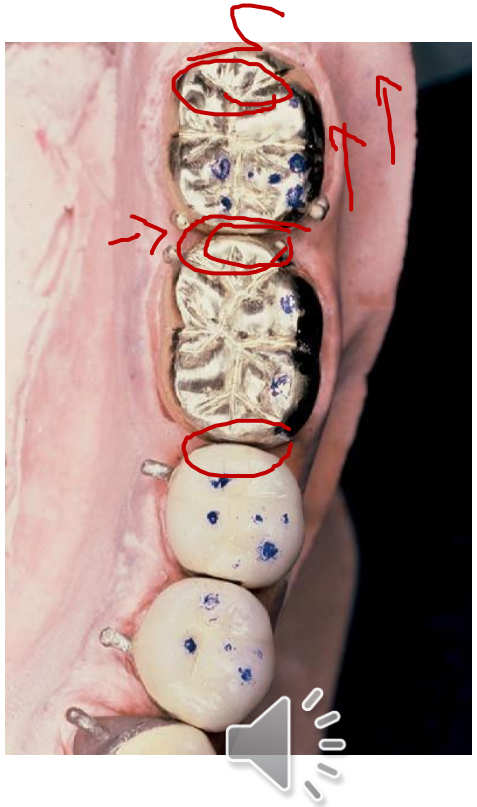


ASSESSMENT OF THE SEATED CROWN

Occlusion

- ► Completed adjustment
- Well distributed occlusal contacts
- Posterior teeth: the prosthesis and the remaining dentition should have the same occlusal contact and hold shim stock
- Anterior teeth: the prosthesis should lightly hold shim stock if other anterior teeth do



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ASSESSMENT OF THE SEATED CROWN

Aesthetics

- Patient approval should be obtained prior to cementation
- Shade and morphology
  - Lighter shade: can be stained and glazed
  - Darker shade: should be cut back and followed by new ceramic application
- Modify the morphology with diamond burs and soflex discs
  - Send back for glazing
- Consider temporary cementation

Before

After

ASSESSMENT OF THE SEATED CROWN

Finishing and Polishing

- Metal: rubber polishing wheels and points
- Ceramic: Rough ceramic will wear the opposing teeth
  - Composite finishing rubber burs
  - Rubber cup and diamond polishing paste
  - Or send to laboratory for reglazing

ASSESSMENT OF THE SEATED CROWN

Finishing and Polishing

- Metal: rubber polishing wheels and points
- Ceramic: Rough ceramic will wear the opposing teeth
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  - Rubber cup and diamond polishing paste
  - Or send to laboratory for reglazing

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Systematic approach

1. Evaluation of the restoration on the die

a) Die and opposing model
b) Internal surface of restoration
c) Restoration on the model (die)

2. Seating the crown on the prepared tooth

a) Proximal contact
b) Internal fit
c) Marginal fit

3. Assessment of the seated crown

a) Stability
b) Contour
c) Occlusion
d) Aesthetics

Questions?

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