THE UNIVERSITY OF WESTERN AUSTRALIA

Occlusion and TMJ + Tooth Replacement

By Dr Cheryl Fu

Learning Outcomes

- Recap on key concepts of occlusion: Centric Relation, Maximum Intercuspation Position (see 2025 occlusion lectures for full slides)
- Discuss clinical implications of pathological adaptations caused by malocclusion.
- Recap the envelope of function
- Review the criteria for the ideal occlusion and how to assess clinically.
- Tooth replacement options (including immediate replacement options)

Whilst theoretical background knowledge is important, as this module focuses on the “clinical” aspects, we will try to keep the topic relevant.

As these lectures are given as a guest for “Clinical Practice 3”, these concepts will not be directly assessed for the FPD/RPD module, unless the content is also covered in the prosthodontic module. However, you are expected to retain knowledge from previous years.

Occlusion

THE JOURNAL OF PROSTHETIC DENTISTRY

THE GLOSSARY OF PROSTHODONTIC TERMS

Ninth Edition

occlusion \a-klōō′shun\ *n* (1645)**: 1.** the act or process of closure or of being closed or shut off; **2.** the static relationship between the incising or masticating surfaces of the maxillary or mandibular teeth or tooth analogues; *comp,* ARTICULATION, CENTRIC OCCLUSION, COMPONENTS OF OCCLUSION, ECCENTRIC OCCLUSION, LINE OF OCCLUSION, LINEAR OCCLUSION, MONOPLANE OCCLUSION, PATHOGENIC OCCLUSION, SPHERICAL FORM OF OCCLUSION

Occlusion

An ideal occlusion is defined as “the maxillary and mandibular teeth contact simultaneously when the condylar processes are fully seated in the mandibular fossae, and the teeth do not interfere with harmonious movement of the mandible during function. Ideally, in the fully bilateral seated position of the condyle– articular disk assemblies, the maxillary and mandibular teeth exhibit maximum intercuspation. This means that the maxillary lingual and mandibular buccal cusps of the posterior teeth are evenly distributed and in stable contact with the opposing occlusal fossae. These functional cusps can then act as stops for vertical closure without excessively loading any one tooth, while left and right TMJs concurrently are in an unstrained position.”

Importance of Occlusion

Occlusal disharmony can cause a variety of issues:

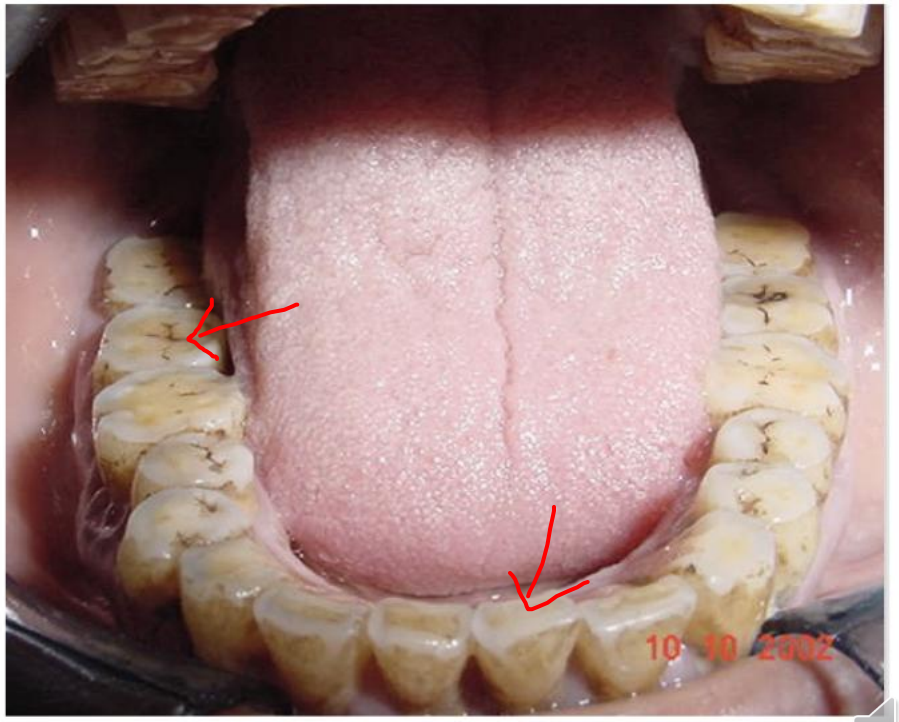
- Attrition
- Splayed teeth
- Sore/sensitive teeth
- Mobility/occlusal fremitus
- Re-occurring failure of restorations/ cracked teeth
- + more

Attrition

- Defined as wear due to “tooth-on tooth” friction
- Usually from bruxism

Attrition

- How to determine clinically? Check the posterior teeth, may be due to deflective interferences from CR causing a forward slide.
- If even the anterior teeth are affected, may result in treatment difficulty (loss of prosthetic space etc.)
- If mainly affecting anterior teeth may be due to poorly shaped restorations on anterior teeth resulting in interferences to the envelope of function



Splayed Teeth

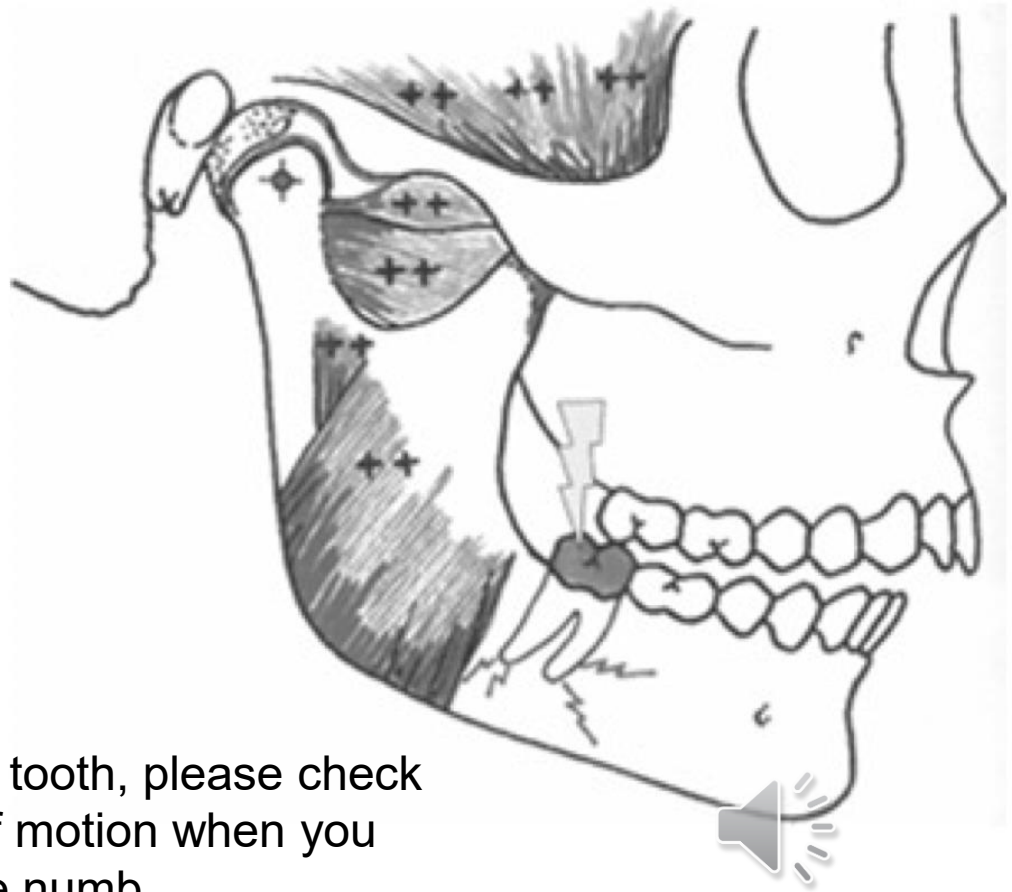
Same type of forces that cause tooth wear can also force anterior teeth forwards.

Possible causes:

- Loss of posterior support (posterior teeth are better at supporting the occlusal forces)
- Anterior teeth take excessive occlusal load

Sore/Sensitive Teeth

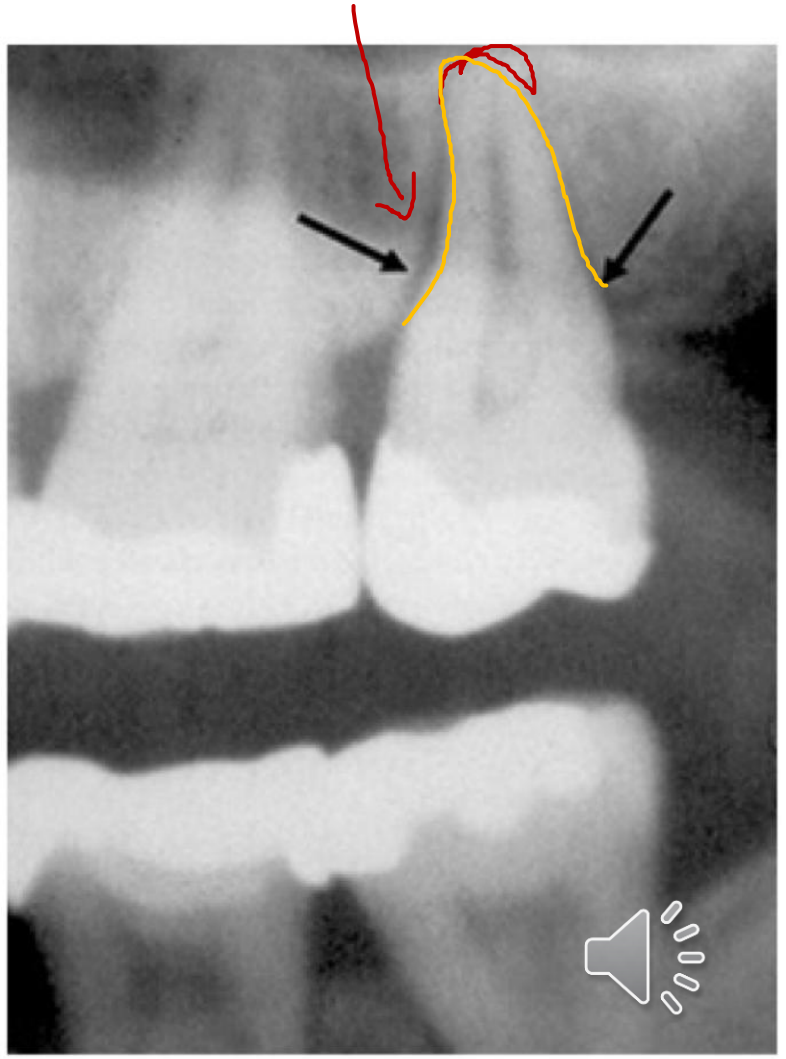
- Compression of periodontal ligament can cause tenderness during percussion/pressure
- Occlusal overload can also cause hypersensitivity of the pulp
- May be due to occlusal interferences from **restorations**, or general occlusal overload/bruxism.



If you recently placed a restoration on the tooth or opposing tooth, please check bite again. Sometimes patient fail to do their full envelope of motion when you check with articulating paper. Also hard to tell when they are numb.

Hypermobility

- Occlusal fremitus from occlusal overload
- Can usually see widening of the PDL, with absence of apical radiolucency consistent with infections.
- Should check occlusal contacts for deflective contacts or occlusal overload and adjust if required.



Cracked teeth/restorations

- Fracture of cusps or other restorative material from heavy loading.
- Often seen in occurring to the last couple of teeth in the arch which takes considerable occlusal forces.

J Endod. 2016 Apr;42(4):557-62. doi: 10.1016/j.joen.2016.01.014. Epub 2016 Mar 2.

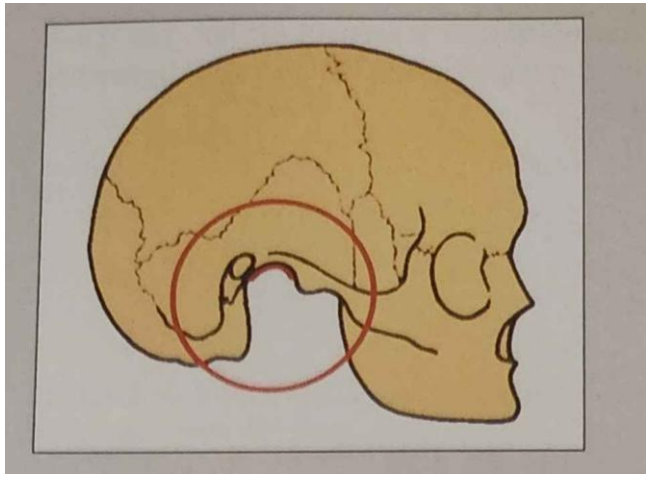
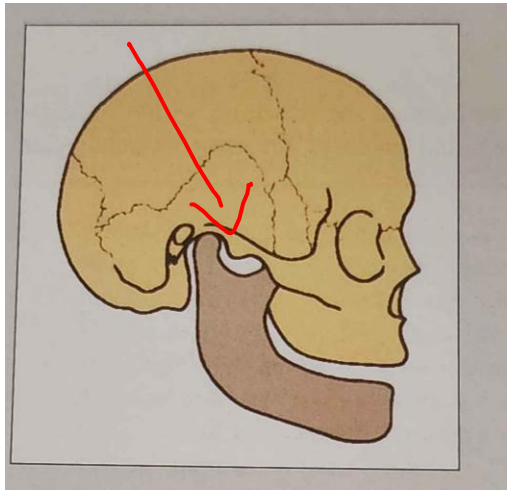
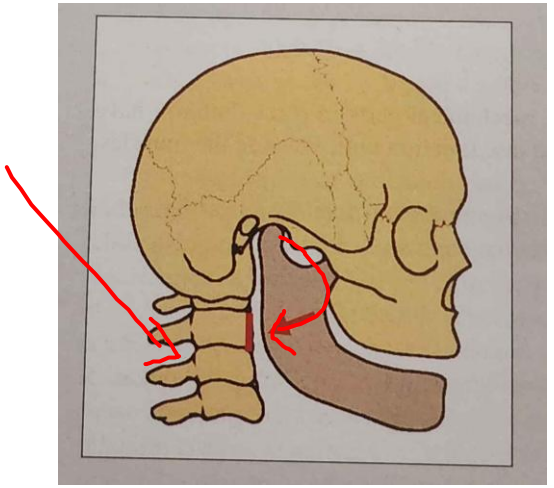
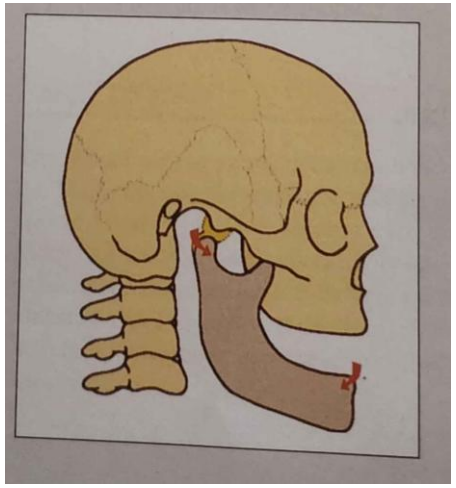
Cracked Teeth: Distribution, Characteristics, and Survival after Root Canal Treatment

Sung Hyun Kang [1], Bom Sahn Kim [2], Yemi Kim [3]

Results: One hundred seventy-five teeth were diagnosed with cracks. Most of the patients were aged 50-60 years (32.0%) or over 60 (32.6%). The lower second molar was the most frequently (25.1%) affected tooth. Intact teeth (34.3%) or teeth with class I cavity restorations (32.0%) exhibited a higher incidence of cracks. The 2-year survival rate of 88 cracked teeth after RCT was 90.0%. A probing depth of more than 6 mm was a significant prognostic factor for the survival of cracked teeth restored via RCT. The survival rate of root-filled cracked teeth with a probing depth of more than 6 mm was 74.1%, which is significantly lower than that of teeth with probing depths of less than 6 mm (96.8%) (P = .003).

Determinants of Occlusion

Have you ever wondered why the the opening of the mouth has both a hinge and translatory movement?

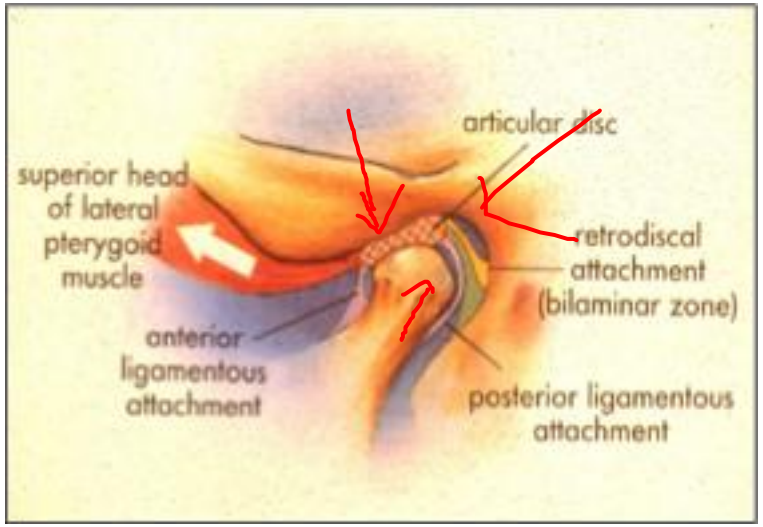





Disclaimer: This fantastic explanation is by Peter Dawson in the textbook “Functional Occlusion”, I did not invent it

TMJ

The temporomandibular joint is comprised of:

- Condyle head
- Articular disc (dense connective tissue)
- Glenoid fossa

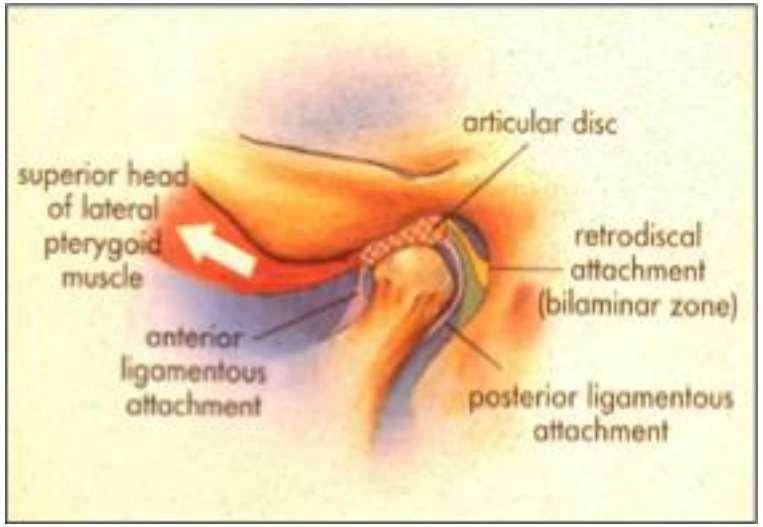


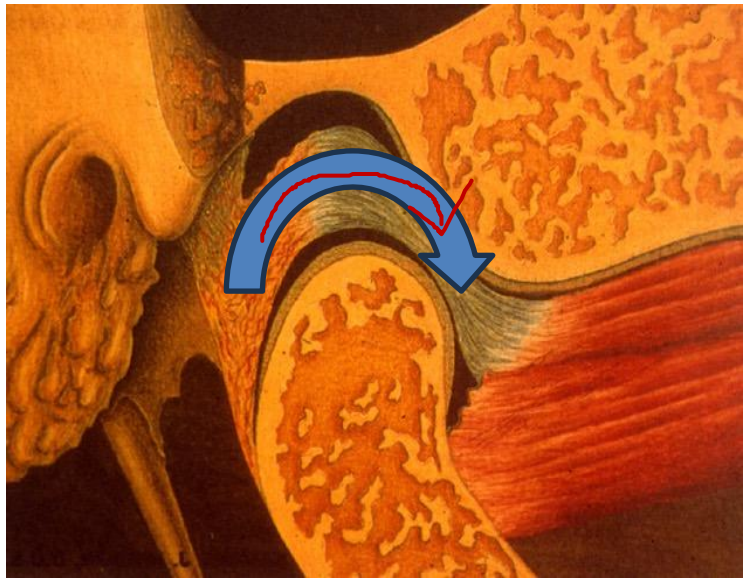
You have already been delivered lectures on the TMJ (in previous years such as anatomy units). I will not be going over this topic in great detail for today. Please revise in your own time if you have forgotten!

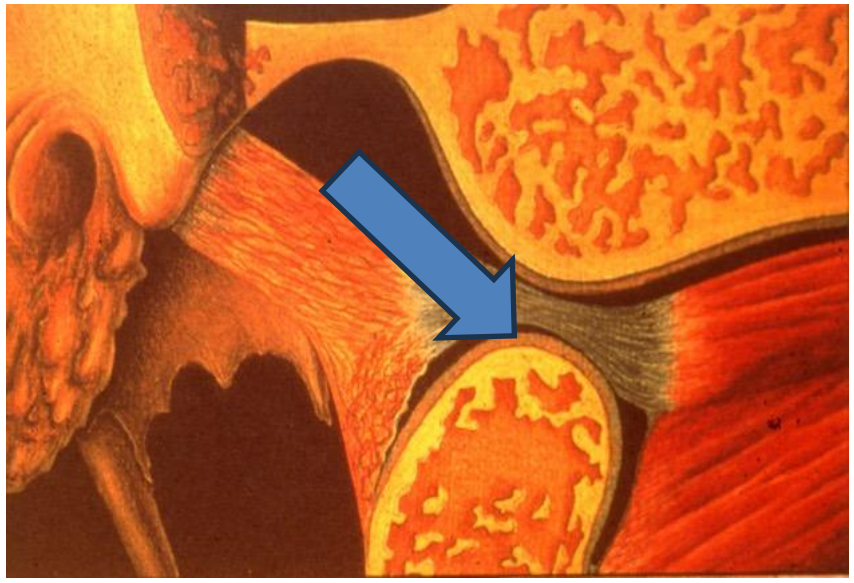
TMJ

The temporomandibular joint is capable of both hinging and gliding motions (ginglymoathrodial).

- During the first part of opening (<2cm), the condyle rotates WITHIN the glenoid fossa about the intra-condylar axis



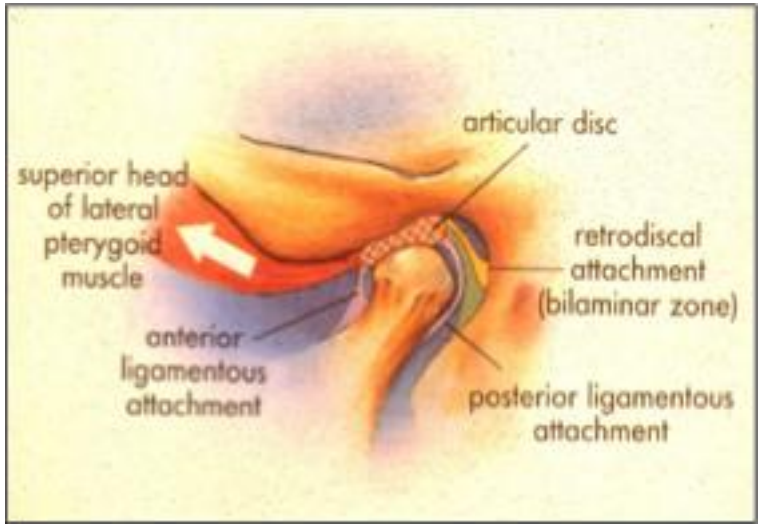


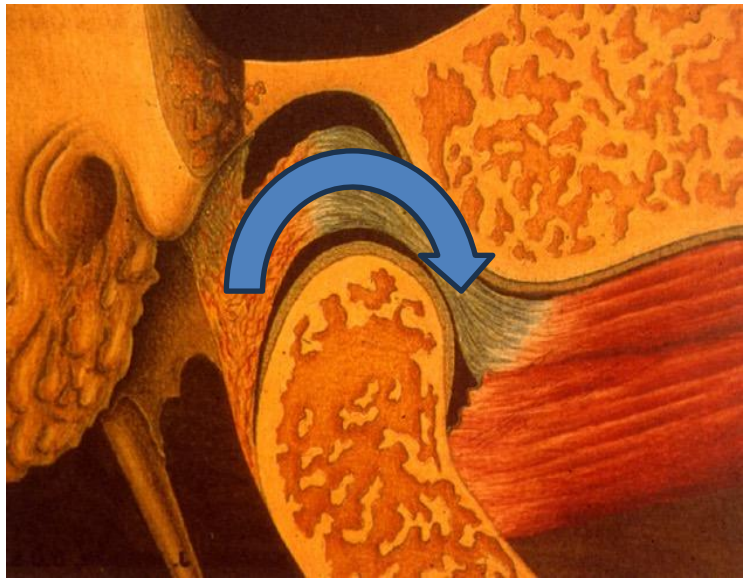


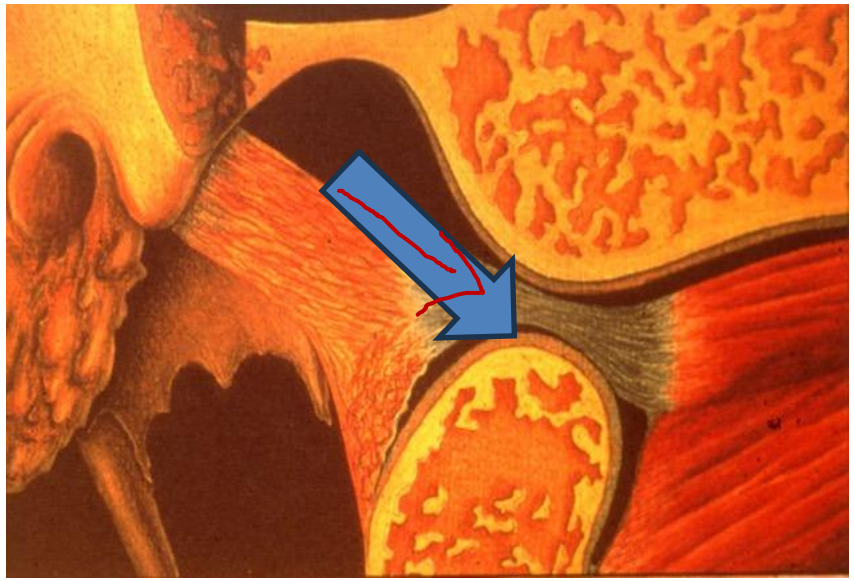
TMJ

The temporomandibular joint is capable of both hinging and gliding motions (ginglymoathrodial).

- During the second part of opening(>2cm), there is a translational movement as the condyle glides against the articular eminence.



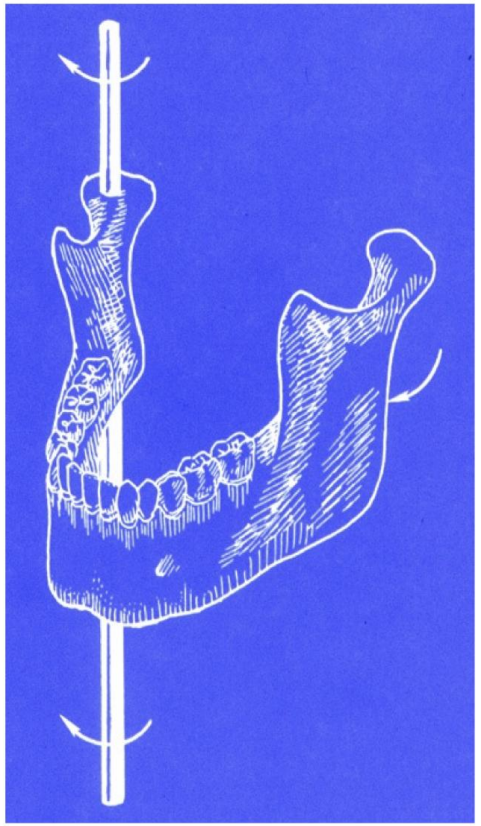




TMJ – Excursive movements

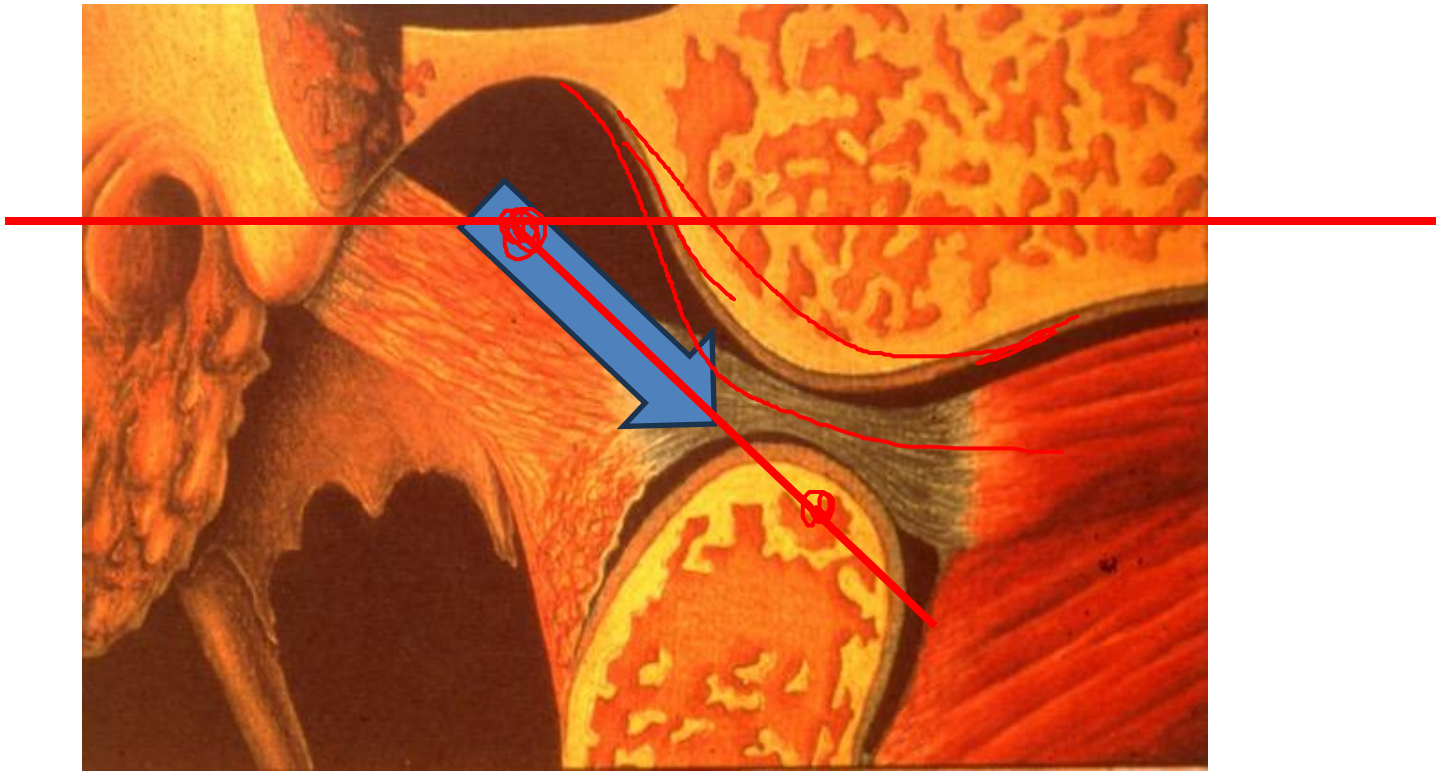
Other than just opening and closing that would produce static occlusal contacts, a wide array of excursive movements are possible through different movements of the condyles

- Protrusive movements: Both condyles move in gliding motion forwards
- Lateral movements:
  - Working side rotates about the vertical axis without leaving the glenoid fossa
  - Non-working side has a gliding path against the articular eminence.



Protrusive Movements

The angle of the movement downwards is hence determined by the articular eminence. This termed “condylar angle” or “guidance inclination”.



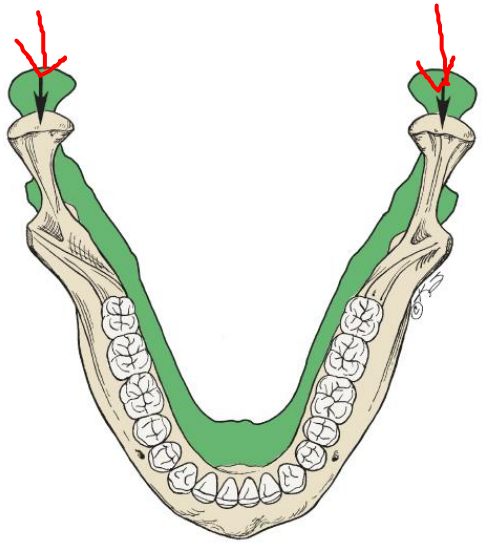


FIGURE 4-10 ■ Protrusive mandibular movement in the horizontal plane.

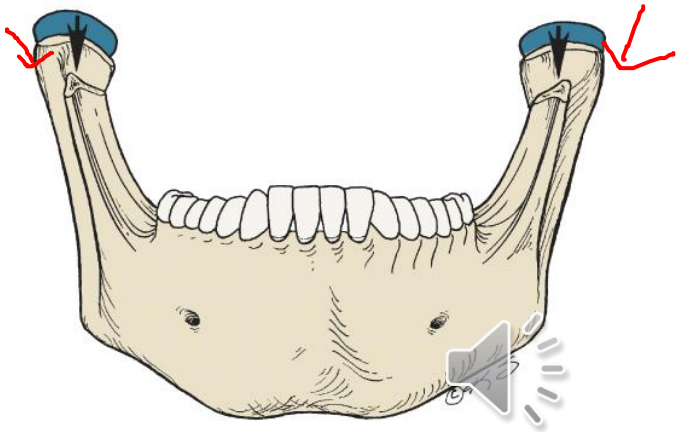
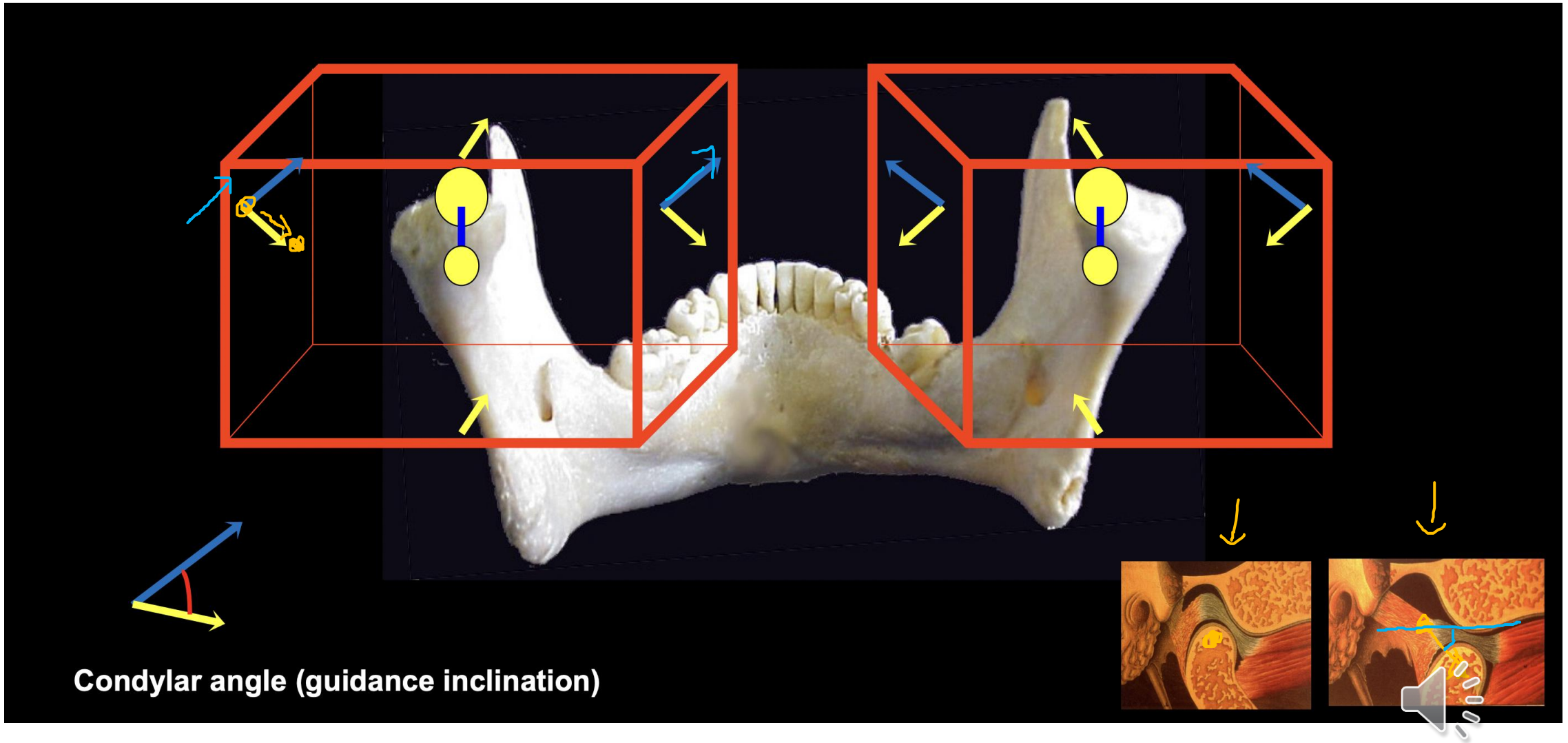


FIGURE 4-12 ■ Protrusive movement in the frontal plane.

Images from Contemporary Fixed Prosthodontics

TMJ – Condylar Angle/Inclination



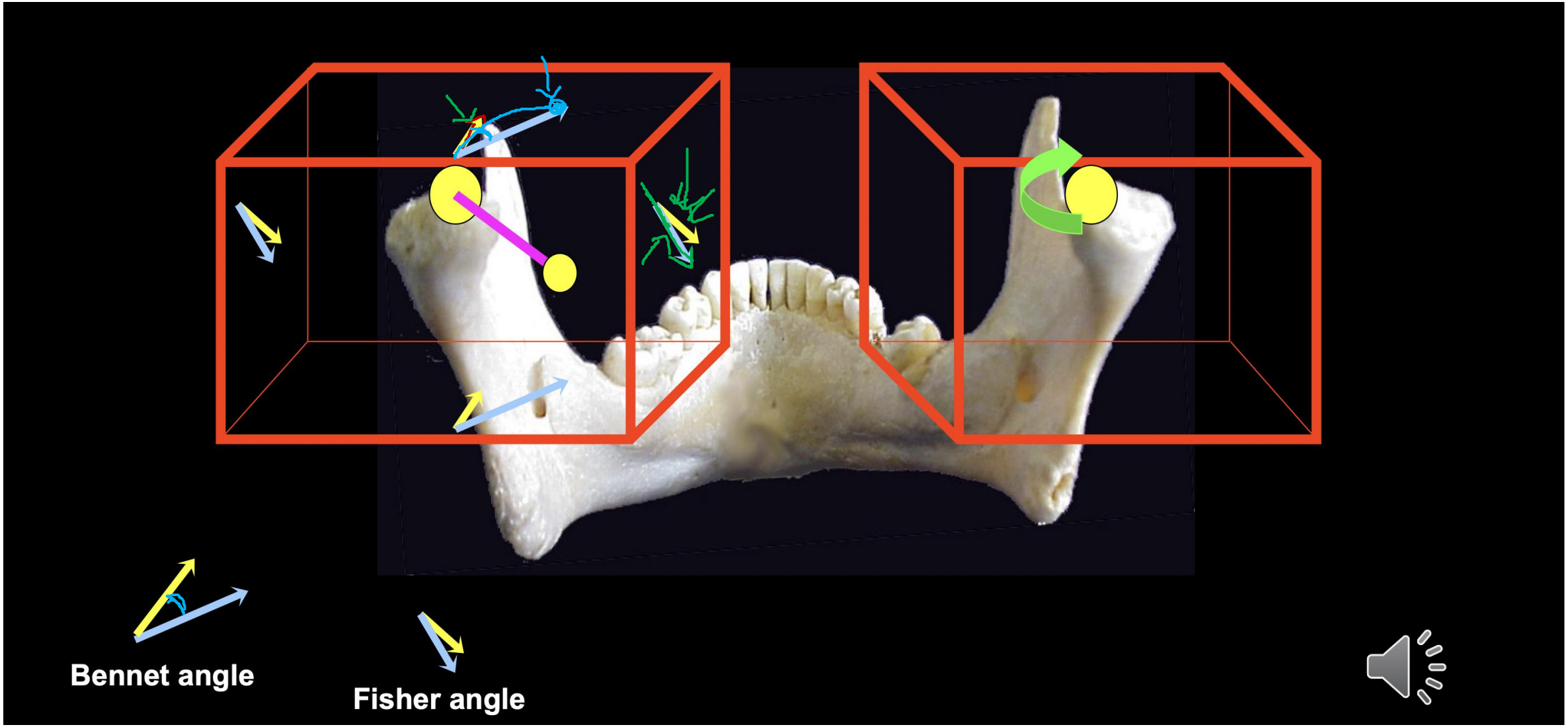
Slide by Dr Matsubara and Dr Nedelcu

Excursive Movements

During lateral excursive movements, the principal movement is on the non-working side.

- Head of condyle of the non-working side moves forward, downward and medially
- The downward angle is limited by the articular eminence (condylar angle)
- The maximal angle of medial movement is the Bennet angle. (Formal definition “angle formed between the sagittal plane and the average path of the advancing condyle as viewed in horizontal plane during lateral mandibular movement.)
- The angle between the protrusive movement and lateral excursive movement of the non-working side is the Fisher angle. It is thought that the lateral condylar path is steeper than the protrusive path (glenoid fossa/condyle isn’t a sphere).

TMJ – Bennet Angle

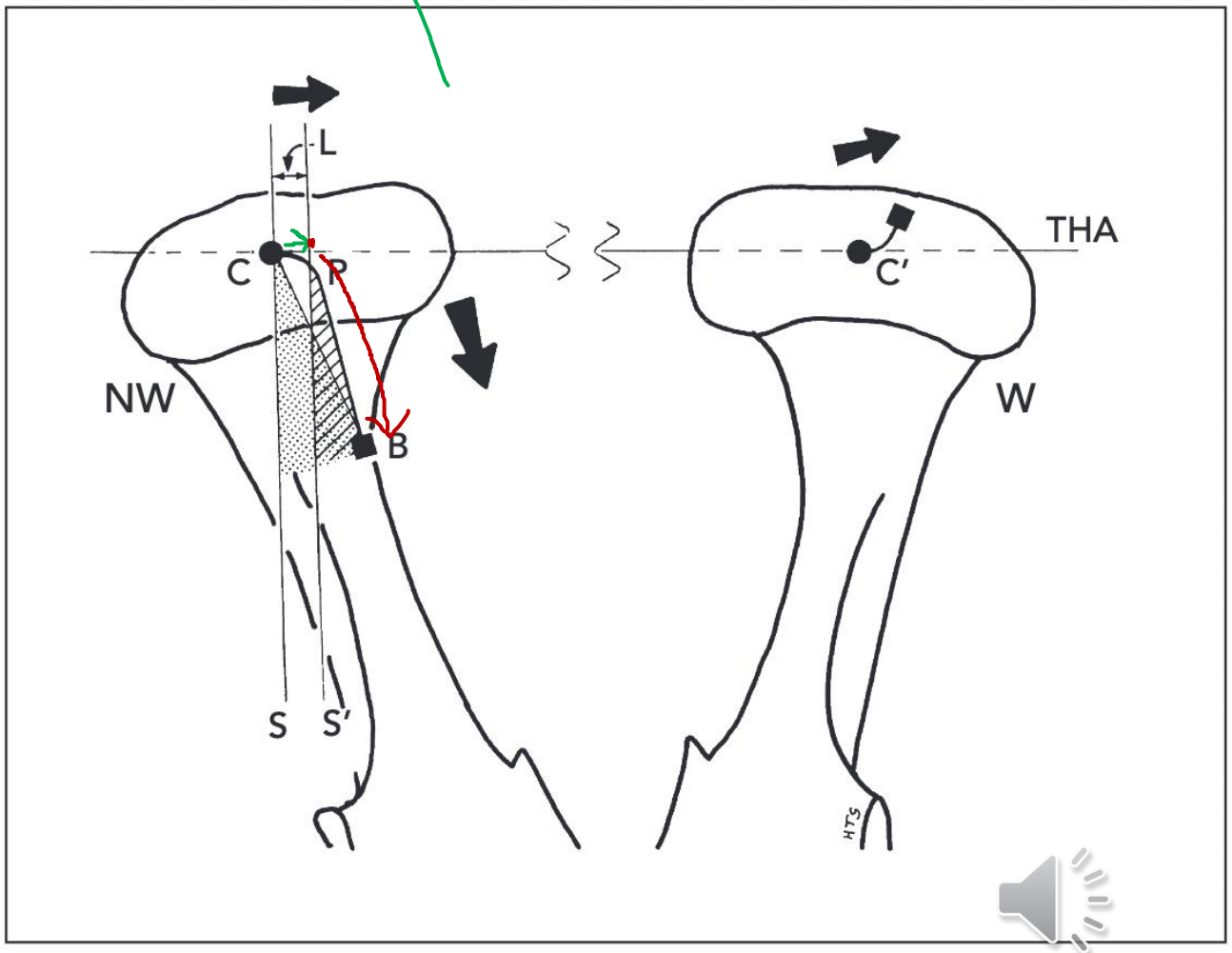


Slide by Dr Matsubara and Dr Nedelcu

Excursive Movements

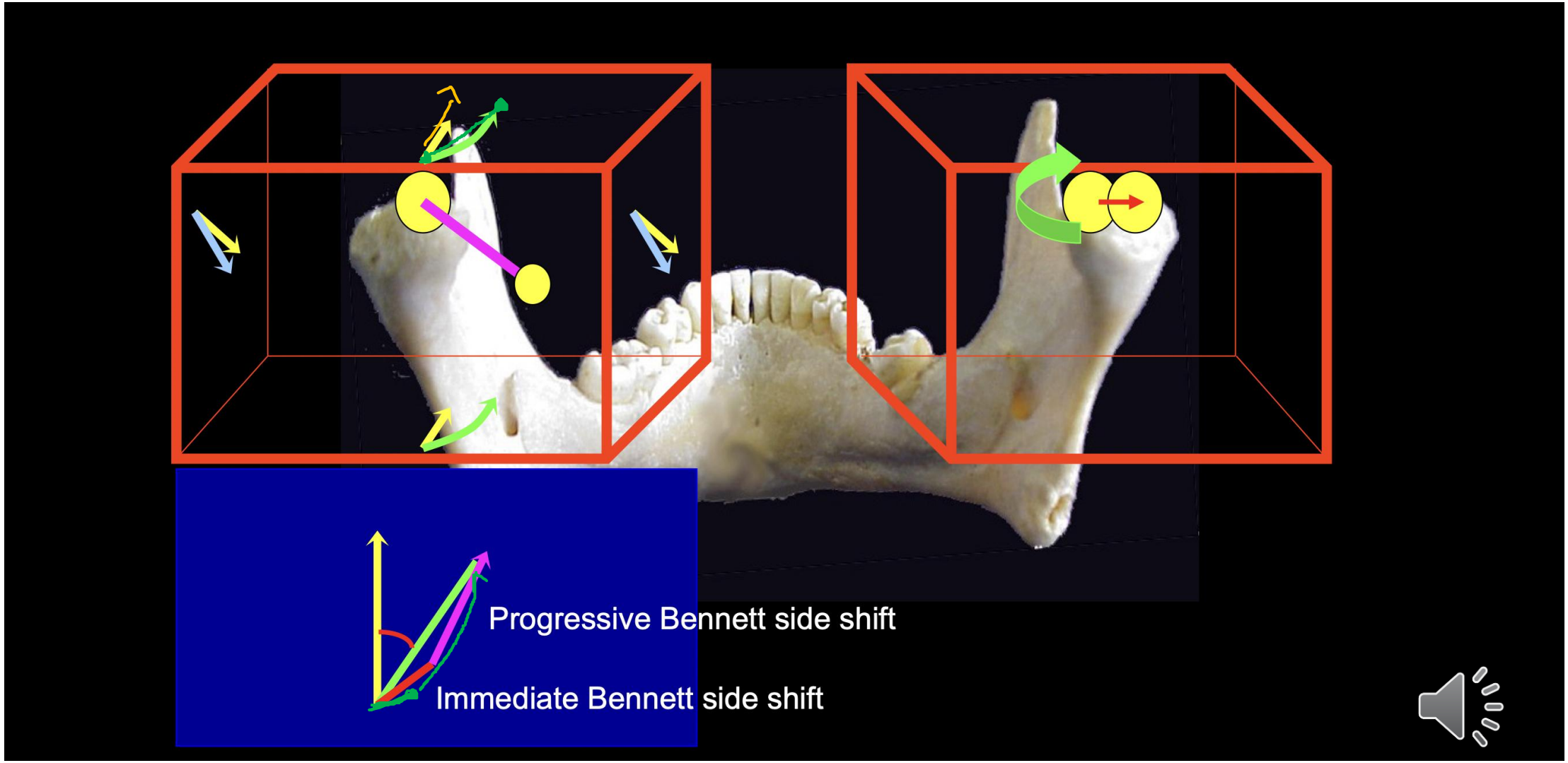
The lateral movement of the non-working condyle (Bennett side shift) is also not a linear movement.
It is comprised of:

- Immediate side shift (The non-working condyle moves straight medially)
- Progressive side shift (The non-working condyle moves from where it end up in immediate side shift, and translates laterally in a curve)



Fundamentals of Fixed Prosthodontics

Bennett Side Shift



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Excursive Movements

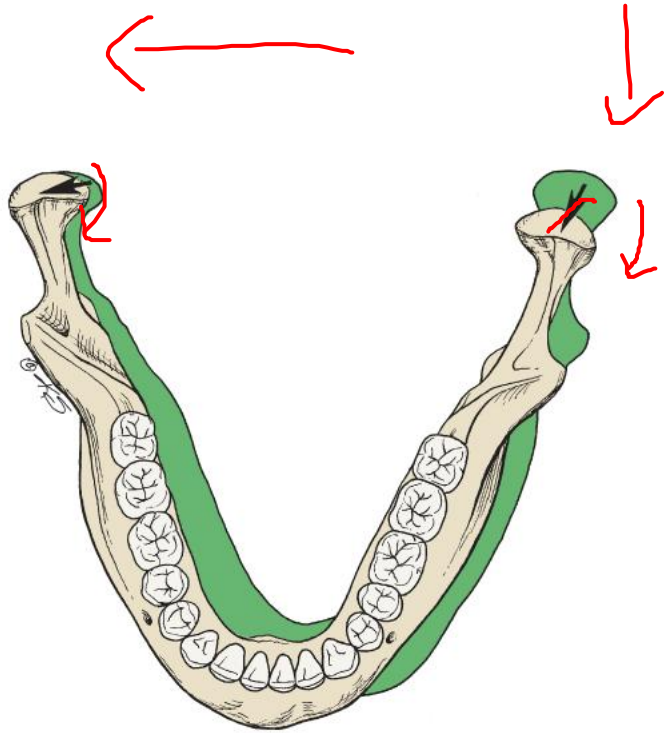

FIGURE 4-9 ■ Right lateral mandibular movement in the horizontal plane.

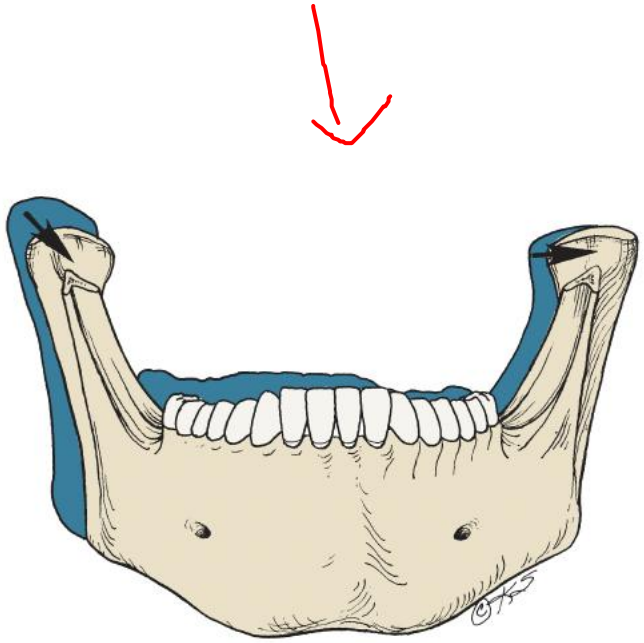

FIGURE 4-11 ■ Lateral movement in the frontal plane.

Condylar Angle and Bennet Angle

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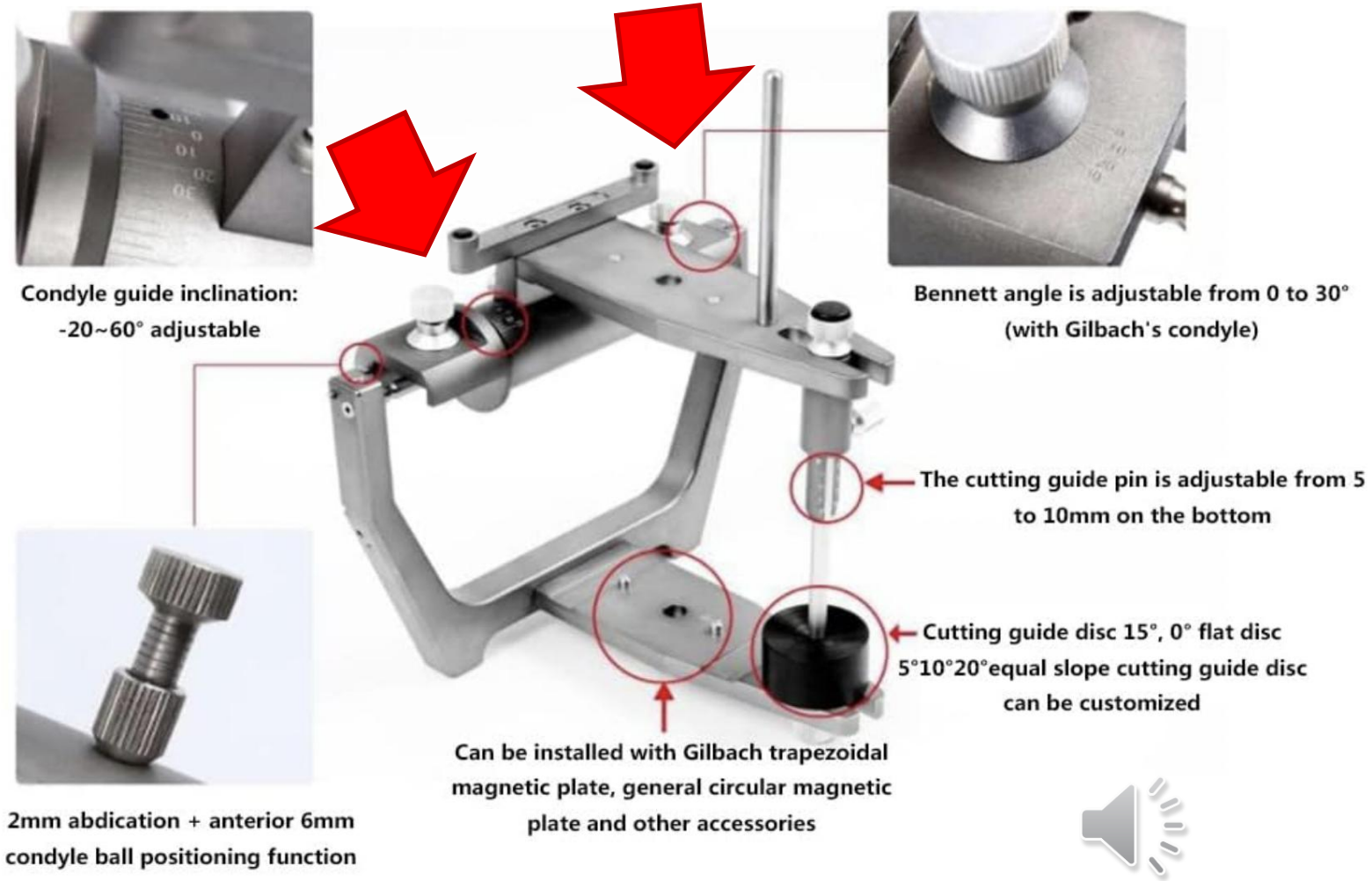
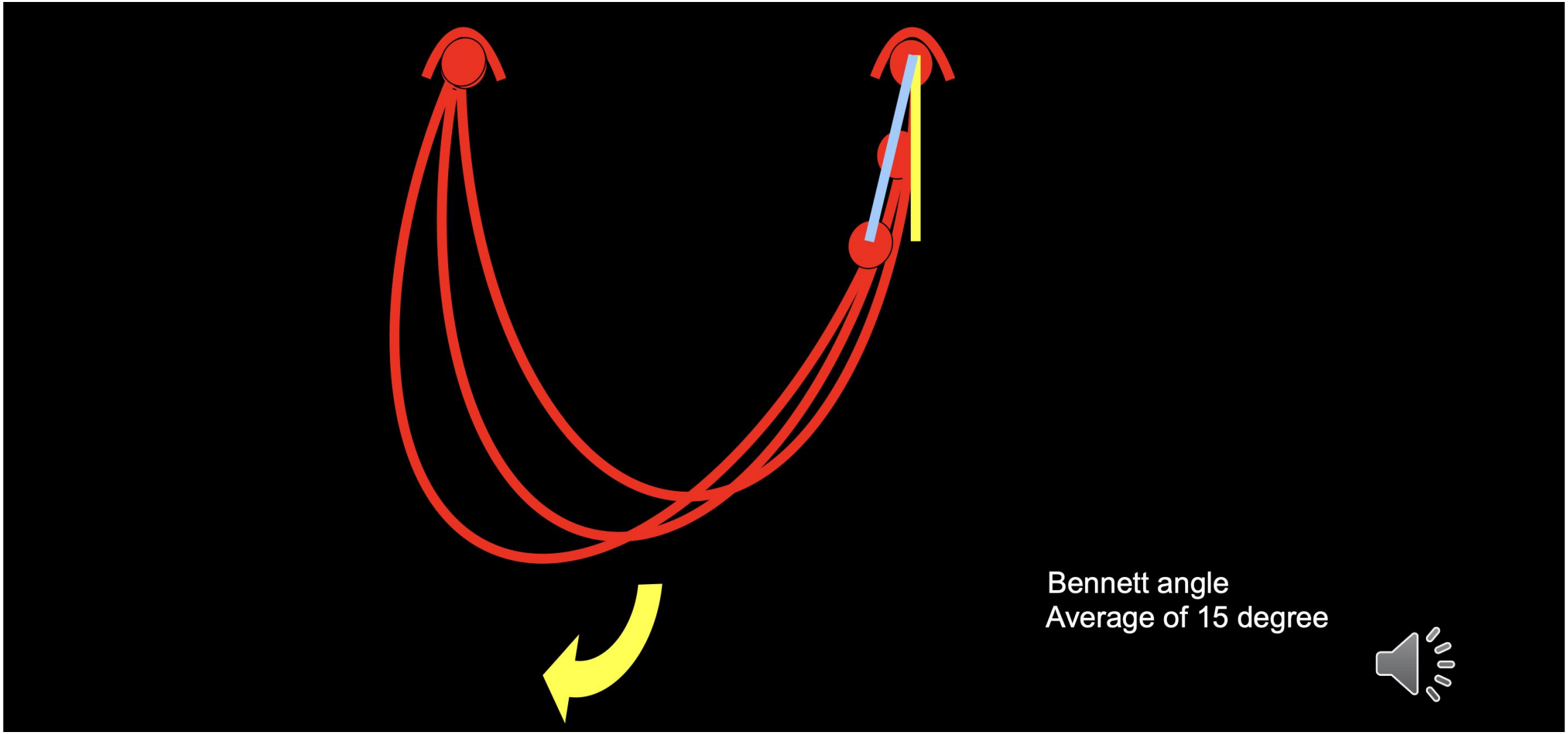
To accurately reflect the relationship and movement of the patient's jaw, we may wish to replicate the condylar angle and the Bennet angle.



Bennet Angle



Slide by Dr Matsubara and Dr Nedelcu

Condylar Angle and Bennet Angle

Arbitrary articulator values:

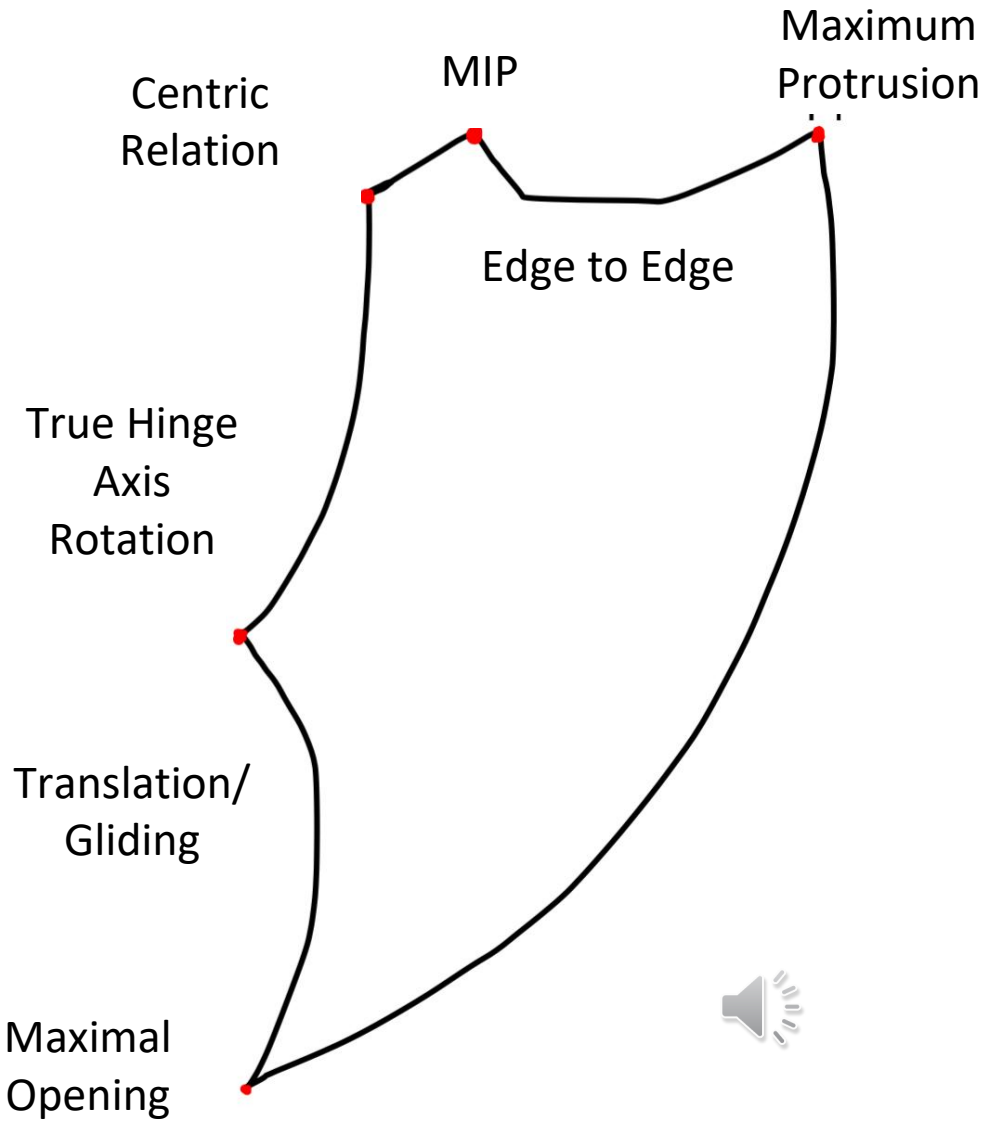
- Condylar angle 30 degrees
- Bennet angle 15 degrees

Posselts Envelope

Posterior and anterior determinants of mandibular movements:

- Posterior: Shape of the articular eminence, configuration of the condyles, etc. (Not affected by dentist)
- Anterior: The palatal surface of maxillary anterior teeth and labial surfaces of mandibular incisors.

Review in your own time if needed, this was covered last year in DMD2

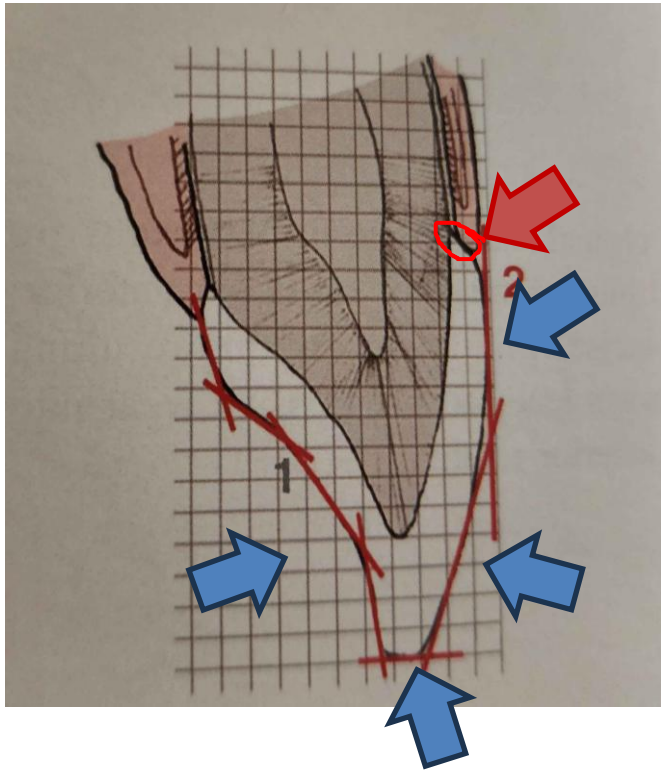


Anterior teeth

When you are placing restorations that involve a large portion of the incisal area, please be aware of the SHAPE of the tooth. The incisors are not a “rectangle”, but have various curves/bends that serve for anterior guidance.

Anterior teeth

Note all the planes to the tooth



The top half of the labial plane emerges with a prominent curve at the gingival embrasure, but overall follows the contours of the alveolar process

Please note we are not covering all aspects of smile design. Comprehensive smile design is out of the scope of all of us. I just want to draw your attention to the shape of the incisors for the purpose of direct restorations (that do not require any changes in occlusion)

Image from “Functional occlusion” textbook

Anterior teeth

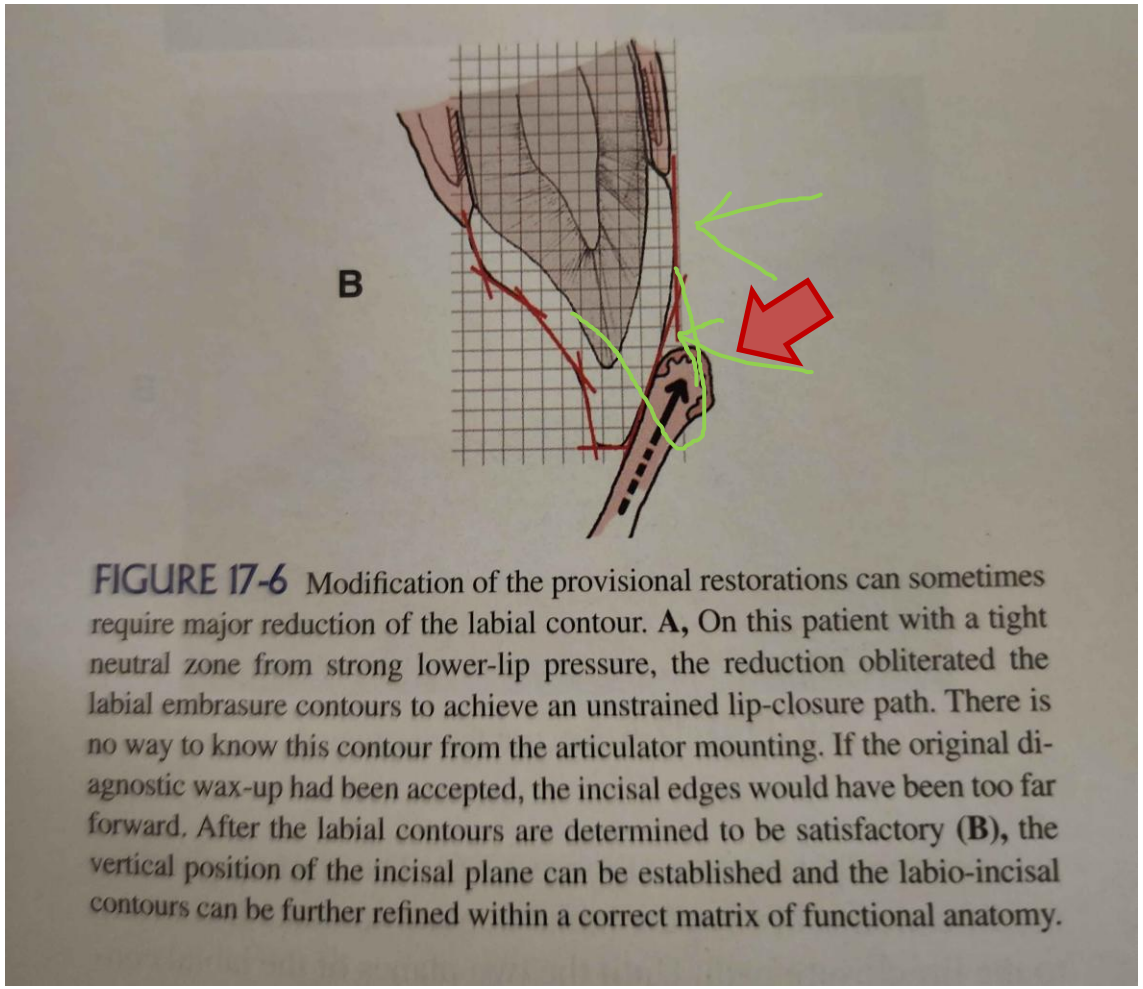


FIGURE 17-6 Modification of the provisional restorations can sometimes require major reduction of the labial contour. **A,** On this patient with a tight neutral zone from strong lower-lip pressure, the reduction obliterated the labial embrasure contours to achieve an unstrained lip-closure path. There is no way to know this contour from the articulator mounting. If the original diagnostic wax-up had been accepted, the incisal edges would have been too far forward. After the labial contours are determined to be satisfactory **(B),** the vertical position of the incisal plane can be established and the labio-incisal contours can be further refined within a correct matrix of functional anatomy.

Image from “Functional occlusion” textbook

The lower half of the labial surface is in a DIFFERENT PLANE to the gingival half. The surface should be contoured in a way that allows the lower lip to comfortably slide by the incisal third of the tooth, to contact the top lip.

Have you noted that when we prepare an anterior tooth for a crown, we also have TWO planes?

Anterior teeth

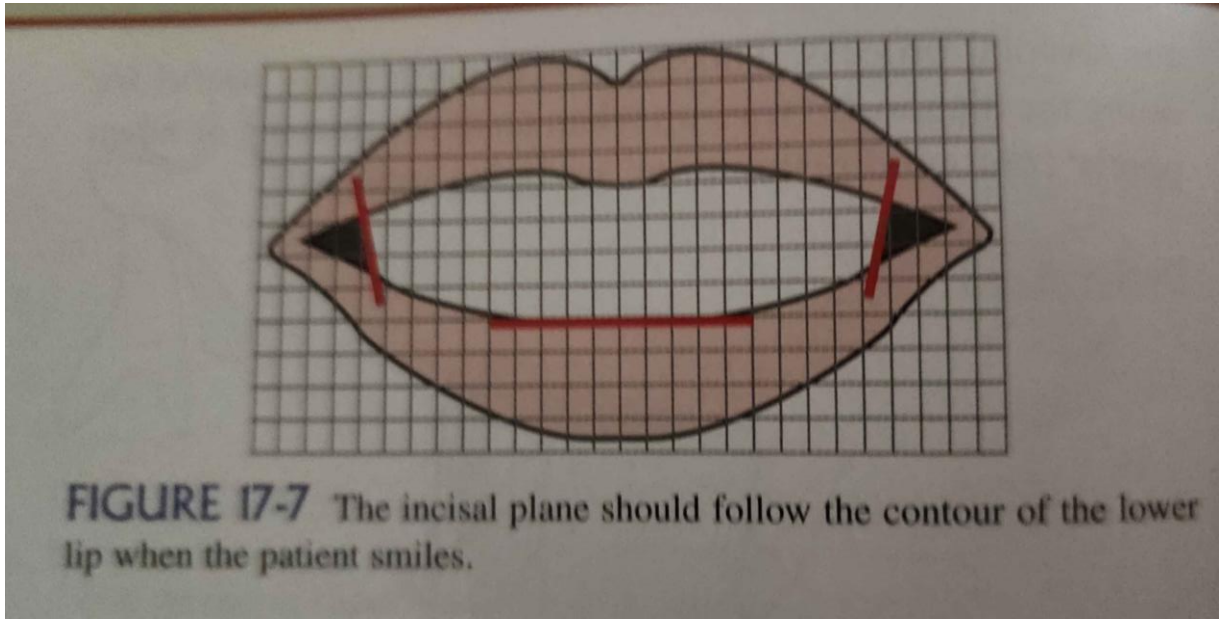


FIGURE 17-7 The incisal plane should follow the contour of the lower lip when the patient smiles.

Terminology

maximal intercuspal position \măk′sa-mal ĭn′ter-kŭs′pal′ pa-zĭsh′an**:** *acronym* is MIP; 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; *comp,* CENTRIC OCCLUSION

centric relation \sĕn′trĭk rĭ-lā′shun**:** *acronym* is CR; a 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

When to use CR or MIP?

Because CR is reproducible, and independent of dentition:

- Complete dentures (patient HAS no MIP to start with)
- Current occlusal scheme is to be changed (attrition etc)

In the case of where you are using the existing occlusal scheme, MIP is more than sufficient.

Slide by Dr Matsubara and Dr Nedelcu

Dynamic occlusion

Dynamic occlusion: occlusal contacts when the mandible is moving. This is powered by the muscles of mastication, and the pathways are guided by the TMJ and dentition.

This should make sense based on what we have just talked about in the first half of lecture regarding posselt's envelope and the anterior and posterior determinants of occlusion!

Occlusion

An ideal occlusion is defined as “the maxillary and mandibular teeth contact simultaneously when the condylar processes are fully seated in the mandibular fossae, and the teeth do not interfere with harmonious movement of the mandible during function. Ideally, in the fully bilateral seated position of the condyle– articular disk assemblies, the maxillary and mandibular teeth exhibit maximum intercuspation. This means that the maxillary lingual and mandibular buccal cusps of the posterior teeth are evenly distributed and in stable contact with the opposing occlusal fossae. These functional cusps can then act as stops for vertical closure without excessively loading any one tooth, while left and right TMJs concurrently are in an unstrained position.”

Occlusion

An ideal occlusion is defined as “the maxillary and mandibular teeth contact simultaneously when the condylar processes are fully seated in the mandibular fossae, and the teeth do not interfere with harmonious movement of the mandible during function. Ideally, in the fully bilateral seated position of the condyle– articular disk assemblies, the maxillary and mandibular teeth exhibit maximum intercuspation. This means that the maxillary lingual and mandibular buccal cusps of the posterior teeth are evenly distributed and in stable contact with the opposing occlusal fossae. These functional cusps can then act as stops for vertical closure without excessively loading any one tooth, while left and right TMJs concurrently are in an unstrained position.”

Ideal Occlusion

1. Mandibular stability
2. Axial load
3. No interferences

Ideal Occlusion

Mandibular stability:

- Contacts of mandibular and maxillary teeth must stabilize the mandible
- Condyles are positioned within the glenoid cavity without stretching or compressing the ligament or articular disc
- Bilateral and simultaneous occlusal contacts

Ideal Occlusion

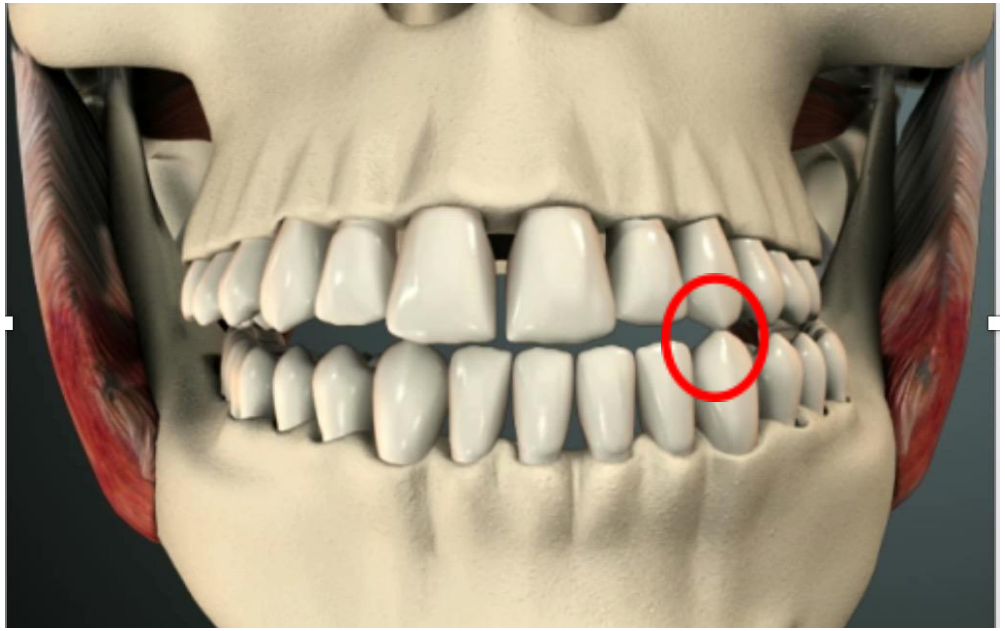
Axial load:

- Occlusal forces distributed down the long axis of teeth for even distribution on the periodontal ligament fibres.

Ideal Occlusion

Lateral excursive interferences.

- Occlusal schemes:
  - Canine guidance (dentate)
  - Group function or unilaterally balanced occlusion (dentate)
  - Balanced occlusion (edentate)



Canine guidance

Canine guidance:

- A form of mutually protective articulation in which the vertical and horizontal overlap of canine teeth disengage posterior teeth in excursive movements of the mandible
- Widely used and accepted concepted within restorative dentistry
- Canine are long and well designed to act as “guiding teeth”
- Easy to achieve
- Not indicated if canines are endodontically or periodontically compromised

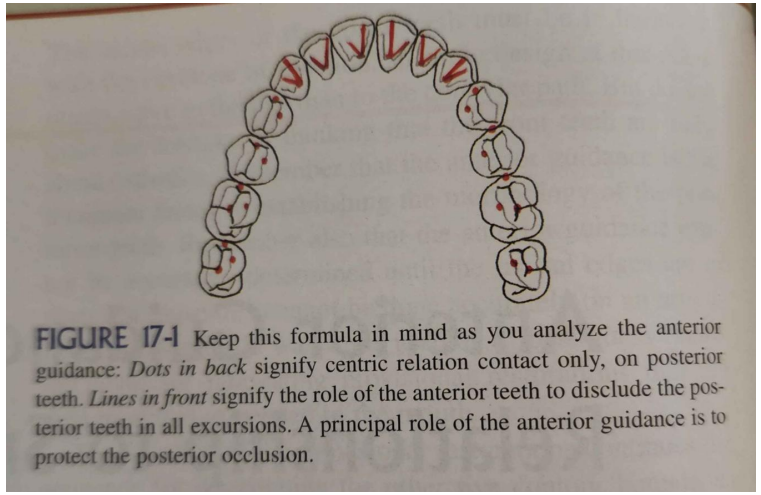
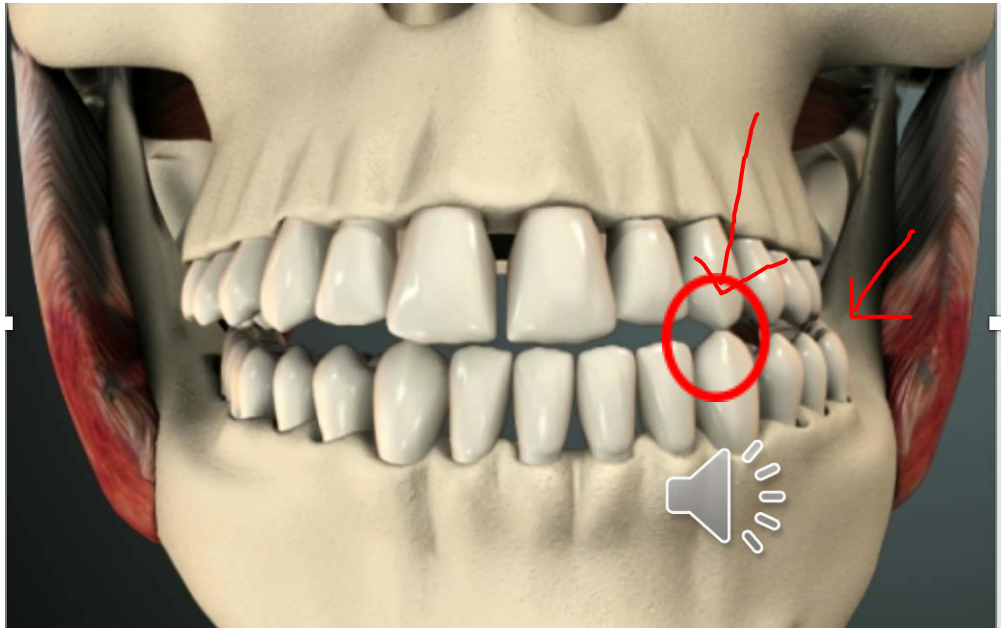


FIGURE 17-1 Keep this formula in mind as you analyze the anterior guidance: *Dots in back* signify centric relation contact only, on posterior teeth. *Lines in front* signify the role of the anterior teeth to disclude the posterior teeth in all excursions. A principal role of the anterior guidance is to protect the posterior occlusion.



Ideal occlusion

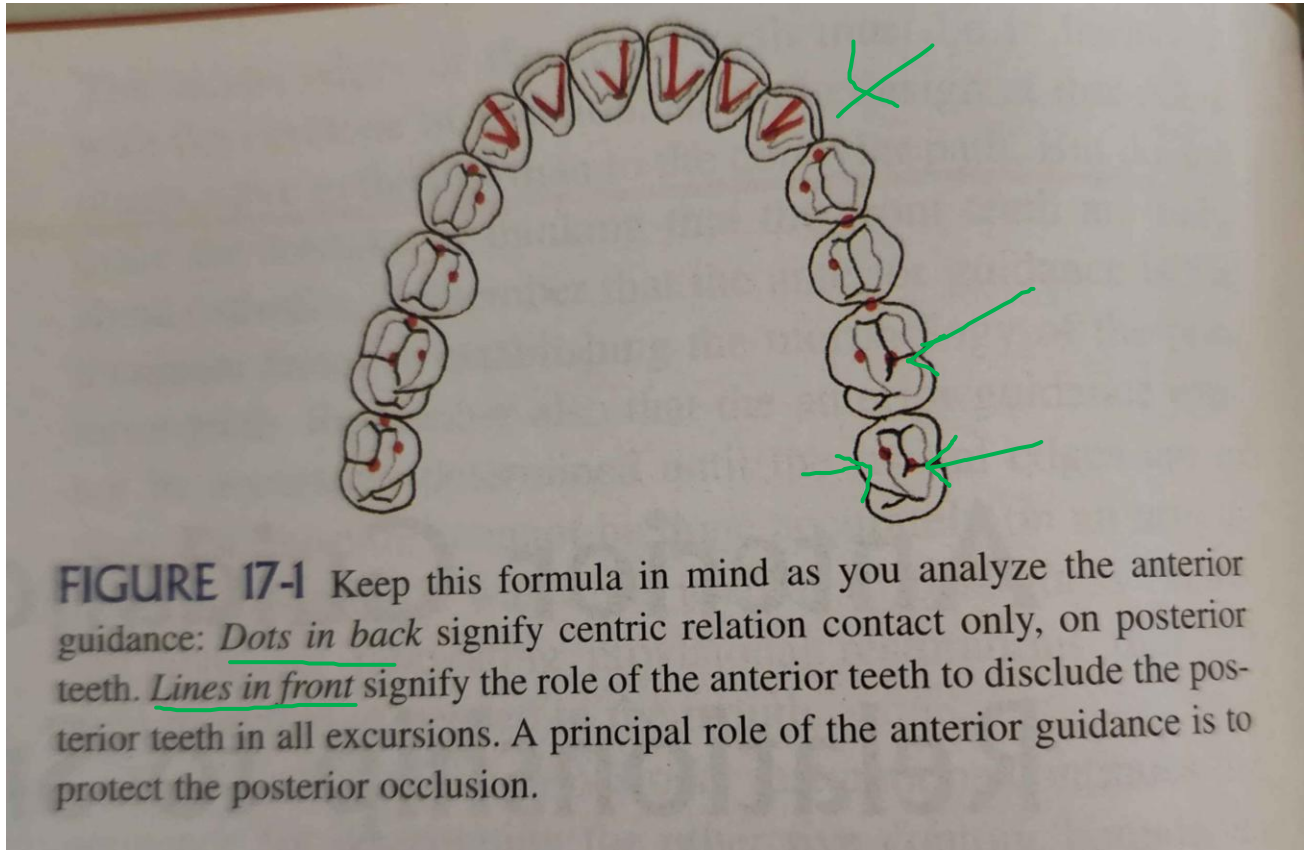


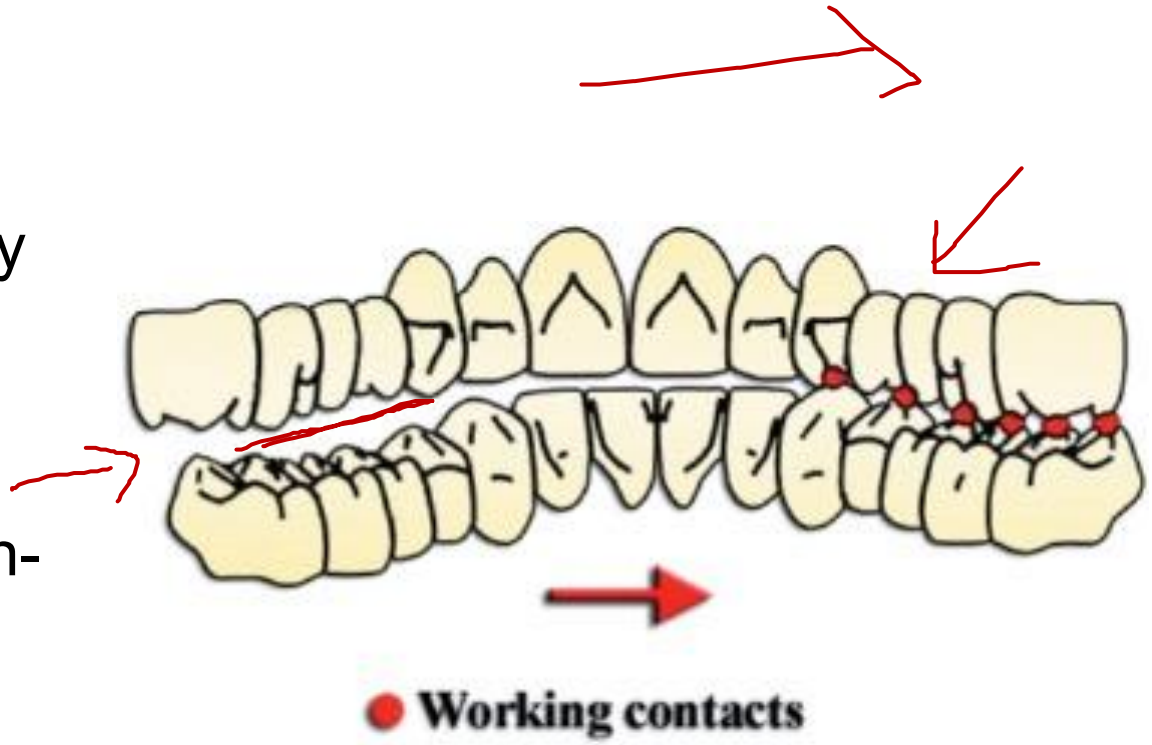
FIGURE 17-1 Keep this formula in mind as you analyze the anterior guidance: *Dots in back* signify centric relation contact only, on posterior teeth. *Lines in front* signify the role of the anterior teeth to disclude the posterior teeth in all excursions. A principal role of the anterior guidance is to protect the posterior occlusion.

From “Functional occlusion” textbook

Group function

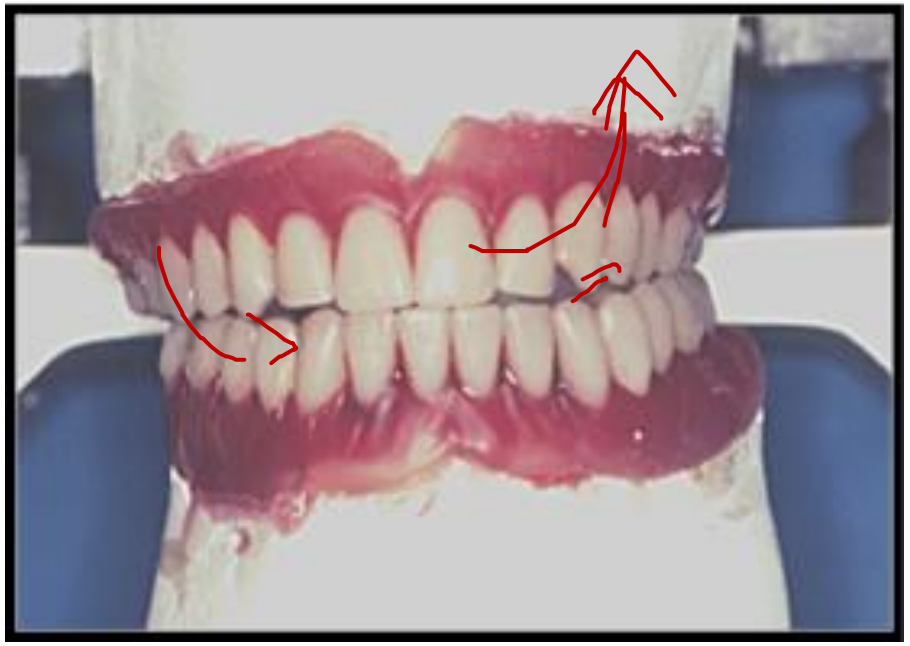
Group function:

- Multiple contacts between the maxillary and mandibular teeth in lateral movements on the working side whereby simultaneous contacts of several teeth **act as a group to distribute occlusal forces.**
- Avoids contact on non-working side (non-working interferences are particularly destructive)
- Also widely accepted concept
- But difficult to establish group function
- And may be more destructive/additional load on posterior teeth



Bilateral occlusion

- Bilateral, simultaneous, anterior and posterior occlusal contact of teeth in centric and eccentric positions (At least 3 contact points: 2 posterior and 1 anterior)
- Too destructive for natural teeth. But cross arch balanced occlusion can be used in complete denture cases to help stabilize the denture and stop it from flipping over.



Criteria for Ideal Occlusion

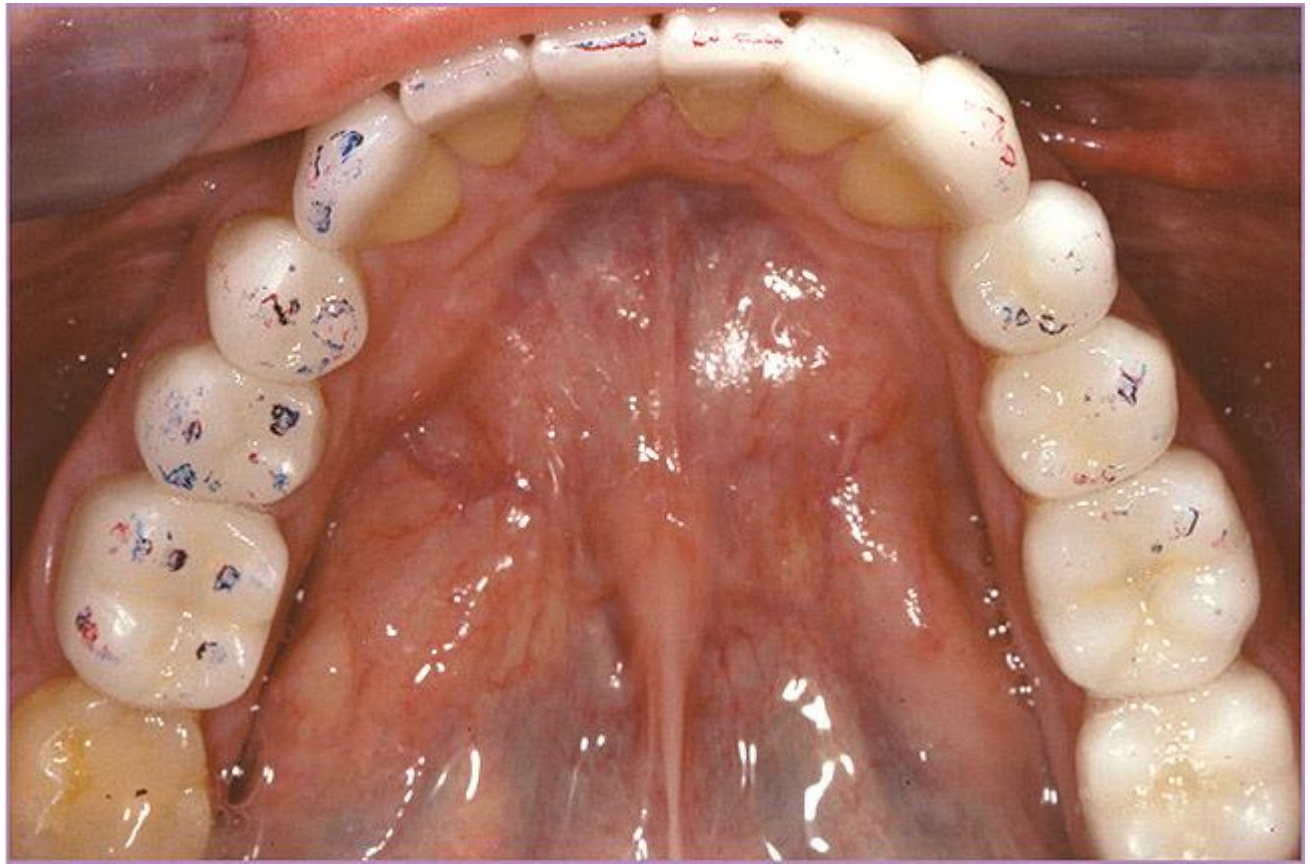
1) Mandibular stability
2) Axial occlusal load
3) During lateral excursions: no interference in the working side
4) During lateral excursions: disocclusion in the non-working side
5) During protrusion: disocclusion of posterior teeth

Interferences

Interferences are undesirable occlusal contacts that may produce mandibular deviation during closure to maximal intercuspation or may hinder smooth passage to and from the intercuspal position. There are four types of occlusal interferences.

- Centric
- Working
- Non-working
- Protrusive

Occlusal analysis



Tooth replacement

Second lecture of the combined lecture

Importance of Teeth

- One of the components of the masticatory system
- Teeth are important for acquisition and chewing of food
- Loss of masticatory efficiency may impact diet

Masticatory System

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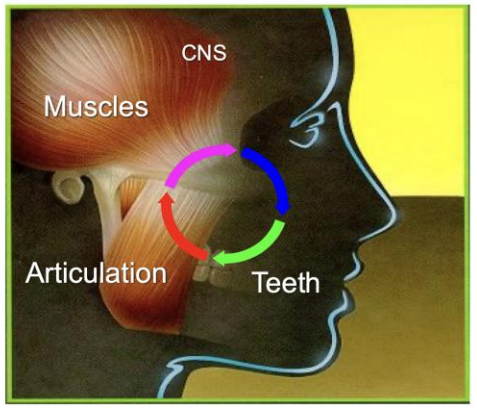
Components

1. Teeth
2. Periodontal tissues
3. Articulatory apparatus

Interconnected biomechanical system



Davies and Gray; 2000

Impacts of tooth loss: Diet

There are inconsistent reports of dietary changes + nutritional deficiencies associated with tooth loss.

Theorized that tooth loss reduces masticatory function and chewing ability, which in turn can limit food choices and variety in the diet. For these reasons, dietary intake has been regarded as an intermediate in the pathway between tooth retention and a number of diet-related chronic diseases.

The nutritional effects of tooth loss[1]

Catherine A Geissler,[2] BDS, PhD and John F Bates,[3] DDS, Dr Odont

ABSTRACT In view of the high prevalence of edentulousness in developed countries, the evidence is reviewed for the effects of tooth loss on nutrition and health in the following categories of effects: mortality; food choice and nutrient intake; gastrointestinal irritation; digestion and nutrient absorption; nutritional status. The evidence indicates reduced consumption of meat, fresh fruit, and vegetables, and total energy resulting in lower Hb and vitamin C levels, increased gastrointestinal irritation and increased mortality from choking but no striking differences in digestion or nutritional status. However, most studies are not carefully controlled for other social and health factors. *Am J Clin Nutr* 1984;39:478–489.

KEY WORDS Tooth loss, mortality, food choice, gastrointestinal irritation, digestion, nutritional status

Review article

Does tooth loss affect dietary intake and nutritional status? A systematic review of longitudinal studies

Piyada Gaewkhiew [a b], Wael Sabbah [a], Eduardo Bernabé [a]

Conclusion

There is at present no strong evidence on the effect of tooth loss on diet and nutrition, with inconsistent results among the few studies identified. Additional high-quality longitudinal studies should address the limitations of previous studies identified in this review.

Impacts of tooth loss: Diet

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However, if we look at masticatory efficiency:

RESEARCH ARTICLE Open Access

Relationship between tooth loss, low masticatory ability, and nutritional indices in the elderly: a cross-sectional study

Nozomi Okamoto[1*], Nobuko Amano[2,3], Tomiyo Nakamura[4] and Motokazu Yanagi[5]

Conclusions: A low number of teeth was associated with low masticatory ability in both males and females. Low masticatory ability was associated with low plasma albumin levels and low BMI in females. Not smoking, maintaining grip strength, preventing cancer, and masticatory ability are important for preventing undernutrition.

Because occlusal contact area is highly correlated with masticatory performance, the loss of molar teeth would be expected to have a greater impact on measures of performance in that the molar has a larger occlusal contact area. This effect has been demonstrated in individuals with missing molars who reveal a greater number of chewing strokes required and a greater mean particle size before swallowing. The point at which an individual is prepared to swallow the food bolus is another measure of performance and is described as the *swallowing threshold*. Superior masticatory ability that is highly correlated with occlusal contact area also achieves greater food reduction at the swallowing threshold. Conversely, a diminished ability to chew is reflected in larger particles at the swallowing threshold.

McCracken's Removable partial prosthodontics

Impacts of tooth loss: Cognitive

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Masticatory Deficiency as a Risk Factor for Cognitive Dysfunction

Francisco Bruno Teixeira[1], Luanna de Melo Pereira Fernandes[1,2], Patrycy Assis Tavares Noronha[3], Marcio Antonio Raiol dos Santos[1], Walace Gomes-Leal[3], Cristiane do Socorro Ferraz Maia[2], Rafael Rodrigues Lima[1] ✉

Cognitive dysfunction

- Regular sensory stimulation of mastication is essential for maintaining the learning and memory functions of the aged **hippocampus**
- The decrease of masticatory stimulation may reduce synaptic density in the **cerebral cortex** by decreasing sensory input to the cerebral cortex
- **Cerebellar** functions also seem to be influenced by masticatory activity: the increase in cerebellar activity during chewing may improve certain motor functions

Tooth loss, chewing efficiency and cognitive impairment in geriatric patients

Fanny Elsig[1], Martin Schimmel[1], Elena Duvernay[1], Sandra V. Giannelli[2], Christoph E. Graf[2], Sabrina Carlier[2], François R. Herrmann[2], Jean-Pierre Michel[2], Gabriel Gold[2], Dina Zekry[2,*] and **Frauke Müller[1,2,*]**

[1]Division of Gerodontology and Removable Prosthodontics, University of Geneva Dental School, Geneva, Switzerland; [2]Department of Internal Medicine, Rehabilitation and Geriatrics, University Hospitals Geneva, Thônex, Switzerland

doi: 10.1111/ger.12079

Tooth loss, chewing efficiency and cognitive impairment in geriatric patients

Background: Patients with dementia have poorer oral health and fewer teeth than their peers without cognitive impairment.
Objective: The hypothesis of this study is that the number of natural teeth and the chewing efficiency are associated with cognitive functioning.
Methods: This cross-sectional study included 29 patients diagnosed with dementia aged 75 years or older and 22 controls who were either cognitively normal (n = 19) or with mild cognitive impairment (n = 3). Neuropsychological, nutritional and dental assessments were performed. The chewing efficiency was evaluated with a two-colour mixing test.
Results: Demented patients and controls presented with a mean of 4.9 and 6.5 teeth, respectively (n.s.). The number of natural teeth was not associated with dementia (p = 0.553). Same results were found for age (p = 0.746) and sex (p = 0.901). The chewing efficiency by visual inspection proved worse in participants with dementia than in the controls (p < 0.011) and explained 9.3% of the variance in the diagnosis of dementia. Neither dental state nor chewing efficiency was related to the nutritional state.
Conclusion: Chewing efficiency seems stronger associated with cognitive impairment than the number of teeth. Hence, in a more holistic approach for the geriatric assessment, the dental examination may be complemented by a chewing efficiency test.

Keywords: elderly, chewing, dementia, geriatrics, mild cognitive impairment, risk factor.

Accepted 14 September 2013

Impacts of tooth loss: Cognitive

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Good news: partial dentures (or other teeth replacement options may help)

Results: Compared to non-denture users, dentate participants who used dentures had better baseline cognitive function (β, 1.032; 95% CI, 0.813–1.251; $p<0.001$) and a slower annual decline in cognitive function (β, 0.127; 95% CI, 0.047–0.206; $p<0.01$). For edentulous participants, denture use was associated with higher baseline cognitive function (β, 3.063; 95% CI, 2.703–3.423; $p<0.001$) but not with the rate of cognitive decline (β, 0.011; 95% CI, −0.082 to 0.105; $p=0.818$). Results remained consistent across subgroups of dentate participants with various degrees of missing teeth.

Conclusions: Denture use may help protect against cognitive decline in older adults with partial tooth loss. This study highlights the potential importance of prosthodontic rehabilitation in preserving cognitive health. Further research is needed to establish a causal relationship between denture use and cognitive function.

Denture use and a slower rate of cognitive decline among older adults with partial tooth loss in China: A 10-year prospective cohort study

Xiang Qi[1] | Zheng Zhu[1,2] | Yaolin Pei[1] | Bei Wu[1]

Impacts of tooth loss: Cognitive

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However, may be influenced by other confounding variables

Abstract

Dementia is a major contributor to dependence and disability in older people, with aging societies characterized by growing numbers of people living with the condition. Dementia rates are highest in those with low education early in life, midlife hypertension, midlife hearing loss, depression, obesity, loneliness, a sedentary lifestyle, or sustained exposure to smoking or diabetes. Tooth loss is a putative risk factor for dementia which has received increasing research attention, but systematic review findings are mixed. Three main mechanisms have been proposed, involving 1) tooth loss leading to compromised nutrition and then leading to poorer central nervous system (CNS) function; 2) tooth loss resulting in fewer interocclusal contacts and so less somatosensory feedback to the CNS, leading to impaired cognition; and (3) chronic periodontitis resulting in tooth loss, but not before the inflammation has affected the CNS, impairing cognition. None of these is supported by compelling empirical evidence. Here, we use the life course approach to propose a plausible, empirically supported explanation for the associations between missing teeth and poorer cognitive function in older people. Evidence from longstanding cohort studies demonstrates that the putative association arises from cognitive function much earlier in life, in childhood. People with better childhood cognitive function have better oral health and access to routine dental care as they go through life, losing fewer teeth along the life course. They are also much more likely to have better cognitive function in old age. Their less cognitively able childhood counterparts will experience higher disease rates and poorer access to care, resulting in greater incremental tooth loss. Comparison of the 2 groups at any age from the mid-20s on will show greater numbers of missing teeth in the group who were less cognitively able in childhood. Those differences will be most pronounced in old age.

Tooth Loss and Dementia: A Critical Examination

W.M. Thomson[1] and Y. Barak[2]

Impacts of tooth loss: Anatomical

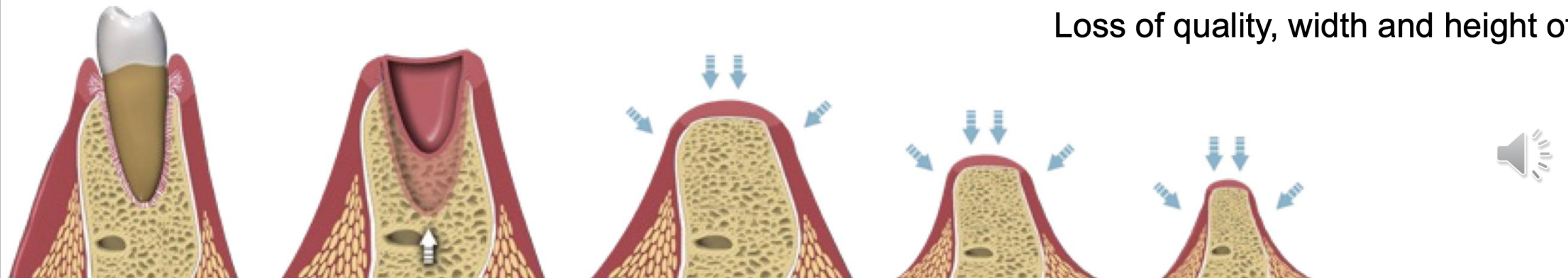
After tooth loss occurs:

- The residual ridge no longer benefits from the functional stimulus it once experienced.
- Results in a loss of ridge volume—both **height and width**
- However, the ridge volume loss is not predictable for all individuals with tooth loss
- In general, bone loss is greater in the mandible than in the maxilla and more pronounced posteriorly than anteriorly, and it
- Produces a broader mandibular arch while constricting the maxillary arch. (As you have likely learned in complete denture module)

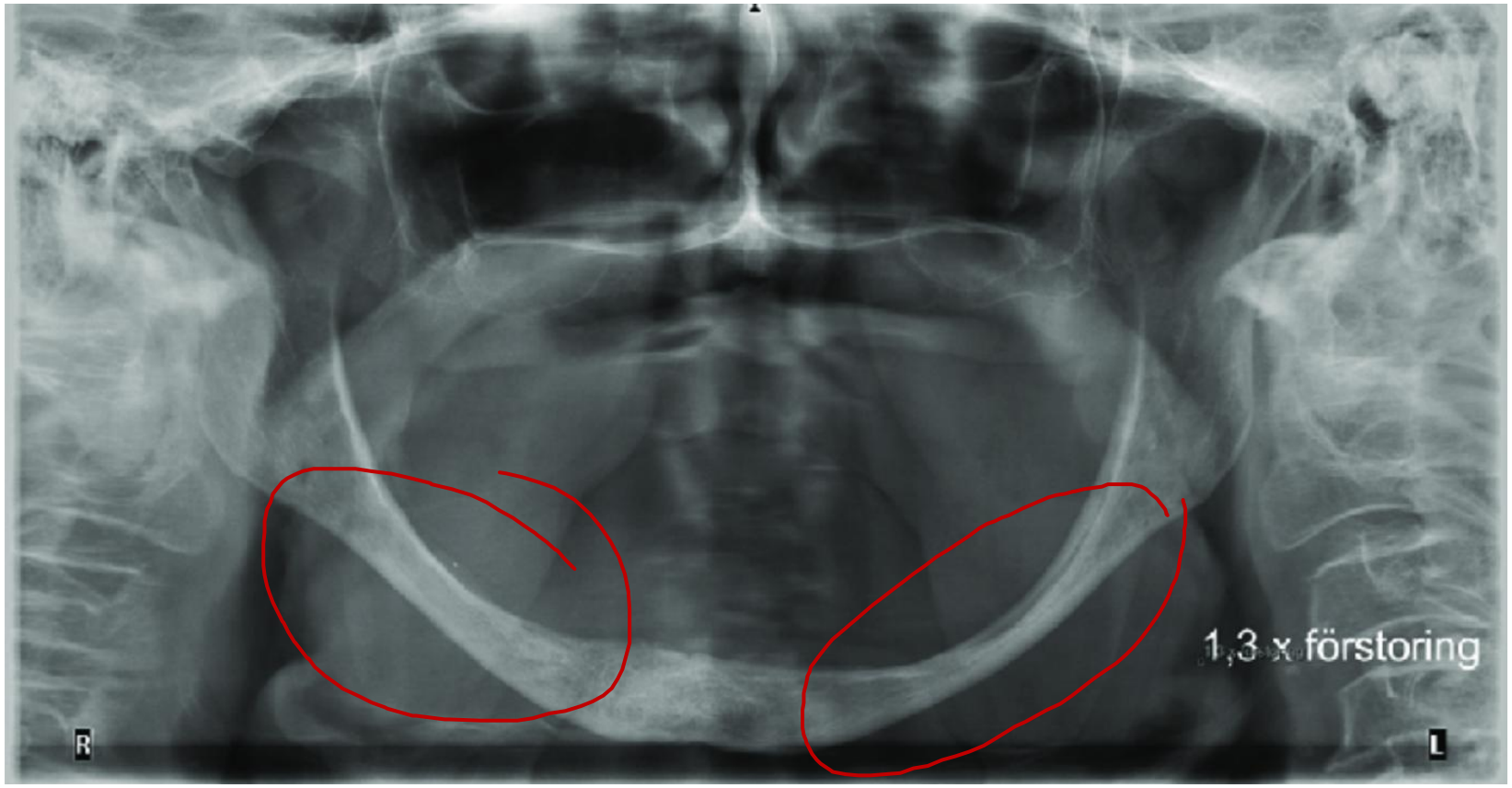
Tooth loss

↓

Loss of quality, width and height of bone



Impacts of tooth loss: anatomical



Where would you be able to place implants for this patient?

The rise and fall of the alveolar process: Dependency of teeth and metabolic aspects

Article | Full-text available | Sep 2018

Grethe Jonasson · Ingmarie Skoglund · Marianne Rythén

Reasons for tooth loss

- Congenitally missing teeth
- Periodontal disease
- Caries
- Trauma
- Resection due to cancers etc

Tooth replacement

- Prosthesis to replace missing or lost teeth

DENTURES (RPD) BRIDGES (FPD) IMPLANTS

combo

combo

Fixed Prosthodontics

Replace coronal portion of teeth and are rigidly fixed to the remaining teeth or implants

Removable Prosthodontics

Replacement of missing teeth and supporting tissues which is designed to be removed by the patient.

“Management” of tooth replacement

Loss of teeth represent a non-reversible medical condition, and the managing the expectations of the patient may be harder than the “technical skills” we have to learn

If patient has never had any replacement options, their experiences are limited to their own natural teeth

Fixed (implants) → Fixed (tooth supported) → Removeable

most “similar” to a “real” tooth → least “similar” to a “real” tooth

Which one is the correct choice?

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Which one is the correct choice?

Shared decision making

It's up to you AND the patient to decide together

You need to involve the patient in the shared decision making by providing crucial information outlining the differences:

- *Technical outcomes*
- *Physical outcomes*
- *Esthetic outcomes*
- *Various maintenance needs*
- *Initial and future costs*
- *Physiologic outcomes that suggest to what extent prostheses "feel" like teeth.*

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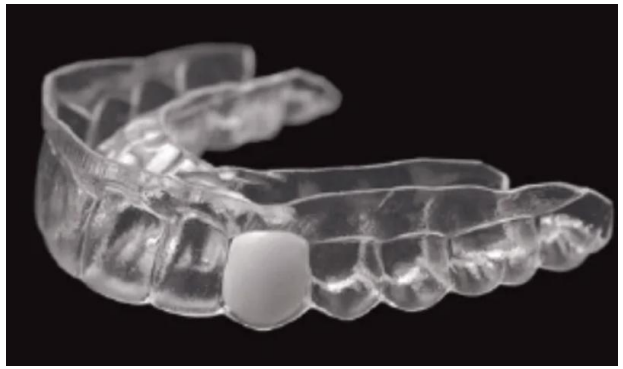
Immediate replacement of teeth

- Immediate replacement of teeth (usually referring to immediate replacement after extraction, although the listed options can also be used as a temporary prosthesis as patient awaits further definitive treatment)
- Why is it important?
  - Aesthetics (Patients may feel self conscious of missing tooth/teeth)
  - Maintaining function (such as cases of full clearance)
  - Preserving soft tissues (we will discuss this further in FPDs)

IF IMMEDIATE TOOTH REPLACEMENT IS REQUIRED, ENSURE YOU MAKE PATIENT AWARE OF ADDITIONAL COSTS (if applicable)

Immediate replacement

Some examples of immediate replacement prosthesis:



Vacuform stent
Essix retainer + tooth
(also known as “suspension bridge”)

Immediate FPD (temporary)

Immediate denture

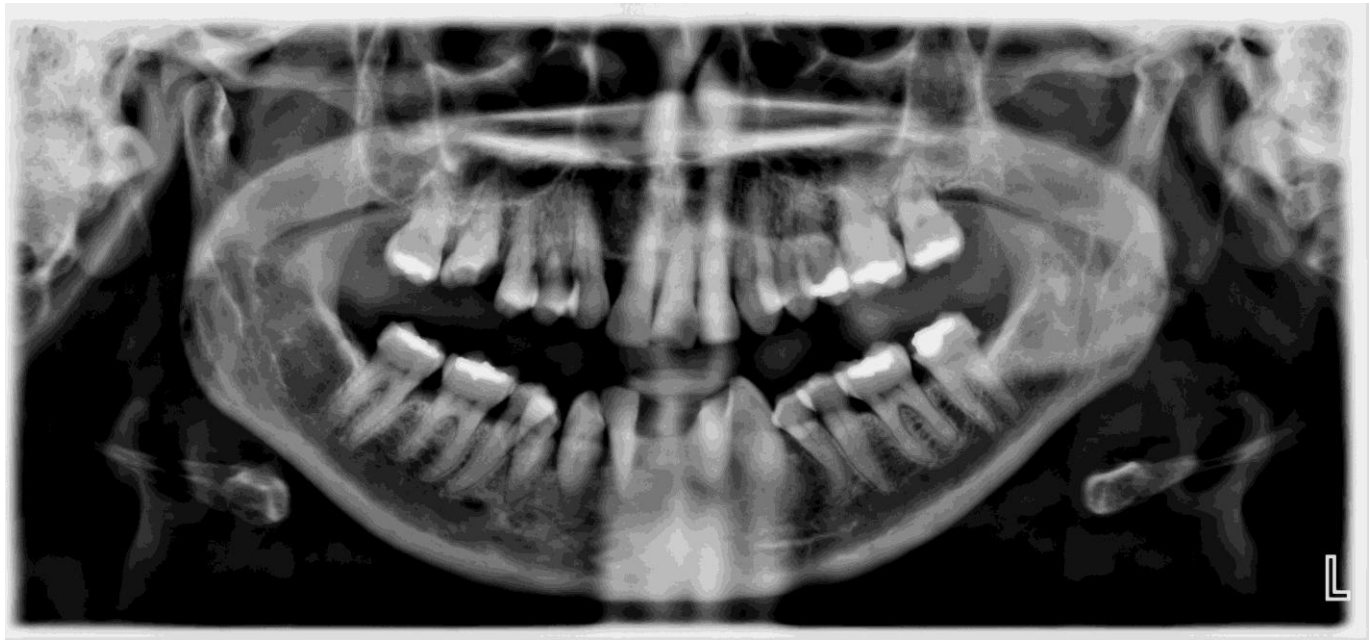
Figure 4.
Temporary abutment inserted on the immediate implant.

Immediate replacement via implant

Suspension bridge- example

DMD patient: A.S.

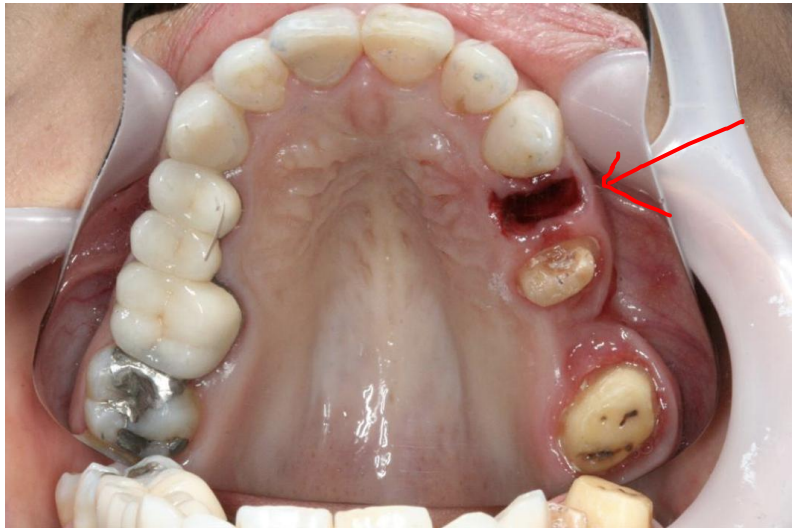
- Presenting complaint was missing lower teeth, bleeding gums and “bad breath”
- Due to timing of picking up patient (August), unable to proceed to ”definitive” treatment before the end of the year.
- Patient offered an essix retainer as a temporary solution

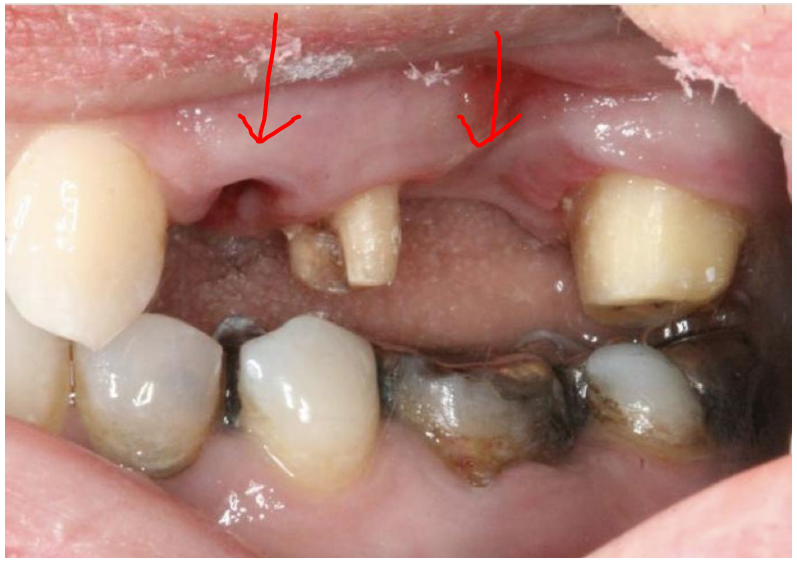


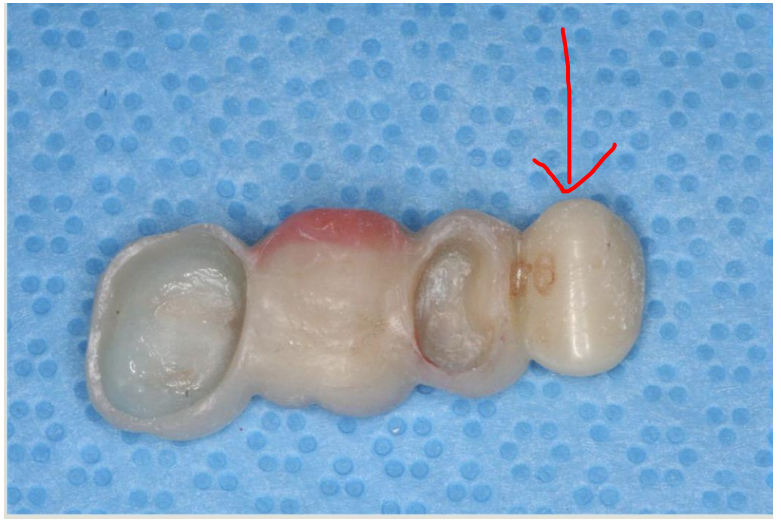
Suspension bridge

- Good option for short term replacement (with only several teeth requiring replacement)
- Very cheap and quick
- Patient not able to eat on the prosthesis (not strong)
- Eg: replacement of missing front tooth whilst awaiting implant healing

Immediate (temporary bridge)







We will talk more about this in our FPD module. Just be aware this exists. It is a relatively uncommon immediate prosthesis.

Immediate denture

- RPD vs complete denture
- Denture inserted at date of extraction
- Requires pre-planning of denture, with accommodations for potential tissue inflammation during healing
- Easy to maintain and modify (eg relines)
- Dependance on the skill of technicians
  - Not able to do a real “try-in” with the patient. Fit is unpredictable
  - Lab is estimating what the extraction site looks like
- Requires good communication with patient (you need to tell them what to expect, and set the bar low low)
- Significant chairside time (adjustments)

This lecture is not going to be able to cover all aspects of immediate dentures, there’s simply too much to discuss. I can organize another lecture on this if you want. It might also be covered in the RPD module?

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Immediate denture

- At treatment planning stage, go over all options with the patient
- This includes the option of immediate denture (if applicable)
- Explain the benefits and the disadvantages to patient and let them participate in the decision

Option 1: Immediate denture

- Immediate replacement of teeth (patient won't have to walk around no teeth, which some people will really care about)
- The immediate denture will NOT fit well
- Further steps required after the immediate denture completed (either relined, or a new separate denture made)

Option 2: Denture fabrication after healing

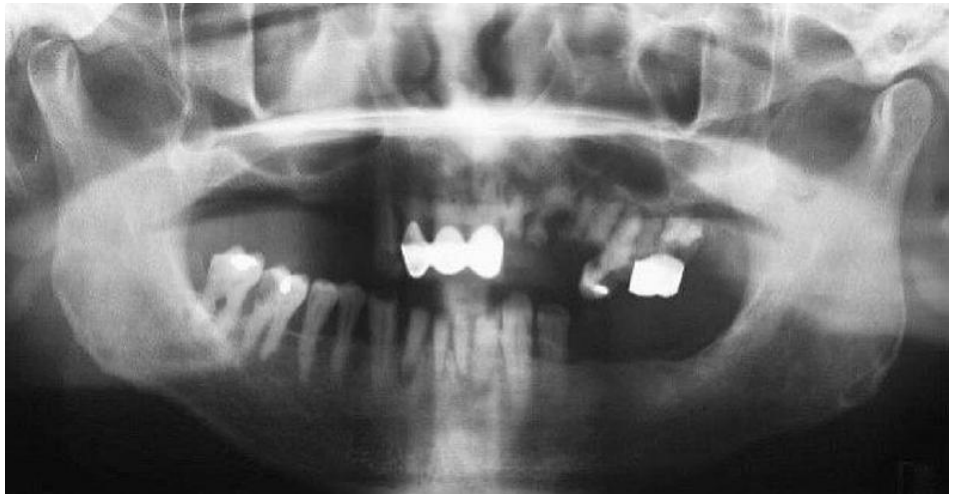
- Delayed replacement of teeth, may be non-aesthetic
- Potentially cheaper cost of treatment (relines not required shortly after insert)

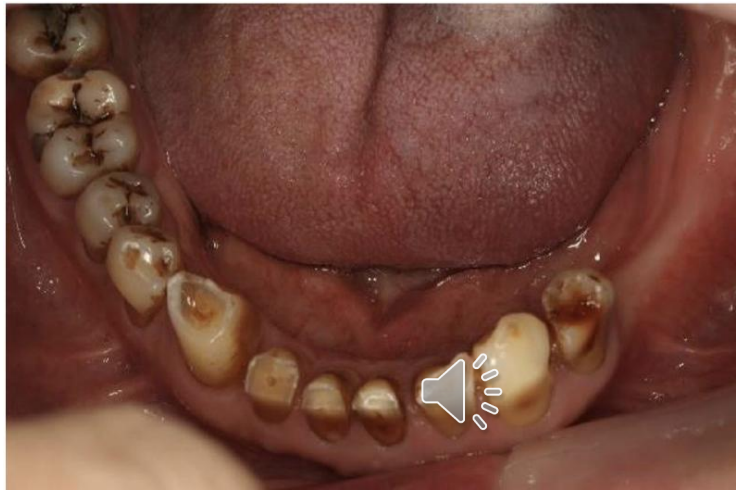
Immediate denture

This case is taken from a published article:

Prosthodontic Rehabilitation and Follow-Up Using Maxillary Complete Conventional Immediate Denture

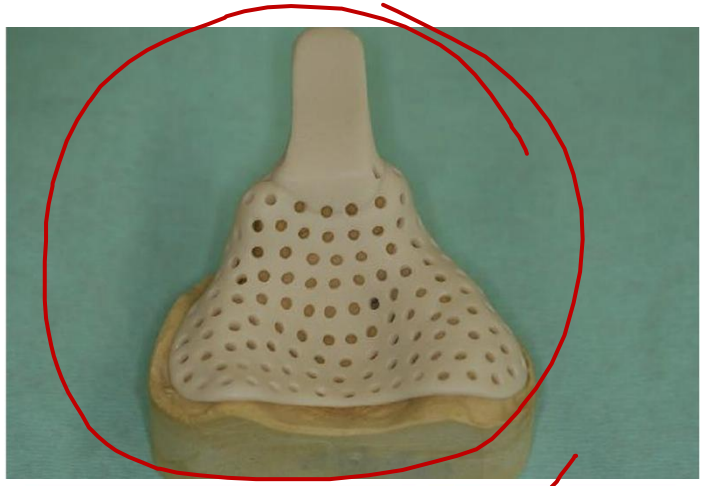
Conson Yeung, Katherine Chiu Man Leung, Ollie Yiru Yu, Walter Yu Hang Lam, Amy Wai Yee Wong & Chun Hung Chu





Immediate denture

- After discussion with patient, all parties agreed to full clearance of maxillary teeth and immediate denture. (Mandibular teeth restored and RPD made)



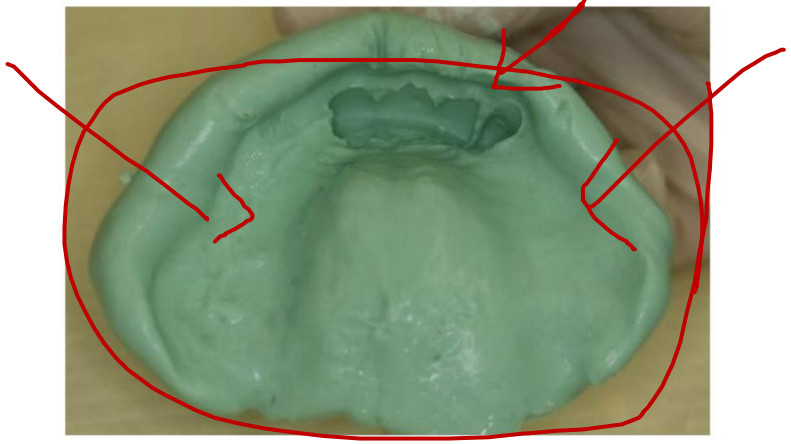


Figure 8 Maxillary irreversible hydrocolloid impression.

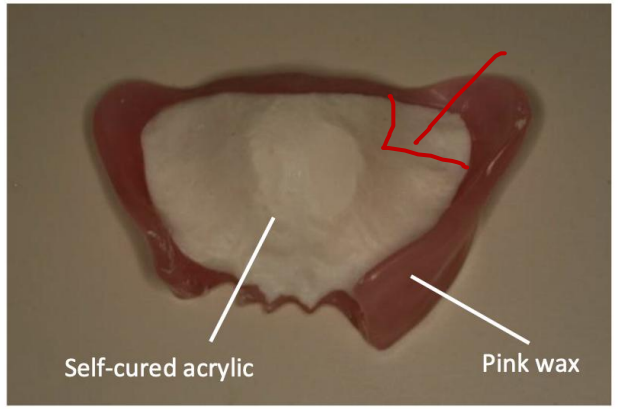


Figure 10 Maxillary occlusal rim.

Figure 12 The wax-up denture try-in.

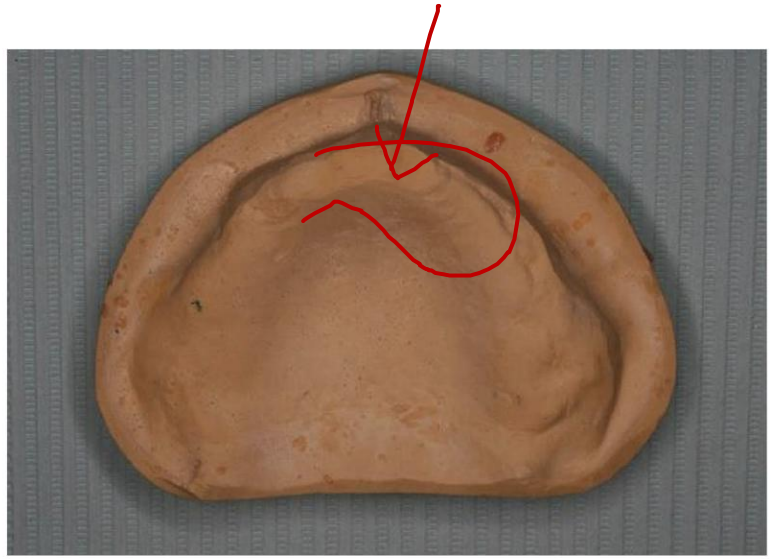


Figure 13 The trimmed maxillary cast.

Immediate denture

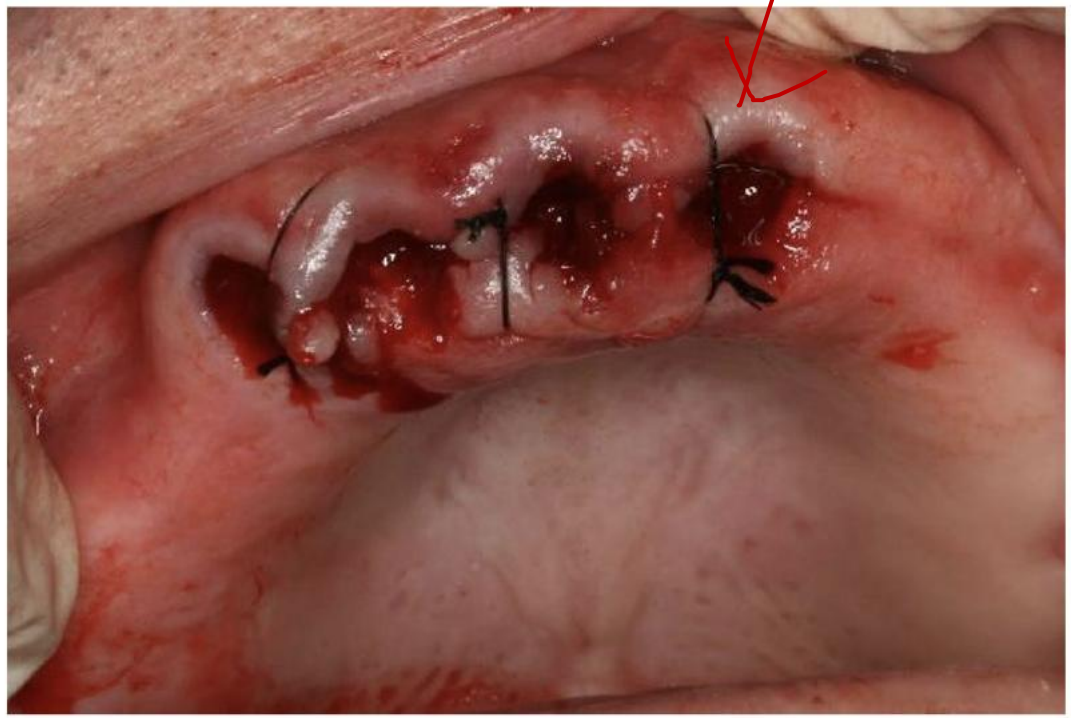


Figure 14 Sutures to assist haemostasis.

Figure 16 Maxillary immediate denture in situ.

Special instructions: Denture to be kept in for 24hr (or overnight) if possible. Swelling may occur.

Immediate denture: relines

- Direct relines may be required until healing complete (~3 months for bone remodeling)
- Indirect reline once healing complete.

  - Denture roughened
  - Relining material mixed, applied to area of denture
  - Denture inserted, patient to bite down in MIP
  - Border molding completed
  - After material is set, excess material removed (eg scalpel)

Immediate replacement: Implants

Figure 1.
Clinical view of the compromised left central incisor.

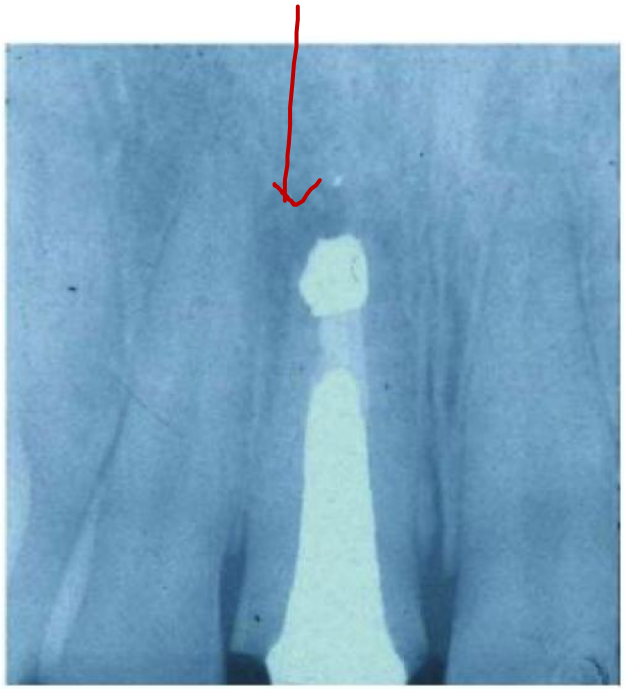


Figure 2.
Periapical radiograph of the compromised incisor.

Immediate Restoration of Single Implants Placed Immediately After Tooth Extraction

Antonio Barone,* Lorena Rispoli,† Iole Vozza,‡ Alessandro Quaranta,‡ and Ugo Covani§

Immediate replacement: Implants

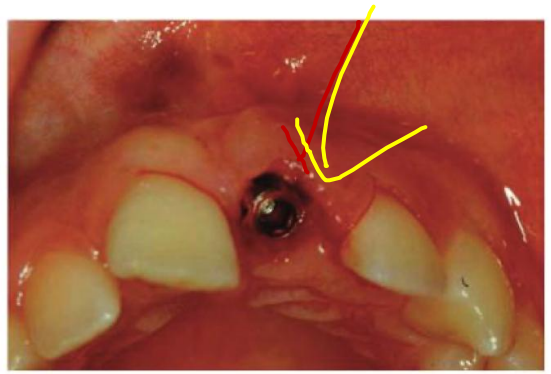


Figure 3.
Fresh extraction site and immediate implant placement.

Figure 4.
Temporary abutment inserted on the immediate implant.

Figure 5.
Temporary crown in place at the time of implant insertion.

Figure 6.
Soft tissue healing 6 months after implant placement and temporary restoration.

Thanks for listening!

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Any questions?