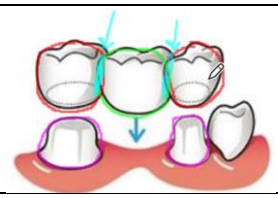
Mental Dental Prosthodontics

General Considerations

Bridge

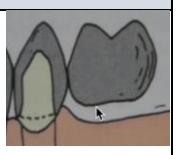
Abutment	= tooth that the bridge attaches to
Retainer	= Crown that attaches to the abutment
Pontic	= Fake tooth that you are replacing (could be multiple depending on the length of the bridge)
Connector	= Connects the retainer to the pontic

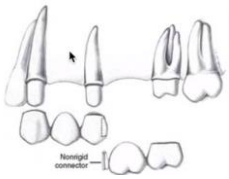


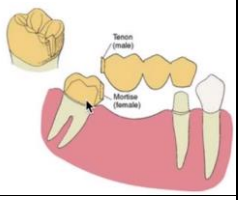
Prognostic Factors	

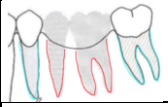
Poor Prognosis	- < 1/2 bone support (C:R ratio)
	- Single retainer cantilever (Lots of force on the connector and abutment)
	  - Cantilevers are usually only reserved for anteriors
	- Multiple splinted abutment teeth
	- Non-rigid connectors
	  - Mostly indicated when you have a severely tilted abutment
	- Intermediate Abutments (Pier abutments)

Contraindications for Abutments	- Endodontically treated teeth -> they are weak AF after the RCT - Removal of the internal root dentin makes it weaker, NOT desiccation - Periodontally compromised teeth -> C:R Ratio <1:1







Considerations to Consider		
C:R Ratio	= Compares the length of the clinical crown to the clinical root - 1:2 = Ideal - 2:3 = Realistic - 1:1 = Minimum - 2:1 = Poor (Contraindication for an abutment)	
Ante's Law	= PDL surface area of the abutment teeth should be > the imaginary PDL surface area of the missing teeth  -> This example abides by the law. However if there was 1 more tooth to be replaced, than the imaginary PDL surface area would be > the abutment PDL, leading to a poor prognosis	
Splinting	- Distributes occlusal forces - Recommended when Ante's law would be violated *When replacing a canine…the central and lateral should be splinted to prevent lateral drifting of the bridge*	
Root Shape	**Preferred shapes:** - Divergent - Multiple - Curved - Broad *These you hate to see for extractions*	**Not Preferred:** - Fused - Single - Conical - Round *These are roots you would love to extract*

Alternatives to Bridges

Removable Partial Denture	**Indications** 1. Distal Extension 2. Long Spans 3. Bone loss around potential abutments 4. Bridge or Implant is too expensive
Complete Denture	Indications 1. All teeth are missing **Contraindicated in the Max. when mandibular anterior teeth are present -> Combination Syndrome
Overdenture	Indications 1. All/Most teeth are missing

	Implant supported: - Mandible: 2 implants - Maxilla: 4 implants	
Implants	**Cement Retained** - More economical - Allows minor angle correction better than screw retained - Easier to use in small teeth - Requires more chair time and have the same propensity to loosen ☹ **Excess cement can cause perio-implantitis**	**Screw Retained** - Retrievable 😊 - Access hole usually is grey (poor esthetics) - Screw may loosen during function - Highly angled placements may not allow for screw retention

---

Occlusion & Articulators

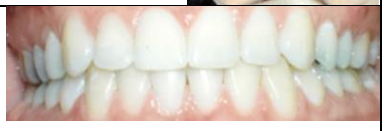
Impression Materials

Alginate (Irreversible Hydrocolloid) 	= Choice material for diagnostic casts Na or K salts of alginic acid + Calcium Sulphate -> **Insoluble calcium alginate** - **Diatomaceous Earth**: adds strength - **Trisodium phosphate**: controls the setting rate ↑ Bulk = ↓ unwanted dimensional change Timing: - 2-3 minutes setting time -> Remove tray from mouth - Within 15 minutes -> Pour impression - 30-60 minutes -> Cast sets

…I guess that is it for now…

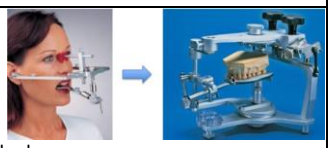
Maxillo-Mandibular Relations (MMR)

Occlusal Harmony: Joint, Muscles and teeth must all function in harmony like a door in its frame

Centric Relation (CR)	= Position in which the **condyles** articulate within the thinnest avascular portion of the respective discs in the most **anterior-superior position** against the articular eminences  - Position independent of the teeth - **Most reliable and reproducible position in the mouth** Use to mount cases when: - Pt is edentulous - Lack of tripodized stable occlusion - When MI is impossible to maintain - Complete occlusal reconstruction **Bimanual Manipulation:** One of the most accurate methods to obtain CR 1. With patient lying back, support the posterior mandible w/ fingers and the chin w/ thumbs 2. Deprogram the jaw -> direct condyles to be in the most anterior-superior position 3. Find first CR tooth contact -> repeat until it is consistent 4. Keep anterior teeth slightly apart in CR w/ leaf gauge or acrylic resin jig 5. Take occlusal registration of posterior teeth w/ Futar or PVS 
Maximum Intercuspation (MI) **AKA Centric Occlusion (CO)**	= Complete interdigitation of the teeth - Independent of the condyle position  MI and CR only coincide perfectly in only 10% of the population - Usually (90% of people) there is a 2mm slide into Centric Occlusion Mount Casts in MI/CO when: - Single fixed procedure is planned (Single crown) and the teeth can be locked and stable in MI

Facebow Record

= Duplicates on the articulator the relationship of **Maxillary arch to the skull** and the **Mandible to the rotational center of the TMJ**

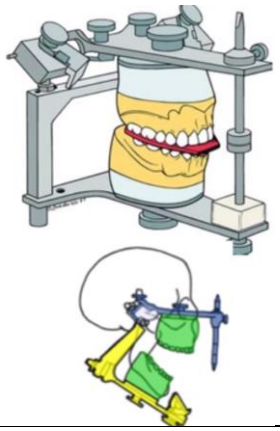


Arbitrary Facebow

- Orients the maxillary cast to the skull via the external auditory meatus to stabilize the bow

Kinematic Facebow

- Placed on the hinge axis of the mandible (much more complex to arrange)



Upper Member - Mounted with the facebow	Maxilla
Lower Member - Mounted with the bite reg/CR Reg	Mandible
Hinge Axis	TMJ

Casts poured from **Alginate are more accurately mounted with **Wax** records
Casts poured from **Elastomeric Materials (PVS) are more accurately mounted with **Elastomeric Materials (PVS) or ZOE paste**

Articulators

Non-Adjustable

- Doesn't reproduce the full range of mandibular movement -> ONLY Hinge axis opening
- Distance between the hinge and teeth is significantly short than in the patient

*May result in premature contacts and incorrect ridge and groove direction of restorations

- Reserved for very simple cases

Semi-Adjustable

- Allows setting of Bennett Angle (15°) and Horizontal Condylar Inclination (30°)

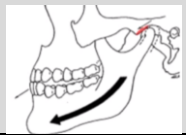
Arcon	Non-Arcon
= Condyles are a part of the lower member = Fossa is a part of the upper member **Just like a real human**	= Upper and Lower members are rigidly attached

Fully Adjustable

- Can do a complete adjust to replicate all border movements
- Pantograph is used to trace all the patients border movements to replicate on the

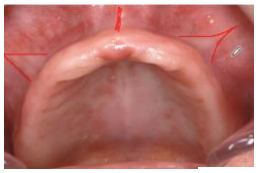
Disclussion

Protrusive Movement

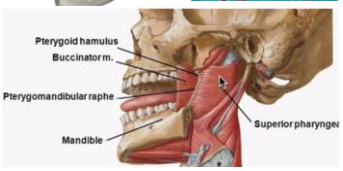


Condylar Guidance (Posterior determinant)	- Slope of the articular eminence - Represented by **HCl (Horizontal Condylar Inclination)** on articulator (30°) 
Incisal Guidance (Anterior determinant)	- Incisal edges of lower incisors against lingual slopes of upper incisors - Represented by the **pin and guide table** on articulator 
Lateral Movements	
Canine Guidance	- All posterior teeth are immediately discluded as contact occur **solely** between upper and lower canines on the **working side** (side the mandible is moving **towards**)
Anterior Guidance	- Refers to both incisal and canine guidance **Mutual Protection** Front Teeth protect the back teeth - *During protrusive:* Incisal and condylar guidance provide clearance for all posterior teeth - *During lateral:* Canines on working side and condyle on balancing side (non-working) provide clearance for posterior teeth on the balancing side (non-working) Back teeth Protect the front teeth - Flatter occlusal surfaces and strong roots protect the anterior teeth from strong biting forces
Guide Table	*Anterior guidance must be preserved when restorative procedures change the surfaces of any "guiding teeth" - Incisors, Canines etc **Mechanical**: - Not sufficient to reproduce the lingual contours of maxillary anterior natural teeth -> Because the teeth are curved and the table is straight **Custom**: - Made out of acrylic resin to provide accurate information of the curved lingual contours of maxillary anterior teeth 

Maxillary Edentulous Anatomy

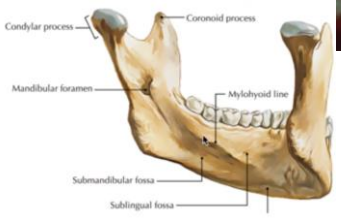


- Alveolar Ridge
- Labial Frenum
  - At or adjacent to the midline
- Buccal Frenum
- Labial Vestibule
  - Vestibule anterior to the 2 buccal frena
- Buccal Vestibule
  - Vestibule posterior to the 2 buccal frena to the hamular notch
- Hamular Notch
  - Soft tissue that connects the distal end of the maxilla to the pterygoid hamulus
- Vibrating Line
  - Runs from hamular notch to hamular notch
  - 2mm away from Fovea Palatini
  - Make Pt say "Ahhhh" -> That is the location of the vibrating line
- "Butterfly Line"
  - Demarcation between soft palate and hard palate
  - Slightly anterior to the Vibrating line
  - If you do the Valsalva maneuver, the butterfly line will balloon down
- Posterior Palatal Seal
  - Area of denture that compresses the soft tissue of the palate to create a suction on the maxilla
  - Butterfly line = anterior boundary; Vibrating line = posterior boundary
- Coronoid Notch
  - Distobuccal area of the impression and denture
  - Captured with border molding and getting patient to **move their jaw side to side** during border molding. Coronoid notch slides past the distobuccal region of the impression
- Pterygomandibular Raphe
  - Connects the buccinator muscle and superior pharyngeal constrictor
  - Ask patient to **open very wide to capture** this in the posterior of the impression

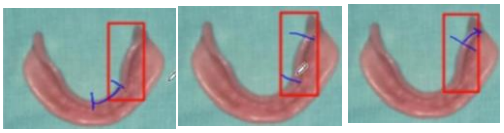


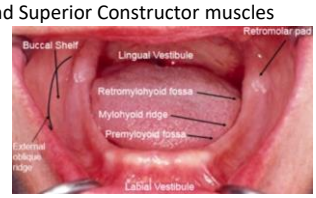
Mandibular Edentulous Anatomy

- Alveolar Ridge
  - Less broad than Maxilla
- Labial Frenum
  - Attaches with orbicularis oris muscle
- Buccal Frenum
  - Attaches with orbicularis oris + Buccinator
- Lingual Frenum
  - Attaches with genioglossus muscle
- Labial Vestibule
  - Anterior to the buccal frena
  - Mentalis muscle forms the inferior border
- Buccal Vestibule
  - Posterior to the buccal frena
  - Buccinator muscle forms the inferior border
- Retromolar Pad
  - Marks the distal extension of the edentulous ridge
  - Ideally covered for support and retention (integrity of the bone is maintained here)
  - Contains attachments from: Temporalis, Buccinator, Superior pharyngeal constrictor, and pterygomandibular raphe
- Masseteric Notch
  - Refers to the distobuccal area on the mandibular impression/denture (analogous to the hamular notch)
  - Masseter contracts when the mouth closes against resistance
  - Have patient close against resistance to capture in border molding -> Prevents the masseter from impinging on an overextended distobuccal corner of the denture
- Alveololingual Sulcus
  - Between the mandibular alveolar ridge and the tongue
  - Two "S"'s in the name Sulcus…and two "S"'s in the structure (vertical S and horizontal S)
  - 3 Regions:
    - *Anterior Region*
      - From Lingual frenums to the premylohyoid fossa
      - First "curve" in the S
      - Sublingual gland sits above the mylohyoid muscle in this region be shorter in this region
    - *Middle Region*
      - From premylohyoid fossa to the distal end of mylohyoid ridge
      - Flange is deflected medially away form the mandible b/c of mylohyoid ridge in this area + contraction of mylohyoid medially
      - 2nd curve of the S
    - *Posterior Region*
      - Extens into retromylohyoid fossa
      - Mylohyoid attaches higher the most posterior you go, but the posterior fibers are directed vertically -> So denture can sit deeper alloing the lingual flange to be longer
      - Flange is deflected laterally towards the ramus of the mandible -> 3rd curve of the S
      - Extension is limited by Palatoglossus and Superior Constructor muscles
- Buccal Shelf
  - Provides Main support for denture
  - Lies perpendicular to occlusal forces
  - Buccinator attaches here
  - Found lateraly to the posterior alveolar ridge



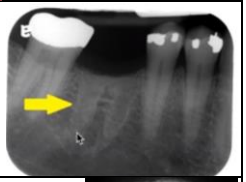
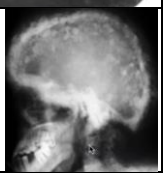
= Flange will



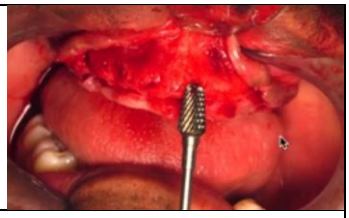


Pre-Prosthetic Surgery

Frenectomy	*Indication*: Frenum attachment is too high and will interfere with the seating of the denture Most -> Least Common: Labial > Buccal > Lingual
Free-Gingival Graft	*Indication*: Lack of KT on the alveolar ridge, implants, or around overdenture teeth - FGG widens the band of KT -> Allows for improved oral hygiene with the tougher mucosa

Hypermobile Ridge	= Flabby edentulous ridges - Most common in the anterior maxilla - Use large relief with perforated tray so you don't displace the ridge in your impression *Tx*: - If the tissue is inflamed -> Tx with tissue conditioner - If tissue conditioner is ineffective -> Electrosurgery or laser surgery to eliminate tissue. CAUTION, may eliminate the vestibule which is important 
Epulis Fissuratum	= Hyperplastic tissue reaction caused by an ill-fitting or overextended denture flange *Tx*: - Tissue conditioner and adjust the flange - If refractory to flange adjustment -> Surgery may be needed to excise the excess tissue 
Fibrous (Pendulous) Tuberosity	- Common when large tuberosities touch the retromolar pads -> can interfere w/ denture construction by limiting interarch space Tx: - Surgical excision of fibrous tissue and/or bone 
Papillary Hyperplasia	= Multiple papillary projections of the palate -> caused by local irritation, ill-fitting dentures, poor OHE, and leaving dentures in all the time - Candidiasis is the main cause *Tx*: - OHI, Leave dentures out at night, soak denture in 1% bleach and rinse thoroughly, use tissue conditioner - Brush irritated area VERY lightly with soft brush - Tx Candida w/ Nystatin 
Combination Syndrome	= Specific pattern of bone resorption in the anterior edentulous maxilla **when it is opposing mandibular anterior teeth only** *Characteristics* - Overgrowth of tuberosities - Papillary hyperplasia in hard palate - Extrusion of lower anterior teeth - Loss of bone under the partial denture bases 
Retained Root Tips	- Residual root tips can be infection risk - May be left behind if they have an intact lamina dura and no RL (sign of infection) 
Paget's Disease	*Etiology*: Unknown *Characteristics*: Bone resorption and repair leading to deformities - Denture no longer fits, and Hats no longer fit -> will need to periodically remake the denture 

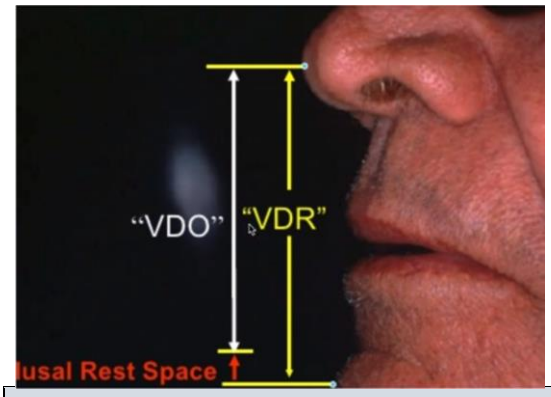
Treatment Options

Alveoloplasty	Surgical reshaping of the alveolar bone - Use surgical bur, rongeur, bone file *Indications*: - Sharp, spiny or extremely irregular ridges 
Tori Removal	*Indications*: - Tori creating undercut or interfering with posterior palatal seal 

Vestibuloplasty	Increases the relative height of the alveolar process to ↑ denture base area by apically repositioning the alveolar mucosa, buccinator, mentalis, and mylohyoid muscles as they insert into the mandible - Lingual vestibuloplasty is more traumatic and not usually indicated 
Bone Augmentation	Bone grafts - Iliac crest of hip and rib are common Autograft donor sites - Hydroxyapatite -> Synthetic biocompatible bone substitute Horizontal Augmentation > Vertical 

Complete Dentures

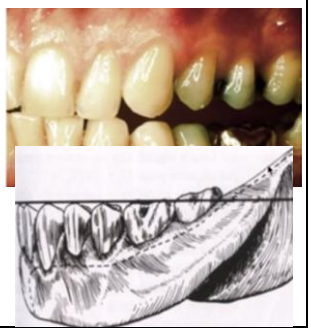
VDO and Occlusion

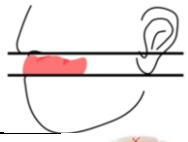
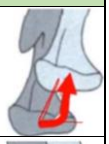


Vertical Dimension of Rest (VDR)	= Distance between nose and chin **at rest** - Where elevator and depressor muscles are in a relaxed state of equilibrium - Usually 2-4 mm of space between U and L Premolars
Vertical Dimension of Occlusion (VDO)	= Distance between nose and chin when **biting together** - Indicates superior inferior relationship of max. and mand. when the teeth are occluded **in MI**
Interocclusal Space	= Difference between these two distances (ideally 2-4mm) - VDR = VDO + 3mm

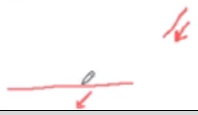
Issues with VDO	
Excessive VDO	- Excessive display of **Mandibular** teeth - **Muscles of mastication fatigue** - Clicking of posterior teeth when speaking - Strained lips - Pt unable to wear dentures - Discomfort - Excessive trauma to supporting tissues - Gagging 
Insufficient VDO	- **Aged appearance** of lower 3rd of face -> thin lips, wrinkles, chin too close to the nose, overlapping corners of the mouth - Diminished occlusal force - **Angular cheilitis** 

Records

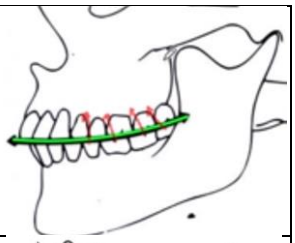
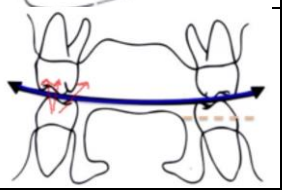
CR Record	For Edent patient, it gives us the ability to ↑ or ↓ the VDO accurately in the articulator -> establish a radius of the mandible's arc of closure (Adjusting the guide pin) - Facebow still used to transfer the relationship between the hinge axis and the maxilla to the articulator
Protrusive	= Registers the anterior-inferior condylar path in the translation movement of the condyles -> Condyles slide down the articular eminence **Christensen's phenomenon** = distal space created between the Man and Mand. occlusal surfaces when the mandible is protruded, due to the downward and forward movement of the condyles down their articular eminences -> Posterior open bite as the mandible is protruded. - This leads to instability in a denture! Build in **Compensating curves** into the denture so it maintains contact on protrusion 

Plane of Occlusion	**Camper's Line** = imaginary line from the ala of the nose to the tragus of the ear **Interpupillary Line** = Imaginary line between the pupils of the eyes *Maxillary occlusal wax rim should be parallel to both of these lines -> Measure with a Fox Plane 
Balanced Occlusion	= Simultaneous anterior and bilateral posterior contacts (tripodisation) in Centric **AND** eccentric movements to maintain seating of the dentures - Removes the **Christensen's Phenomenon** *Anterior Guidance (Incisal and Canine guidance) should be avoided to prevent dislodgement of denture bases* - On the **balancing side:** Max. lingual cusps contact the lingual incline of mandibular buccal cusps - On **working side:** Max. lingual cusps contact facial incline of mandibular lingual cusps AND mandibular buccal cusps contact lingual incline of max. buccal cusps  
Lingualized Occlusion	= Only the palatal cusps of the maxillary posterior teeth contact the mandibular posterior - In theory eliminating the destabilizing buccal force vectors
Bennett Concepts	
Bennet Angle	= Angle obtained after ***non-working side condyle*** has moved anteriorly and medially relative to the sagittal plane - Standard: 15° 
Bennett Shift	= Lateral movement of ***mandible (whole mandible)*** toward the working side during lateral excursions 
Bennett Movement	= Lateral movement of ***both condyles*** (whole mandible) toward the working side - "TMJ looseness"

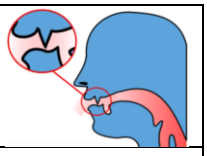
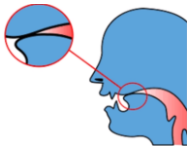
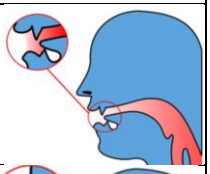
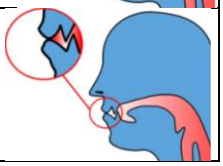
Determinants of Occlusion

Factors that favor disclussion (no eccentric contacts) of posterior teeth	
Anterior Guidance	*Horizontal/Anterior*: Steep Incisal Guidance *Lateral*: Steep Canine Guidance
Posterior Guidance	*Horizontal/Anterior*: Steep Horizontal Condylar Inclination (HCI) *Lateral*: ↓ Bennett movement (side shift)
Cuspal Anatomy	Short posterior cusps w/ shallow inclines
Tooth Arrangement	↓ Curve of Spee ↓ Curve of Wilson
Orientation of Occlusal Plane	Less parallel to orientation of condylar path 
Factors that favor eccentric occlusion on posterior teeth	
	It's the opposite of everything above

Compensating Curves

Curve of Spee	= A-P curve to ensure loading into the long axis of each tooth - More mesial inclination as you move distally 
Curve of Wilson	= Mediolateral curve along posterior cusp tips to ensure loading into long axis of each tooth - More lingual inclination as you move distally 

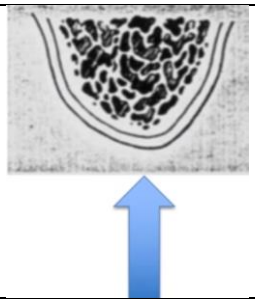
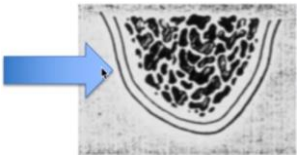
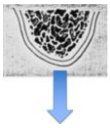
Phonetics

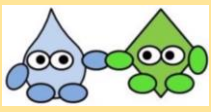
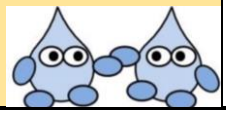
Fricative/Labiodental Sounds **= F, V, Ph**	= Contact between max. incisors and wet/dry line of the lower lip - Helps determine position of **incisal edges of Maxillary anterior teeth** Ask patient to count up from 50 
Sibilant/Linguoalveolar Sounds **= S, Z, Sh, Ch, J**	= Contact between tip of the tongue and anterior palate or lingual surfaces of teeth - Helps determine **vertical length and overlap of anterior teeth** Ask patient to count up from 60 If Whistling = Too narrow arch form If Lisp = Too wide arch form *****Closest Speaking Space = Evaluate VDO during "s" Interincisal separation should be 1-1.5***** 
Linguodental Sounds **= Th**	= Contact between tip of the tongue and the upper and lower teeth - Helps determine **labiolingual position of anterior teeth** If tongue not visible = Teeth too far forward If tongue sticks out = tooth are too far back 
Bilabial Sounds **= B, P, M**	= Contact between both lips - Insufficient lip support by the teeth or labial flange can affect these sounds 

Support, Stability, Retention

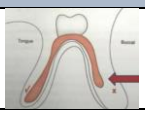
**Ridge = best indicator for success of denture -> It is able to provide Support, Stability and retention

- Wide broad ridge is the ideal

Support	= Resistance to **vertical seating** forces against soft and hard tissues *Maxilla*: - Palate - Alveolar Ridge *Mandible*: - Buccal Shelf - Retromolar Pad *Denture*: - Denture Base 
Stability	= Resistance to **horizontal** dislodging forces *Maxilla AND Mandible:* - Ridge Height - Depth of vestibule *Denture*: - Denture Flange 
Retention	= Resistance to **vertical dislodging** forces (pulling away from tissue) Maxilla and Mandible: - Peripheral Seal 

Peripheral Seal	
Adhesion 	= Attraction of unlike molecules - Saliva to tissues - Saliva to denture base *Intimate contact of denture base to tissues creates the best seal* - Occlusal prematurities may break retention
Cohesion 	= Clinging of like molecules - Saliva to saliva *Thick ropy saliva is unfavorable -> thin water saliva is better for retention*

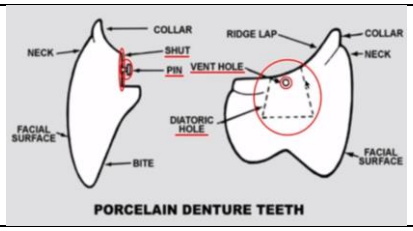
	Surface Tension 	= Combination of adhesion and cohesion forces that maintain film integrity - Water molecules are more attracted to each other than the surrounding air - Like trying to pull 2 glass slabs with film of water between apart -> idea is to replicate this phenomenon with the denture

Over-extension	
Overextended Flange	= Gets sore spot/ulcer after wearing for a while Tx: relieve denture and re-evaluate in a few weeks for healing 
Overextended base	Extends too far back - Teeth go onto the ramus (this is why we don't add 8's or even 7's to denture) - Occlusal forces would dislodge the denture
Under-extension	
Under-extension	= Denture flange is too short - ↓ Retention 

Processing and Materials

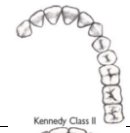
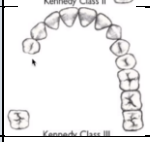
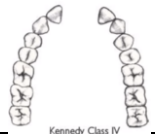
Heat Cured Acrylic	
Liquid	***MMA (Methyl methacrylate)*** = Monomer (Liquid) - Memory Trick…most begin with M *Other components* Hydroquinone = Inhibitor - Prevents it from polymerizing on its own Glycol dimethacrylate = Crosslinking agent - Crosslinks cured resin to ↑ rigidity dimethyl-p-toluidine = Activator - Tertiary amine, breaks down benzoyl peroxide into its radical form 
Powder	***PMMA (Polymethyl methacrylate)***= Polymer (Powder) - Memory trick…all begin with P *Other Components* Benzoyl Peroxide = Initiator - Starts the polymerization reaction (same as self-cure composites) Salts of Iron, Cadmium, Organic dyes = Pigments
Processing errors	**Shrinkage** - ALWAYS occurs -> but ↑ ↑ shrinkage with excess monomer - Ideal ratio of monomer to polymer = 1:3 **Porosity** - Due to under packing with resin at the time of processing… - OR if it is heated too rapidly (boiling too fast, creates voids in the material)

Denture Teeth

Acrylic	↑ Retention to the base - Bonds to the acrylic resin of the base
Porcelain	↑ Esthetics - More stain and wear resistance Brittle ↑ wearing of opposing teeth Doesn't bond to acrylic base - ↑ retention with pins (anterior teeth) or diatorics (posteriors) 

Partial Dentures

Kennedy Classification

Class I		= Bilateral Distal Extension
Class II		= Unilateral Distal Extension
Class III		= Unilateral **bounded** edentulous space
Class IV		= Edentulous Space crosses the midline

Applegate's Rules

Rule #1: Classification should be assigned **AFTER** any extractions

Rule #2: Missing 3rd molars are not counted

Rule #3: Abutment 3rd molars ARE considered

Rule #4: Missing 2nd molars are not considered if they are not going to be replaced by the denture

Rule #5: **Most posterior edentulous area** determines the classification

Rule #6: Other edentulous areas are referred to as **Modifications**

Rule #7: Extent of modification does not matter, only the number of modifications

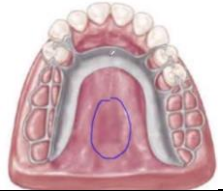
Rule #8: Kennedy Class IV cannot have any modifications by definition

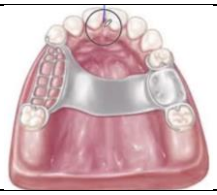
---

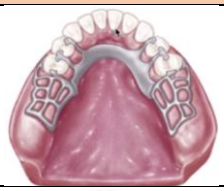
Major and Minor Connectors

Major Connectors

- Provides Rigidity (this is the primary function)
- Unites all other components
- Not placed in movable tissue

Maxillary Major Connectors		
Complete Palatal Plate	= Most rigid option *Indication*: - All posterior teeth are missing bilaterally (Kennedy class I) - Periodontally compromised teeth - Shallow palatal vault - Small mouth - Flat or flabby ridges	
Horseshoe	= Least Rigid *Indication*: - If there is a large palatal torus that cannot be removed	

Palatal Strap	= Metal strap that crosses between the edentulous areas *ALL major connectors should cross the midline at 90° 
Beading	*Exclusive for maxillary major connectors = Scribing a 0.5mm rounded groove in the cast at the borders of the major connector - Adds strength and maintain firm tissue contact to prevent food impaction 

Mandibular Major Connectors	
Lingual Bar	= Simplest and most common *Indication*: - When depth of lingual vestibule is **≥ 7mm** 
Lingual Plate	*Indication* - When depth of lingual vestibule is <7mm - Additional tooth loss is anticipated - Lingual tori cannot be removed - All posterior teeth are missing bilaterally (Kennedy Class I) 
Labial Bar (Swinglock)	*Indication*: - Missing canine - Unfavorable soft tissue contour - Questionable periodontal prognosis 

Minor Connectors:

- Connect the major connector to the rests, indirect retainers and clasps

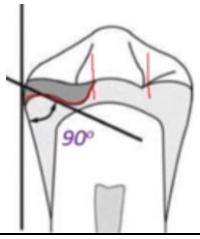
---

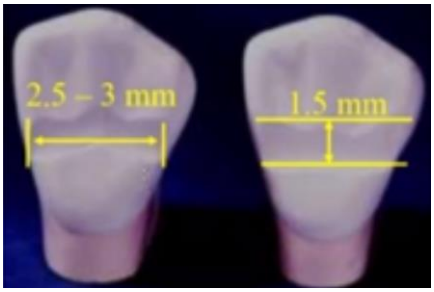
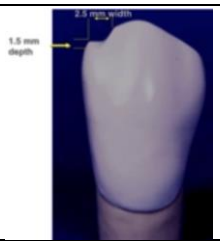
Rests and Proximal Plates

Rests

= Rigid extension of an RPD framework that contact the ***occlusal, lingual, or incisal*** surface of an abutment tooth

- Directs forces through the long axis = ***Provides Support***

Rest Seats = Prepared into the ***occlusal, lingual or incisal*** surface of an abutment tooth to receive and support a rest 	
Occlusal Rest	= Rounded, Semi-circular outline form (Spoon shape) **Dimensions**: - 1/3rd M-D width of the tooth - 1/2 intercuspal width - 1.5mm deep for a base metal - Floor inclines apically towards the center - 90° angle formed with a vertical minor connector 
Cingulum Rest	= Inverted V or U shape

	- Mostly for Canines **Dimensions**: - 2.5-3mm M-D Length - 2mm labiolingual width (ledge) - 1.5mm deep **Contraindicated for mandibular incisors (too small) **Benefits**: - Good distribution of occlusal load - ↑ esthetics - Closer to major connector ↑ strength 
Incisal Rest	= rounded notch at the incisal angle Dimensions: - 2.5mm M-D - 1.5mm Deep Used as an indirect retainer - Less favorable leverage vs lingual/cingulum rest *Not very esthetic* 

Proximal Plate	- Metal plate that contacts proximal surface of abutment tooth - Technically considered a minor connector 
Guide Planes	= Flat parallel surface of an abutment tooth that provides a path of insertion an removal Dimensions: - 1/3rd Buccolingual width of the tooth - Extends 2-3mm vertically down from the marginal ridge

Indirect Retainer

= A rest (usually) that provides bracing to resist rotational movement of distal extension area

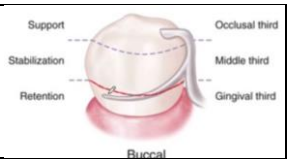
- Provides **Retention**
- Distal extension area of a partial is "loose" and not anchored posteriorly -> causes rotational movement centered around a line drawn through the **most distal rests**
  - Indirect retainer is **directly perpendicular and anterior** to this fulcrum line

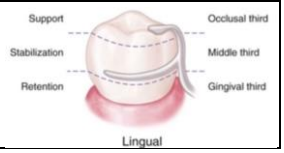
Clasp Design and Selection

Direct Retainer (Clasp Assembly)

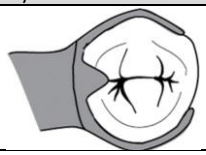
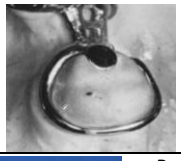
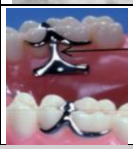
1. Rest = **Support**
2. Minor Connector = **Stability**
3. Clasp Arms
   a. Retentive clasp arm = **Retention**
   b. Reciprocal Clasp arm = **Stability**

Extracoronal Retainer	= More common, conventional design - Clasps should encircle a tooth **at least 180°**
Intracoronal Retainer	= Precision attachment w/ key and keyway pattern - More esthetic (no clasps) - Requires a lot more planning

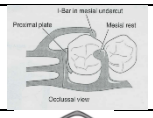
Retentive Clasp Provides **Retention**	- Originates from the minor connector and rest Contacts tooth **below** height of contour/survey line - Shoulder and middle be above HOC -> only the tip (end 1/3rd) of the clasps should be under the HOC	

	- Tip is designed to engage in undercut and resist dislodging forces -> is only active when dislodging forces are applied to them, otherwise it is passive
Reciprocal Clasp Provides **Stability**	- Originates from the minor connector and rest Contacts tooth **above** height of contour/survey line - Braces the abutment tooth so it is not torqued by the retentive clasp - No part of the clasp goes below the HOC 

Clasp Designs

Suprabulge - Originates above the survey line	
Circumferential	 = Most common (by far) - Very Versatile
Ring	 = Used when undercut is adjacent to the bound edentulous space - Ring wraps around the entire tooth
Embrasure	 = Basically 2 circumferential clasps
Infrabulge - Originates below the survey line - Need enough vestibular depth and no soft tissue undercuts for these to work	
I Bar	
T Bar	
Bar Type	
Y Type	

Clasp Assemblies (Entire Direct Retainer)

RPI (Rest Proximal Plate I bar)	= Ideal Class II Lever - Rest is on the mesial side, not the distal 
RPA/RPC (Rest Proximal Plate Akers/Circumferential Clasp)	= Ideal Class II Lever Rest is on the mesial side, not the distal 

Clasp Selection and Materials

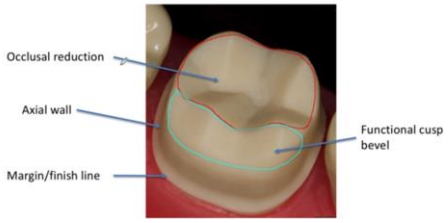
- ***Bounded Edentulous Space*** -> Use Akers/Circumferential clasps w/ rest seats located adjacent to edentulous space
- ***Distal Extension*** possibilities (in order of preference):
  - RPI
  - RPA
  - Wrought Wire Clasp

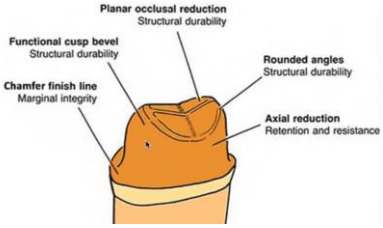
Wrought Wire	= Used for periodontally compromised and Endo-treated abutments - More flexible -> Imparts less force on abutment teeth - Soldered onto the cast framework - Requires 0.5mm undercut
Cobalt Chromium	= Used for the cast framework and for cast clasps 2.3% shrinkage -> causes irregularities and porosity **Cold Working**

	- Involves manipulating the metal while at room temps (ie: when you seat and dislodge the RPD) = Main reason for clasp breakage

Fixed Prosthodontics

Tooth Preparation



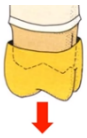


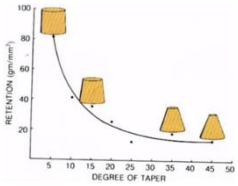
3 Principles of Tooth Preparation

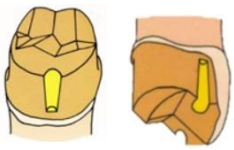
Margins

Supragingival	Above the gingival crest - Best for cleansibility of the margin and gingival health
Equigingival	At the gingival crest
Subgingival	Below the gingival crest - Best for esthetics, but bad for cleansibility and gingival health

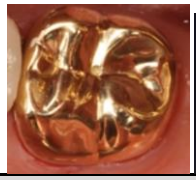
Biologic (Health of oral tissues)	***Mechanical Injury:*** - Thinnest gingival tissues are: Lingual of Molars, Facial of Premolars ***Thermal Injury:*** -> Proximity to the pulp - Use Water spray, sharp cutting instruments, Intermittent light pressure ***Chemical Injury:*** - Soaked retraction cord that remains in place too long, Cement leakage ***Bacterial Injury:*** - Leakage under the crown
Mechanical (Integrity and durability of resto)	***Retention Form:*** - Features that prevent removal of crown along long axis of the prep -> Sticky Foods ***Resistance Form:*** - Features that prevent removal of crown by apical, horizontal, or oblique forces -> Every other force ***Taper/Parallelism*** - Angle of convergence formed between 2 opposite prepped axial surfaces - Operator Control! -> Ideal 6-12° taper ***Height/Length*** - Measured from occlusal/incisal surface to crown margin - ↑ Surface area = ↑ retention - Incisors/Premolars: Minimum 3mm - Molars: Minimum 4mm ***Width***: - M-D or B-L Dimension ***Height:Base Ratio:*** - Minimum = 0.4 - Can taper more if the prep is taller….shorter preps require more parallelism **** Buccal Grooves ↑ Retention**** ****Proximal Grooves ↑ Resistance**** ***Reduction***: - Amount of occlusal tooth structure removed during the preparation (1.5-2.0mm) ***Clearance*** - Amount of space left between tooth prep and opposing tooth (1.5-2.0mm)
Esthetic (Appearance of resto)	Metal < PFM < All Ceramic

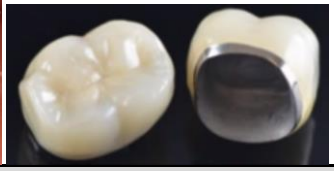




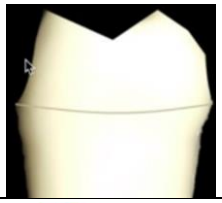
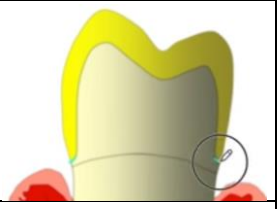
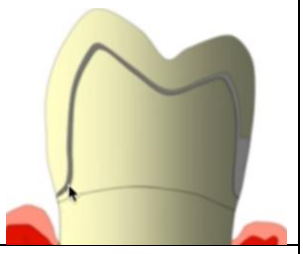
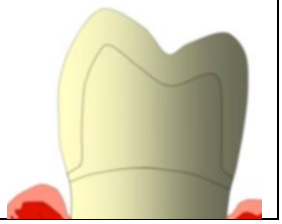


Thickness	
Metal Crown	Margins: 0.5mm Non contact areas (Non functional Cusps): 1.0mm Contact Areas (Functional Cusps): 1.5mm
Ceramic Crown	All dimentions: 1.5mm
MCC	Non Contact Areas: 1.5mm - 1.2mm porcelain + 0.3mm metal Contact Areas: 2.0mm - 1.5mm Porcelain + 0.5mm metal





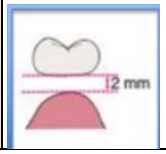
4 Main types

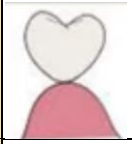
Feather-Edge	Pros: - Very acute and thin margin - Less invasive - Gives the best marginal seal (for gold) Cons: - Insufficient clearance for most materials, labs usually need to over contour the material for adequate thickness (not ideal) - Difficult to visualize 
Light Chamfer	0.3-0.5mm thick **Indication**: - Gold Crowns - Wide gold collars for PFMs 
Heavy Chamfer	1-1.5mm thick - Make sure you remove any enamel lips! **Indication**: - PFM Crowns - Some ACC's *If you don't give enough reduction the lab again will have to over contour* - **#1 Lab complaint = Tooth is under reduced** 
Shoulder	1.0-1.5mm thick - Maximizes esthetics - Aggressive though, so ↑ risk of being close to the pulp **Indications:** - Porcelain margins of PFM crowns - ACC 

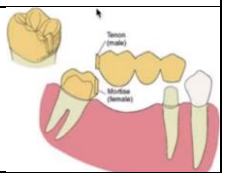
Other options for Indirect Resto

Inlay	= Restoration within the cusps
Onlay	= Covers the Cusps
Partial Crown (3/4, and 7/8 crown)	= Hybrid between onlay and full crown - Conserves tooth structure - Typically only gold - Less restoration margin in close proximity to gingival tissues - More easily seated during cementation Technically very hard to do, and most patients are not keen because of the gold - And most patients

Pontic and Connector Design

Pontics	
Hygienic /Sanitary Pontic	- Posterior Mandible (where esthetics are not an issue)  **Pros**: - Good hygiene **Cons**: - Poor esthetics - Requires enough VDO/restorative space (ie: no supraerupted opposing teeth)

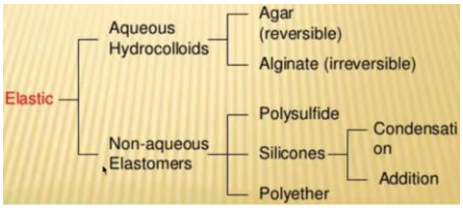
Saddle/Ridge Lap	- **NEVER USE THIS**  **Cons**: - Impossible to clean, leads to all sorts of periodontal issues
Conical	- Molars  **Pros**: - Marginally better esthetics vs the hygienic - Decent hygiene **Cons**: - Not as hygienic as the hygienic pontic
Modified Ridge Lap	- Anterior teeth only  **Pros**: - Good esthetics - Lingual is kinda like Conical design so hygiene is OK as best **Cons**: - Not as hygienic, but we have to compromise to achieve anterior esthetics
Ovate	- Anterior Teeth only - Ponic is placed within a divot in the bone/soft tissue -> Requires surgery to create the divot!  **Pros**: - Best Esthetics, with good emergence profile **Cons**: - Requires surgery - Requires good ridge

Connectors	
- Should be **minimum 3mm tall**	
Rigid	= Either cast in one piece of soldered together
Non-Rigid	= Male and Female components lock together, and are able to be placed like puzzle pieces - Crown on the tipped abutment can have an independent path of insertion, which the connectors (Male and Female) can adopt the POI of the smaller abutment Indications: - When Common path of insertion between abutments is impossible to create 

Impression Materials

Tissue Management for Impressions:

Fluid Control	- Cotton Rolls - Suction - Anti-sialagogues (Atropine) -> Not really used
Tissue Displacement	*Retraction Cords* - Stretch circumferential periodontal fibers *Impregnated Cords* - **Hemodent** -> AlCl (Blocks capillaries) - **Astringident** -> $FeSO_4$ (Coagulates) - **Epinepherine** (Vasoconstricts) -> too much Epi though, dangerous! *Electrosurgery* - Contraindicated for Pacemakers, Insulin Pumps - Electrode must not contact teeth 



Aqueous: Mix power w/ Water

Non-aqueous: No water involved

Aqueous Hydrocolloids

Imbitition = Absorption of water
- Distortion of impression if you leave it in a bowl of water

Syneresis = Loss of water
- If the impression is desiccated it will distort also
- Store in 100% humidity


Reversible Hydrocolloid (Agar)	Changes between Sol phase and Gel phase based on temperature - Liquifies on heating (Sol) and hardens on cooling (Gel) -> Allows it to be reused **Pros**: - Highly accurate **Cons**: - Needs special equipment (water baths) - Technique sensitive - Smells terrible 
Irreversible Hydrocolloid (Alginate)	**Mixing Powder into the water = ↓ bubbles**  *Setting Time*: 3-4 minutes in mouth *Pouring Time*: Pour with gypsum w/i 10 minutes - Store in 100% relative humidity if longer than 10 minutes *Ingredients*: - Primary Ingredient: Diatomaceous Earth - Active Ingredient: Potassium Alginate -> Forms insoluble Calcium Alginate *Cons*: - Most inaccurate

↓ Setting Time	↑ Setting Time
- Hot Water	- Cold Water
- ↓ Water:Powder	- ↑ Water:Powder

Non-Aqueous/Elastomeric

Polysulfide Rubber	**Water is released as a biproduct** - Hydrophobic material - Prone to Syneresis (Drying out) -> Because its hydrophobic and releases water *Pouring Time*: 30-45 minutes
Condensation Silicone	**Alcohol biproduct** - Causes shrinkage of impression when alcohol evaporates  *Pouring Time*: 30 minutes
Polyether	Very stable, but easily influenced by H_2O and Humidity (Opposite to polysulfide rubber) - Hydrophilic - Prone to Imbibition (swelling with water) **Very stiff** - Easy to break teeth on cast when removing the impression from stone *Pouring time*: 60 minutes
Addition Silicone (PVS) - **Polyvinyl Siloxane**	No Biproducts 😊 Best for - fine detail production - elastic recovery - dimensional stability *Inhibited by sulfur in latex gloves and the rubber dam! -> Use nitrile* *Pour Time*: Can handle Weeks 😊

Gypsum Materials

- Mined as Calcium-Sulfate Dihydrate ($CaSO_4 – 2H_2O$)
- Manufactured w/ heat to remove some water and become Calcium-Sulfate Hemihydrate ($CaSO_4 – ½ H_2O$)
  - All gypsum products are chemically the same (as above) but differ in **shape and size of particles**

Water

Gauging Water	Extra water needed to obtain a workable mix of material - Does not chemically react w/ gypsum Gypsum Powder can only react w/ a set amount of water -> this gauging water is extra on top of this
Effects of Water	*Ideally, keep the water ratio as per the manufacturers recommendation

↑ Water	↓ Water
- ↓ Strength - ↑ Porosity (more water separating the particles) - ↓ Expansion - ↑ Setting Time	- ↑ Strength - ↓ Porosity - ↑ Expansion - ↓ Setting Time

Type I

Impression ***Plaster***
- Low Expansion
- Sets quick -> no time for expansion!

Indication:
- Used for mounting the casts to the articulator

Type II

Model ***Plaster***

Indications:
- Models for Mouth Guards, Essex Retainers
- Study Models

Type III

Dental ***Stone***

<u>Indications</u>:
- Diagnostic Casts
- Working Casts

Type IV

**This one is the best*

Dental ***Stone (HS/LE)***
- High Strength
- Low Expansion

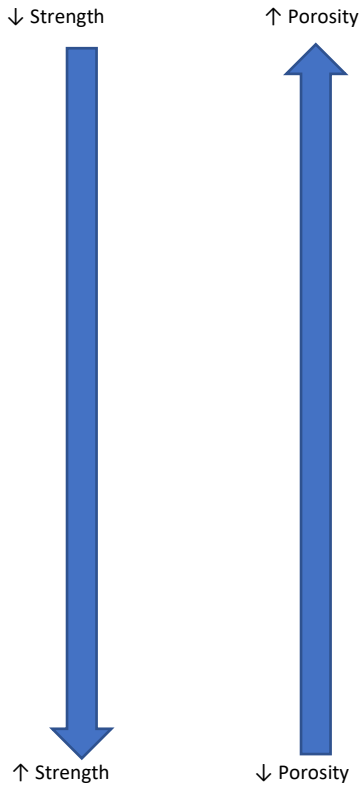
Pros:
- Best abrasion resistance
- Least gauging water needed
- Least expansion

<u>*Indications*</u>:
- Fabrication of Dies

Type V

Dental ***Stone (HS/HE)***
- High Strength
- High Expansion ☹

Indications:
- Fabrication of Dies



Timing:

Mixing Time	- 20 Seconds if using Vacuum mixer - 30 Seconds if hand mixing
Setting Time	45-60 minutes

↓ Setting Time	↑ Setting Time
- Hot Water - ↓ Water - Slurry Water - ↑ Spatulation time	- Cold Water - ↑ Water - ↓ Spatulation time

Disinfect w/ 1:10 Bleach solution, Glutaraldehyde, or Iodophor Spray

---

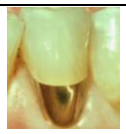
Metal Alloys

Noble Metals *Silver is NOT a noble metal -> Causes Greening of porcelain*	
Gold	= Tarnish Resistance
Platinum	= Strength, ↑ Melting Temp
Palladium	= Strength

S.M. Notes
Alloys are categorized based on their % composition of Noble Metals

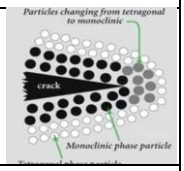
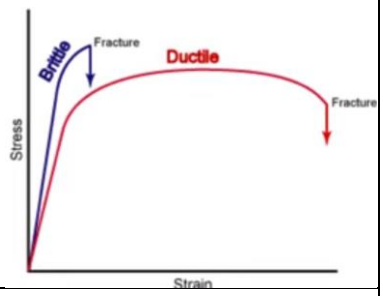
Base Metal Alloy	<25% noble
Noble Alloy	≥ 25% noble
High Noble Alloy	≥ 60% noble -> of which ≥ 40% is Gold

Gold Alloys

Type I (Soft)	"Pure" gold - 98-99% gold - Weakest Indication: - Class V Restorations only -> too soft for any other purpose 
Type II (Medium)	77% gold Indications: - Inlays (Non-cuspal coverage) 
Type III (Hard)	72% gold Indications - Crowns 
Type IV (Extra Hard)	69% gold - Strongest! Indications: - PRD Castings - Post and Cores - Clasps - Bridges

---

Mechanical Properties

Compressive Strength	= Ability to resist fracture during compression - Ie: Crown withstanding occlusal force 
Tensile Strength	= Ability to resist fracture during pulling 
Flexural Strength	= Ability to resist fracture during bending - Ie: Connector of a bridge during occlusion 
Fracture Toughness	= Ability to resist propagation of a crack - Zirconia has best fracture toughness -> undergoes Fracture toughening. During propagation, the normal tetragonal particles transform to monoclinic particles to stop crack propogation! 
Modulus of Elasticity/Elastic Modulus	= Measure of stiffness/rigidity - Stress divided by Strain (Slope of the Stress-Strain line) - Steeper the slope, the stiffer the material - Shallower the slope, the more elastic the material - Ability to deform without permanent change in size or shape 
Brittle	= Fractures easily without substantial dimensional changes - Ie: Porcelain
Ductility	= Deforms easily under **tensile** strength - Ie: Wires - Plastic deformation zone (curved part) is long before it breaks
Malleability	= Deforms easily under **compressive** strength - Ie: Gold
% Elongation	= Ability of a material to be burnished - Contact stress locally exceeds the yield strength (force where permanent deformation occurs) of the material - Ie: Gold, Matrix band

Coefficient **O**f **T**hermal **E**xpansion	= Fractional change in size per degree of temperature change - ↑ CTE = ↑ Change with temps Want to pick a material that has the closest CTE to tooth -> so as the tooth changes dimension the filling will change the same amount -> A large discrepancy ↑ stresses at the margins and ↑ risk of margin failure Composite > Metal > Tooth > Ceramic - Composite: 30 (unfilled resin is the worst) - Amalgam: 25 - Gold: 14 (Best) - Tooth: 11.4 - Porcelain: 6 "**C**omposite met**O**l **T**ooth c**E**ramic"

Ideal Properties

- **High Yield Strength:** Doesn't permanently deform
- **High Elastic Modulus**: Stiff and doesn't flex easily
- **Casting Accuracy**: Gold > Base metal
- **CoTE**: Close to tooth (11.4)
- **Biologic Compatibility**: Nickle and Beryllium allergy!
- **Corrosion Resistant**: Gold
- Minimal wear of opposing dentition

Provisional Crowns

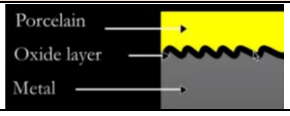
= Designed to enhance the esthetics and provide function for a ***limited period of time*** after which it is replaced by a definitive crown

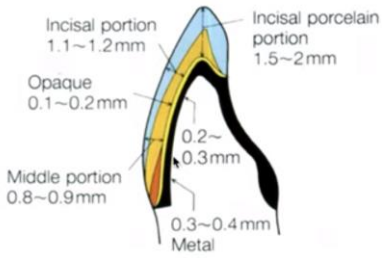
	3 M's
Method	**Direct** = Provisional is made directly in a patient's mouth - Made right then and there **Indirect** = Made outside of the patient mouth in a lab and on a cast - Less chair time required - Typically the marginal fit can be better and easier when made on a cast
Mold	Prefabricated Crown - Polycarbonate - Aluminum - Stainless Steel Cellulose Acetate Crown form Putty or shim
Material	PMMA = Indirect method because it is exothermic and releases heat (dangerous to the pulp) PEMA Bis-Acryl Composite = Direct method - Integrity - More brittle and with ↓ mechanical properties vs PMMA ☹ - Less odor and less shrinkage, and less RO on X-rays 😊

Provisionals cements have Eugenol (Kerr Temp-Bond) which inhibits polymerization of resin -> remove with excavator, explorer or wet cotton pellet before your permanent cementation

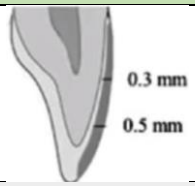
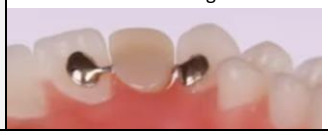
---

MCC and ACC Crowns

	Metal-Ceramic Crowns	
Bonding porcelain to metal	Monomolecular Oxidative layer must be present for porcelain to bond to the metal alloy - However esthetically it is not sweet because its dark	

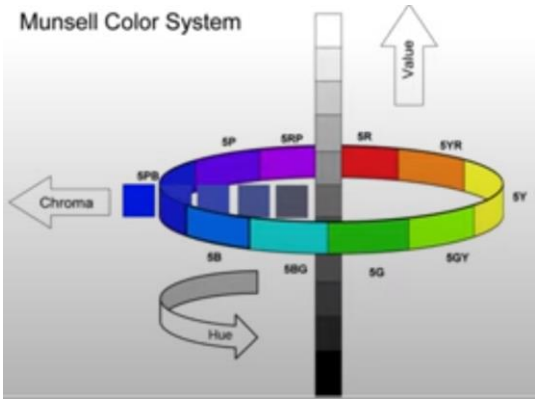
Layers of the MCC	 **Opaque Porcelain** - Masks dark oxide color - Provides porcelain-metal bond - Masking accomplished with min. 0.1mm thickness **Body/Dentin Porcelain** - Contains most of the shade of the crown - Builds up most of the bulk of porcelain **Incisal/Enamel** - Most translucent layer to give natural appearance **Occlusal Contacts but be ≥ 1.5mm away from the porcelain-metal junction**
Failures of MCC's	**Adhesive Failures** (between 1 different materials) - Porcelain-metal = If oxide layer was not formed - Oxide-Metal = If metal was contaminated - Porcelain-Oxide = If porcelain was contaminated **Cohesive Failures** (between same materials) - Porcelain-Porcelain = If there are ***voids*** - Oxide-Oxide = If oxide layer is too ***thick*** - Metal-Metal = Doesn't happen

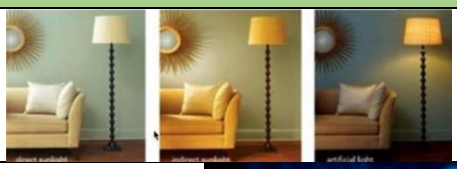
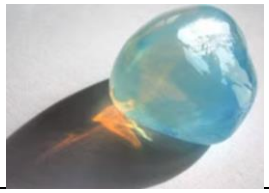
All Ceramic Crowns = ↑ Esthetics	
Glassy Ceramics - Feldspathic - Lithium Disilicate	- Etched w/ Hydrofluoric Acid + Treated with Silane Coupling agent before bonding to tooth
Non-Glassy Ceramics - Zirconia - Alumina	- Luted to the tooth with a cement

Porcelain Veneers - Purely Esthetic in function - Bonded to the facial of anterior teeth to improve esthetics	
Prep Dimensions	**All prep Is confined to enamel for best bonding* Gingival 3rd: 0.3mm Facial Reduction: 0.5mm Incisal Reduction: 1-2mm 
Maryland Bridge	
What?	Far more conservative than traditional bridges -> only need to do minor prep to tooth structure on adjacent teeth - Metal Wings are bonded to the lingual of adjacent teeth (Prone to debonding) 

Shade Selection

Munsell Color System		
Hue	= Color Family - Red? Blue? Green? - Where on the color wheel is it	
Chroma	= Saturation or intensity of color - How far from the center of the color wheel is it?	

Value	= Lightness or darkness - Measured from 0 (black) – 100 (White) - **Most important**	

Effects of Light Source		
Metamerism	= Color appears different under different lighting - Idea lighting = 5500K and 100% Color Rending Index - <5500K bluer ; >5500K is yellower	
Fluorescence	= Object emits visible light when exposed to UV light - This can happen with composites (shine a UV light and it will fluoresce different than other tooth structure *↑ Fluorescence ability = ↑ ability to match tooth*	
Opalescence	= Light effect of a translucent material appearing blue in reflected light and orange-red in transmitted light  - If you are trying to make an incisal edge more translucent…employ opalescence and use a bluer shade	

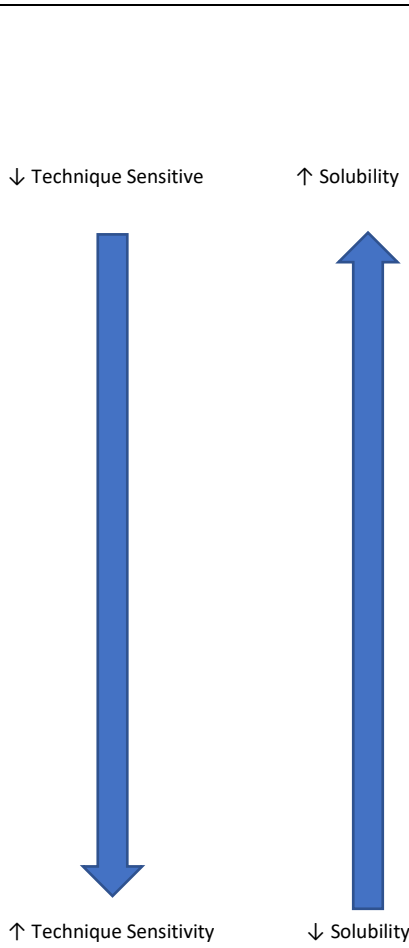
Shade Selection

1. Select **Value** first -> Assess the middle third of the crown
2. **Chroma** 2nd -> Assess cervical 3rd of the crown
3. **Hue** last -> Incisal third of the crown

Characterization = Reproducing natural defects on a crown	
Staining	= ↓ fluorescence and ↑ metamerism - ↓ Value (making it darker) **You can always add more color and make it darker, but you cannot go the other way around. Air on the side of higher value, and lower chroma**
Glazing	= Surface layers of porcelain melt slightly, coalescing particles and filling in defects - Tx of the surface texture

Dental Cements

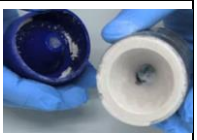
Zinc Oxide Eugenol	*Eugenol* - Sooths the pulp - **Inhibits polymerization of resins** -> remove before definitive cementation Ex: - Kerr Temp Bond 
Zinc Phosphate	Phosphoric acid - Irritates the pulp ☹ - Acid Base Reaction btwn Zinc and Phosphoric acid -> no bonding though Mix on a chilled glass slab due to exothermic reaction
Zinc Polycarboxylate	Another Acid Base reaction - Has a weak chelation bond to the Ca in the tooth -> Chemical bond (although weak) - Minimal pulpal irritation ☺
Glass Ionomer	Adheres to enamel and dentin - Releases fluoride ☺ Ex: RelyX Luting 
Resin Modified Glass Ionomer	Higher strength and ↓ solubility than GI Cement - Not to be used with ACC (except Zirconia) because of expansion from H_2O Absorption Ex: RelyX Luting Plus 
Resin	Most compressive Strength - Bonds to dentin - Light Cure, Chemical Cure or Dual Cure options Ex: - RelyX Unicem -> Self Adhesive cement (↓ bond strength vs Rely X Ultimate) - RelyX Ultimate -> Need to still use an adhesive (↑ bond strength) - RelyX Veneer -> Light cure only, b/c more color stable than dual cure cements with their benzoyl peroxide activator

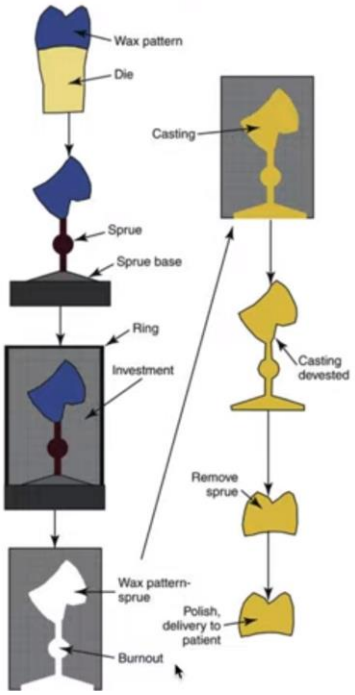


Crown and Cement Armamentarium

Crowns	
Zirconia (Ceramic, but with no silica)	Cements: - Glass Ionomer Cement - Resin Modified GIC - Fluoride release, and ↓ post op sensitivity
Metal (PFM or Full gold)	Cements: - Glass Ionomer Cement - Resin Modified GIC - Fluoride release, and ↓ post op sensitivity
Lithium Disilicate (e.Max)	Cements: - Dual-Cure Resin Cements - Layers (in order of application): Chemical Bond Dentin – Bond – Resin – Etch Crown/Veneer with HF 10% - Silane - Silica
Feldspathic Porcelain (Veneers)	Cements: - Light Cure - Resin Cements - Etched Enamel – Bond – Resin – Etch Crown/Veneer with HF 10% - Silane - Silica

Lab Processing

Die	Ditching the Die -> Exposes the margin of the prep - Die spacer is applied to allow room for the layer of cement  
Waxing Up	= Making a "positive" of the object you eventually want to make - Wax builds up the internal stress as it is manipulated and with these stresses will relax overtime causing distortion in shape and contour 
Spruing	= Making a path with wax for metal to go into the prosthesis as it is being casted - Attach to the crown in the area of biggest bulk (usually cusp)  
Investing	= Making a "negative" by covering the wax with investment material: Types of investments: - **G**ypsum-bonded Investments -> Used for **G**old - **P**hosphate-bonded investment -> used for **P**FM crowns - **S**ilica-bonded investments -> used for Ba**S**e Metal 
Burnout	= Melt out the wax +'ve to leave room for the metal to take its place 
Casting	= Melting metal into the investment (flows down the channel the Spru created)
Recovery	= Retrieving the cast framework by breaking open the investment and seeing what was wax is now gold 
Quenching	= Very hot cast metal is immediately dunked in cool water to make it more malleable for finishing



Porosity Issues

Porcelain	Inadequate condensing of porcelain
Acrylic	Too fast heating
Shrinkage Porosity of metal	Sprue is too thin -> prevents molten metal from flowing effectively into the mold
Back-pressure porosity of metal	Sprue is too thick -> prevents venting of gas, gas was still present in an area prohibiting fluid from flowing in